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EGGS AND LARVAE OF COMMON MARINE FISH SPECIES OF NORTHWEST AFRICA

EGGS AND LARVAE OF COMMON MARINE FISH SPECIES OF NORTHWEST AFRICA

by

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PREPARATION OF THIS DOCUMENT

This identification guide was conceived and supported by the EAF-Nansen Programme "*Supporting the Application of the Ecosystem Approach to Fisheries Management considering Climate and Pollution Impacts*" of the Fisheries and Aquaculture Division (NFI), Food and Agriculture Organization of the United Nations (FAO).

The EAF-Nansen Programme supports fisheries research and management institutions in partner countries in their efforts to sustainably manage their fishery resources. Fisheries and environmental surveys are conducted with its research vessel, the *Dr. Fridtjof Nansen* to strengthen the knowledge base and develop capacity at the institutional and human resources levels. The Programme's science plan guides the research work, and improving knowledge on the ecology of the early life stages of fish is the goal of its first thematic area. Information on early life history stages of fish is important for fisheries management. For example, parameters related to the dynamics of fish populations, such as spatio-temporal ichthyoplankton distribution patterns, larval pool composition and seasonal recruitment could help to improve our understanding of the factors affecting the fishable stock and their potential resilience to fishing pressure. However, fish eggs and larvae identification, which is a crucial point for any biological and ecological study, is challenging even for the experienced scientists. In developing countries, larval fish identification remains an even more significant challenge, mainly due to the dearth of both specialists and identification guides.

Noting that the northwestern coast of Africa is lacking specific tools for the identification of ichthyoplankton, the Programme decided to support the preparation of this identification guide, building on the work previously completed by the author for the western Mediterranean Sea[1].

The work started in early 2021 and was completed at the end of 2022. Before finalizing the guide, a selection of species sheets were tested at the "*EAF-Nansen Programme Regional Training Workshop on the Identification of Ichthyoplankton*" that was held at the University of Cape Coast, Ghana from 20 to 24 June 2022.

This guide is designed to assist researchers in the identification of the early life stages of the fish species that are most likely to be present in the plankton samples collected in the Canary Current Large Marine Ecosystem region waters.

EAF-Nansen Programme coordinator: Merete Tandstad (FAO, Rome)

Technical editing, scientific revision, and formatting: Edoardo Mostarda (FAO, Rome).

[1] **Rodriguez, J.M., Alemany, F. & Garcia A.** 2017. A guide to the eggs and larvae of 100 common Western Mediterranean Sea bony fish species. FAO, Rome, Italy, 256 pp.

ABSTRACT

This guide presents the egg and larval descriptions of 150 species of fishes belonging to 57 families, which are most likely to be present in plankton samples collected in the continental shelf and oceanic waters off northwest Africa. The guide is structured in two parts. The first introductory part describes the different applications of ichthyoplankton studies in fisheries research and management, and fish population ecology, the main sampling strategies, methods and gears, and the problems related to sample representativeness. It also describes the early life history of fishes, and how to identify them. A brief description of the hydrography of the study area is also presented. The second part of the guide features the species identification sheets. Each species sheet includes the following information: an illustration of the adult fish and information on its distribution, habitat, spawning season, and meristic characters; a description of the main features useful towards identifying the egg, yolk-sac and larval stages; and illustrations and photos of different larval stages. Finally, the guide provides a comprehensive list of references.

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Finally, the EAF-Nansen Programme would like to thank the participants in the "*Regional Training Workshop on the Identification of Ichthyoplankton*" that was held at the University of Cape Coast, Ghana from 20 to 24 June 2022 for testing a selection of species sheets.

1. INTRODUCTION

What is ichthyoplankton?

The early life stages (eggs and larvae) of marine fishes are referred to as ichthyoplankton (Figure 1). Some species of marine fish produce demersal eggs that lay on the sea bottom, or are even deposited in nests. Demersal eggs of a number of species are under parental care, extended in some exceptional cases, such as in sea horses, to the larval stage. However, most marine fish species spawn pelagic eggs. Larvae hatched from pelagic and from most demersal eggs are pelagic.

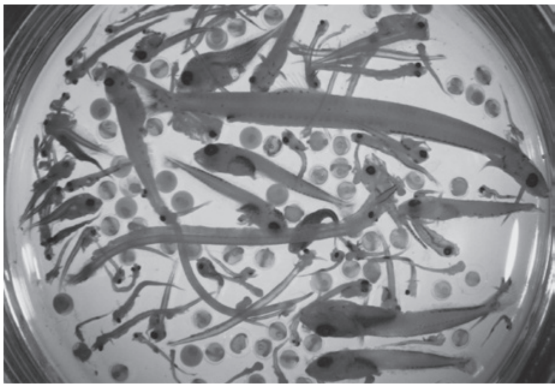

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Figure 1. Ichthyoplankton sample

Due to their null (eggs) or limited (larvae) swimming abilities, they are both integrated into the plankton community as part of the meroplankton (organisms that only spend part of their life cycle within the plankton community). Ichthyoplankton is largely found in the upper layer of the water column (from 200 m depth to the surface), where it is subject to spatial dispersion by marine currents mainly. The planktonic stage of fishes usually lasts from a couple of weeks to a few months (Victor, 1986; Brothers *et al.* 1983).

During the larval stage, larvae develop specializations for the planktonic life and other important changes occur. For example, most fishes increase their weight by five orders of magnitude throughout their life and three of them occur during the planktonic stage (Werner and Gilliam, 1984; Houde, 1987; Miller *et al.*, 1988).

The end of the larval stage is marked by a metamorphosis or transformation process, more or less abrupt depending on the species, during which the larva becomes a juvenile, which is morphologically similar to the adult and possesses the meristic characters of the species.

Juveniles of pelagic species become part of the nekton community and those of most demersal species migrate directly to the bottom, after the metamorphosis. However, in several demersal species, where the transformation phase is prolonged, there is an intermediate stage (called the pre-juvenile stage) where the fish develops specializations that are distinct from both larvae and juveniles. These pelagic pre-juveniles eventually transform into demersal juveniles (Kendall *et al.*, 1984). Pelagic pre-juveniles of demersal species and the early juveniles of the pelagic ones maintain an intense relationship, mainly trophic, with the plankton community, but because of their behaviour and swimming abilities, they cannot be considered ichthyoplankton, they become part of the micronekton.

Why study ichthyoplankton?

There are several reasons for studying ichthyoplankton. For example, information regarding the distribution and abundance of fish eggs and larvae can provide clues to spawning locations and environmental requirements of important (from a fisheries standpoint) fish species. Moreover, the knowledge of ichthyoplankton is necessary because, as one of the components of the pelagic food web (Raymont, 1983), it can represent an important link between smaller planktonic and larger nektonic organisms. Finally, the survival of fish larvae may directly influence the future abundance of adult fish stocks. The latter has been and still is the most important reason for studying ichthyoplankton, as most processes determining the recruitment strength and the spatial distribution of fish populations occur during the planktonic stage of fishes, resulting in important interannual fluctuations in fish stock biomasses. Such fluctuations have been known for centuries, but they started to worry scientists and fishery managers only at the end of the nineteenth century (Petersen, 1894; Garstang, 1900).

Initially, it was thought that fishing pressure itself or fish migrations were responsible for such fluctuations, but at the beginning of the twentieth century, Hjort (1914, 1926), after analysing the causes of the successful herring year-class of 1904, suggested that the variability in "year-class success" was determined during the early life stages of fishes. He proposed two hypotheses to explain the fish stock fluctuations resulting from interannual recruitment variability, the *Critical Period Hypothesis* and the *Aberrant Drift Hypothesis*.

According to the *Critical Period Hypothesis*, the strength of a year-class is determined shortly after yolk-sac absorption, at the beginning of exogenous feeding, when larvae must find suitable prey and in sufficient amounts (Figure 2). Failing to find adequate feeding conditions would lead to massive larval mortality, in a short period of time. Hjort's hypotheses laid the groundwork for future research on recruitment variability, mainly focused on the *Critical Period Hypothesis* (Cowan and Shaw, 2002; Houde, 2008), fostering the development of "recruitment fisheries oceanography" as a multidisciplinary science to investigate the spectrum of oceanographic processes controlling recruitment (Kendall and Duker, 1998).

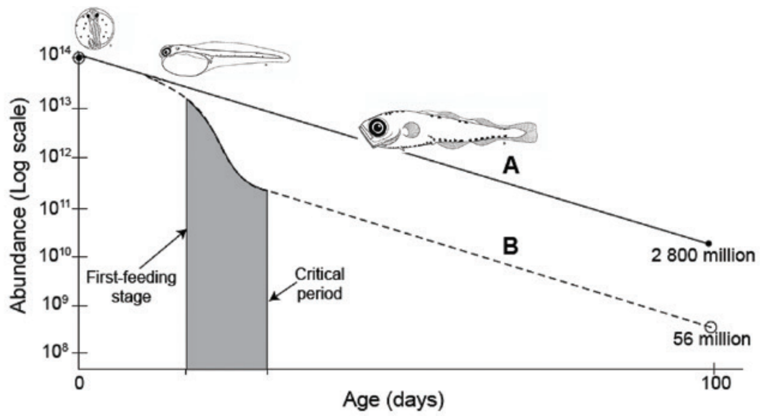

Figure 2. Illustration showing the Hjort's Critical Period Hypothesis (1914, 1926)

Source: modified after Houde, E.D. 2008. Emerging from Hjort's Shadow. *Journal of Northwest Atlantic Fisheries Science,* 41: 53-70

In the *Aberrant Drift Hypothesis*, larvae (due to interannual variability in ocean circulation) may be transported to unfavourable areas, failing to recruit to the exploited stock.

Cushing (1974, 1990) merged both Hjort's hypotheses into the *Match/Mismatch Hypothesis*. He hypothesized that a fixed time of spawning coupled with a variable time of plankton blooms generate variability in larval fish survival and, hence, variable recruitment. In this hypothesis, food limitation at any time of the larval period, rather than mortality being concentrated at a specific larval stage, could be a major contributor to the recruitment variability. In addition, abiotic factors that regulate water-column mixing, and the timing and intensity of seasonal production cycles may be involved.

Lasker (1981), in the *Stable Ocean Hypothesis*, proposed that the occurrence and frequency of calm periods in upwelling ecosystems (named Lasker events) lead to stratification of the water column and, hence, the aggregation of fish larvae and their prey, supporting high larval feeding, survival and recruitment.

A further extension of Lasker's *Stable Ocean Hypothesis* was the *Optimal Environmental Window* (OEW) *Hypothesis* by Cury and Roy (1989). These authors hypothesized that, in upwelling ecosystems, the relationship between the annual recruitment of small pelagic fish species (sardines and anchovies) and the upwelling intensity is dome-shaped. This confirms the existence of an optimal environmental window for recruitment, with recruitment most successful under moderate (roughly 5-6 $m^{*}s^{-1}$) wind stress that controls both ichthyoplankton advective losses and food availability for fish larvae. On the contrary, weak winds, if prolonged, disrupt the upwelling process and the renewal of nutrients in the surface layer, inducing nutrient limitation, which reduces primary productivity (Huntsman and Barber, 1977) and food availability for fish larvae. Finally, strong winds generate strong turbulence that also limits primary productivity (Huntsman and Barber, 1977) and increases the offshore transport of fish eggs and larvae (Bakun and Parrish, 1982).

Based on the Hjort's *Aberrant Drift Hypothesis*, Iles and Sinclair (1982) and Sinclair (1988) proposed the *Larval Retention* or *Member/Vagrant Hypothesis*. In this hypothesis, larval retention, not the levels of available prey, is critical in the recruitment process.

For tropical reef fish species, Sale (1978, 1991) proposed the *Lottery Hypothesis*, which states that recruitment in tropical reef fishes is strongly dependent on the potential to deliver settlers to the reef, and that post-settlement processes could control recruitment levels. However, nowadays, both pre- and post-settlements processes are acknowledged to influence recruitment (Jones, 1991; Doherty, 2002).

The above hypotheses consider starvation and physical processes as the main drivers of recruitment variability. However, there is strong evidence that predation is the main source of ichthyoplankton mortality and, consequently, the main factor influencing recruitment (Hunter, 1981; Bailey and Houde, 1989).

Mortality from nutritional deficiencies and predation may not act independently. Slow growth, caused by a lack of food, can result in fish larvae remaining in the plankton for longer periods and thus being more vulnerable to predation than fast-growing larvae. This is the foundation of the *Stage-Duration Hypothesis*, which implies that large size ("bigger is better") and fast growth improve the survival potential (Houde, 1987; Anderson, 1988; Houde, 2008).

In summary, although Hjort focused on starvation of first-feeding larvae as the main driver of larval mortality, he already envisaged that recruitment variability was the result of complex, interacting factors, stating that "*the simultaneous investigation of meteorology, hydrography and biology seems the only way to a deeper understanding of the conditions in which the destiny of the spawned ova is being decided*" (Hjort, 1926).

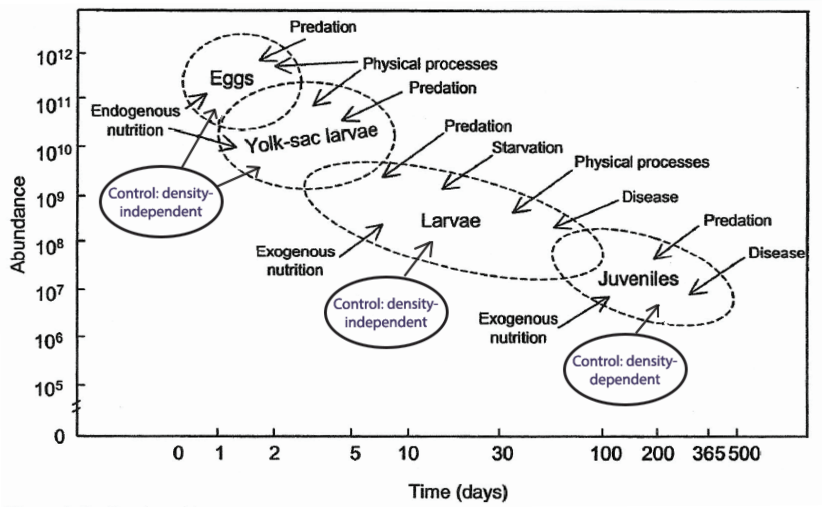

Figure 3. Schematic diagram of different processes acting on the early stages of a marine fish (eggs, yolk-sac larvae, larvae and juveniles)

Source: modified after Houde, E.D. 1987. Fish early life dynamics and recruitment variability. *American Fisheries Society Symposium,* 2: 17-29

In this line, nowadays it is widely agreed that recruitment variability is the outcome of complex trophodynamic and physical processes, operating on different temporal and spatial scales and throughout the pre-recruit life stages of fishes (Figure 3). That is to say, recruitment success is not determined during a particular ontogenetic stage and it depends on the species, populations and environmental conditions (Houde, 2008). In this way, the knowledge of the ecology of the early life stages of fishes is crucial to understanding the population dynamics of fish stocks, but also, the functioning of marine ecosystems.

New discoveries, technological advances and new analytical techniques, developed in the last decades, have allowed for significant advances in the knowledge of the causes of mortality in the early life fish stages. One of the major findings was the discovery by Pannella (1971) that growth rings in fish otoliths are deposited daily. Brothers *et al.* (1976) confirmed the presence of daily growth rings in otoliths of fish larvae (Figure 4). This finding allowed for the estimation of growth and mortality rates during the larval stage, and for the cohort contributions to recruitment (Methot, 1983; Miller *et al.*, 1988; Houde, 1997). The analysis of the otolith's microstructure also allows for assessing the environmental influence on larval survival, dating, with high precision, early life events and relating them to environmental conditions.

Other indicators useful for determining the nutritional status and recent growth rate in fish larvae are the RNA/DNA ratio (Buckley, 1979, 1980, 1984) and the nitrogen (N) and carbon (C) stable isotope analysis (SIA). The latter is used to assess the trophic position and C flow to consumers in food webs (Minagawa and Wada, 1984, Peterson and Fry 1987, Post, 2002). Specifically, 15N provides an estimate of the trophic level, and 13C can be used to assess the sources of C for an organism when the isotopic nature of the sources is different, as C isotope ratios undergo small changes within the food web (Peterson and Fry, 1987, France and Peters, 1997). The SIA analysis has also been used recently to assess the trophic ecology of fish larvae (e.g. Laiz-Carrión *et al.*, 2013, Laiz-Carrión *et al.*, 2015, Laiz-Carrión *et al.*, 2022). Finally, advances in telemetry have allowed synoptic sampling of environmental variables over large areas and advances in computer power the development of biophysical models, simulating larval drift and survival under real or hypothetical environmental scenarios.

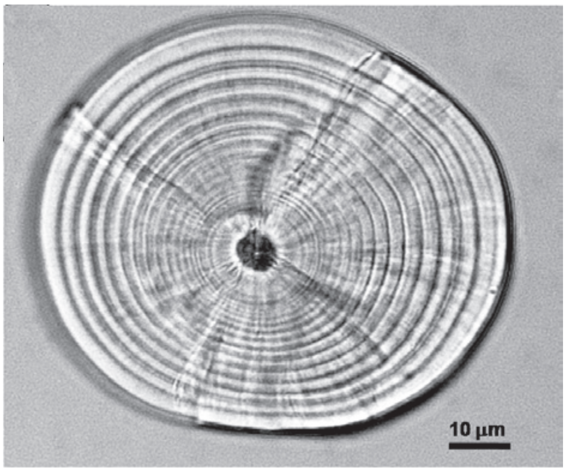

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Figure 4. Otolith of a sardine (*Sardina pilchardus*) larva

Applications of ichthyoplankton studies in fisheries research

One of the main objectives of ichthyoplankton field studies is the direct assessment of the number or biomass in exploitable populations (Heath, 1992). This is based on the fact that for some fish populations there may be a relationship between the number of eggs and/or larvae in a given area and the number or biomass of spawning adult fish, and this can be used to estimate the size of the adult population (Heath, 1992). There are six direct methods that use ichthyoplankton production for estimating the abundance of fish stocks, three based on eggs and three on larvae, with the latter used for demersal spawners (Stratoudakis *et al.*, 2006). The underlying principle of the ichthyoplankton-based methods is that the abundance of an early life stage of a fish species can be used to estimate the reproductive outcome of the population over a time period (Stratoudakis *et al.*, 2006).

Of the three methods based on eggs production, the *Daily Egg Production Method* (DEPM), the most widely used, was developed for small pelagic fishes (such as anchovies and sardines) that exhibit indeterminate fecundity (Lasker, 1985; Parker, 1980). Fecundity is indeterminate when the potential annual fecundity of a female is not fixed prior to the onset of spawning and unyolked oocytes continue to be matured and spawned during the spawning season (Hunter *et al.*, 1992). The advantage of the DEPM is that it only requires a single survey to estimate the daily egg production at sea and the daily specific fecundity at the peak of the spawning period (Parker, 1980). In addition, the application of this method provides information about the reproductive biology and reproductive behaviour of a population and about the distribution, mortality and development of the early life fish stages, which are of particular importance for studying the underlying mechanisms of recruitment (Murua *et al.*, 2010).

The other two methods based on eggs, the *Annual Egg Production Method* (AEPM) (Lockwood *et al.*, 1981) and the *Daily Fecundity Reduction Method* (DFRM) (Lo *et al.*, 1992) were developed for species with determinate fecundity, for which the potential annual fecundity becomes fixed prior to the onset of spawning (Hunter *et al.*, 1992).

Where egg production methods are impractical, a larval census has been employed to obtain a relative index of the spawning biomass (Heat, 1992).

Larval survey data can be used to obtain estimates of recruitment. The estimation or forecasting of recruitment strength, under variable environmental scenarios, is essential for the proper management of fish stocks, particularly in a context of relatively rapid climate change. Moreover, the implementation of the *Ecosystem Approach to Fisheries* (EAF), where fisheries management recognizes the full range of interactions within a marine ecosystem (Katsanevakisa *et al.*, 2011), has led to an increase in studies aimed at understanding recruitment and its underlying processes.

In addition, a holistic understanding of ecosystems, of the environmental influence on fish populations, especially on their highly vulnerable early life stages, is required to implement the EAF. This knowledge is also essential for implementing the *Ecosystem-Based Fisheries Management* (EBFM), in which the order of management priorities is inverse to the customary norm, addressing the status of ecosystems, rather than that of the fishery resources (Pikitch, *et al.*, 2004; Cogan *et al.* 2009).

Ichthyoplankton surveys can also be used for the prospection of new fish resources, determining the timing and location of spawning areas and their variations or to estimate, as said above, the relative abundance of different stocks and monitoring its abundance trends over time.

Other applications of ichthyoplankton studies

Ichthyoplankton studies can provide a lot of information on the ecology and structure of fish populations, in a cheaper and simpler way than information obtained by studying juvenile or adult populations. Indeed, a single collection of plankton hauls can give information about most fish species spawning in a given area, both pelagic and demersal, whereas sampling of adults would require larger vessels and a variety of sampling gears and methodologies. According to Koslow and Wright (2016) "ichthyoplankton surveys provide a relatively low-cost, efficient means to monitor marine fish populations and communities".

On the other hand, because of their null (eggs) or limited (larvae) swimming abilities, fish larvae are displaced by surface marine currents and other water movements, such as those related to e.g. upwelling, upwelling filaments, and eddies. Therefore, fish larvae have been used as tracers of hydrographic processes in several regions of the world oceans, e.g. the Northeast Atlantic Ocean, off the Iberian Peninsula (Rodríguez, 2008; Rodríguez *et al.*, 2015), the Northwest African upwelling region (Rodríguez *et al.*, 1999; Rodriguez *et al.*, 2004), the Taiwan Strait (Hsieh *et al.*, 2012), Australian waters (Smith and Suthers, 1999; Smith *et al.*, 1999), and the Sicilian channel (García la Fuente *et al.*, 2002).

Moreover, in the current context of global warming, ichthyoplankton studies could be used to monitor and evaluate changes in the composition and structure of fish populations and communities of an area, as a consequence of the water temperature increase. Fish species move poleward with water warming, to remain within suitable "climate envelopes" (Walther, 2002). Thus, "each 1 ºC of temperature change moves ecological zones on earth by about 160 km" (Thuiller, 2007). In the marine environment, shifts in the distribution to the north have been observed for several fish species in the Northeast Atlantic (Stebbing *et al.*, 2002; Beare *et al.*, 2004). However, for these species to be able to establish in a new region, they must reproduce successfully, and their offspring survive in the new area (Sabatés *et al.*, 2006). Other species can change their spawning areas (Ibaibarriaga *et al.*, 2007). In both cases, changes in fish species composition or in their spawning areas would be reflected in the composition and structure of the ichthyoplankton assemblage, and these changes could be evaluated through ichthyoplankton studies.

Ichthyoplankton sampling strategies, methods and gears

Any study on ichthyoplankton communities is based on two pillars: an adequate sampling strategy to achieve the specific objectives of the study, and a correct taxonomic identification of the target taxa. There is a great variety of sampling strategies, from large-scale surveys to intensive sampling of a single patch of larvae tracked by means of a Lagrangian buoy (a free-floating buoy that moves with a parcel of water). The sampling methodology to be followed and the sampling gear to be used will depend on the objectives of the study, on the target species and/or the early life stages to be sampled.

It is out of the scope of this guide to explain in detail all possible sampling strategies or describe the different types of ichthyoplankton sampling devices and sampling methods. However, it is worth illustrating those that are most frequently used and the potential sources of bias affecting sample representativeness.

As already explained, many ichthyoplankton studies are aimed at estimating the biomass of adult fish stocks, either by using eggs or larvae. When using eggs, for e.g. applying the *Daily Egg Production Method* (DEPM), the gear employed is the CalVET net (Figure 5) in vertical hauls, and the sampling strategy consists of sampling stations arranged in a regular grid, with a short distance between stations, covering the whole spawning area of the fish stock to be studied.

When the objective is to estimate the biomass of an adult fish stock using larvae, to study the horizontal distribution of fish eggs and larvae of specific species or, in general, the ichthyoplankton community of an area, the most adequate sampling gear to be used is the Bongo net (Figure 5) with a 60 cm diameter mouth opening. Hauls are oblique and the sampling strategy consists of sampling a regular grid of stations. Ichthyoplankton hauls must cover the depth distribution range of the target species or, if the goal is to sample the entire ichthyoplankton community, at least the upper 200 m of the water column, where most fish eggs and larvae are concentrated.

When the aim of ichthyoplankton studies is to investigate the vertical distribution of fish eggs and larvae and/or the vertical (diel and/or ontogenetic) migrations of fish larvae, a multiple net system, capable of sampling successive water layers during the same tow, is required (Figure 6). Hauls are also oblique.

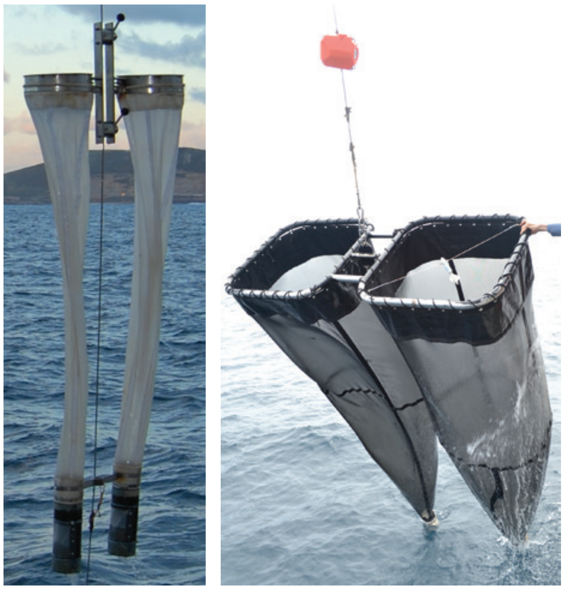

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Figure 5. Left, a CalVET net and right, a Bongo net

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Figure 6. Multiple net systems. Left, a Hydrobios MultiNet and right, a MOCNESS (Multiple Opening-Closing Net and Environmental Sampling System) net

Neuston nets are used to sample the very most surface water layer. Large micronekton nets, fitted with meshes of the size of 1 mm or larger, may also be necessary for effectively sampling late larval fish stages (Figure 7). Light traps are used for capturing advanced post-larvae in the pre-settlement stages.

Ichthyoplankton samples can also be obtained with continuous sampling systems, such as the *Continuous Underway Fish Egg Sampler* (CUFES), capable of collecting plankton as the research vessel is sailing. It consists essentially of a pump that draws seawater at a given depth and sends it through a plankton collector, where plankton is retained (Figure 8). The collector, with its load of plankton, is changed after a fixed period of time. The plankton samples are preserved in a solution of formalin and seawater. After a certain period of time (about half an hour), the preservation liquid is eliminated, and the fish eggs of the target species are identified and counted under a stereomicroscope. The purpose of keeping plankton samples for a while in formalin is to kill eggs and make them opaque, as live eggs are transparent and invisible under the microscope. While CUFES is running, a data logger records the date, time, and position of each sample, as well as other environmental data from the ship's sensors.

In the last decades, new and more sophisticated sampling systems have been implemented. In situ ichthyoplankton imaging systems or plankton

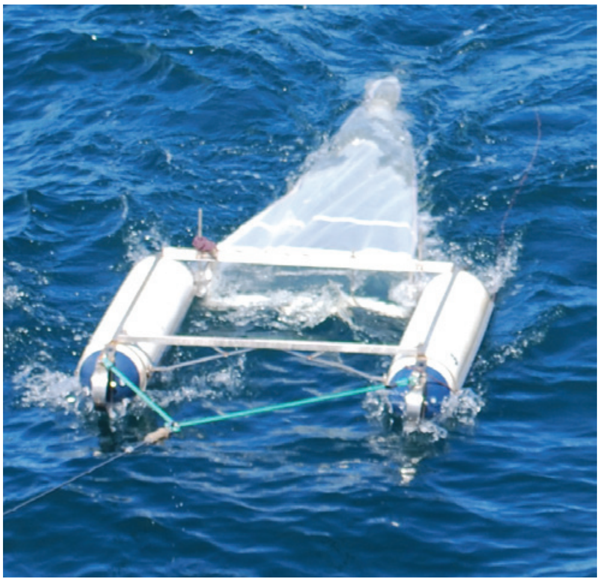


Figure 7. Neuston net

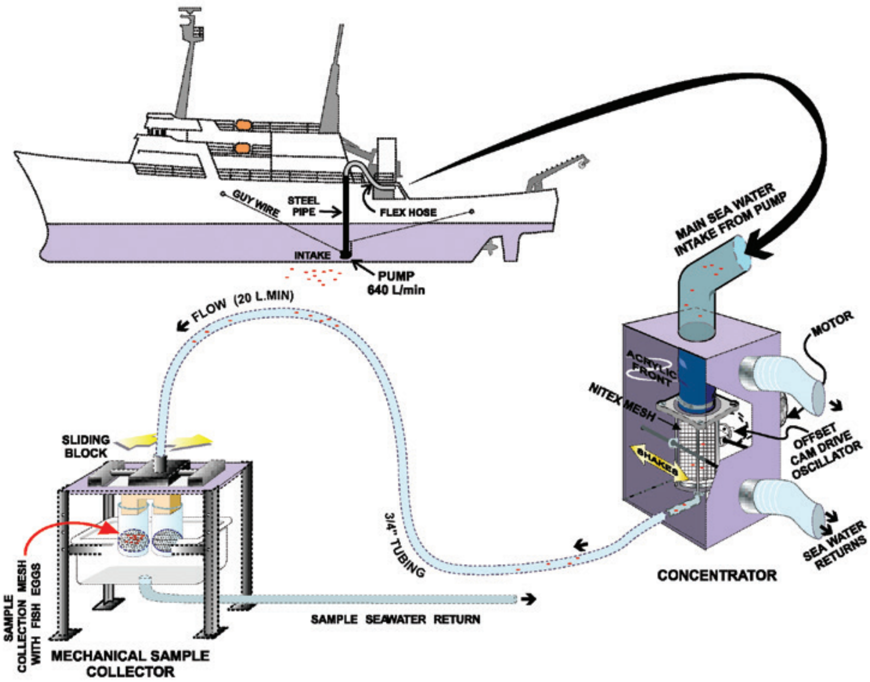


Figure 8. Continuous underway fish egg sampler (CUFES)

Source: Marine Life Research Group, Scripps Institution of Oceanography, Continuous Underway Fish Eggs Sampler website, http://cufes.ucsd.edu/text/descr.htm, accessed on 9/9/23

acoustics, despite not providing biological samples for other types of analyses, can produce impressive amounts of data on larval abundance or biomass, over large areas in relatively shorts periods of time (Cowen and Guigand, 2008; Garcia-Seoane *et al.*, 2016).

Any sampling aimed at obtaining quantitative data on ichthyoplankton requires knowing the exact volume of water filtered by the net during each haul. This is done by using flowmeters attached to the mouth of the net. Flowmeters measure the length of the haul path, which, multiplied by the surface of the mouth of the net, gives the volume of water filtered by the net during the haul. This allows standardization of fish eggs and larvae captured in each haul to the number of individuals per cubic meter, or densities. Ichthyoplankton counts can also be standardised to the number of individuals beneath a unit of sea surface (square meter), by multiplying densities by the maximum depth of tow in meters (Smith and Richardson, 1977). Haul depth can be determined by using any device equipped with pressure sensors, such as a conductivity-temperature depth instrument (CTD) of small size or simple depth gauges, such as those used for scuba diving, attached to the sampling gear structure. If flowmeters or depth gauges are not available, the volume of water filtered can be estimated from the duration of the tow and the vessel's speed, which allows for estimating the distance covered by the net's path. Haul depth can be estimated by multiplying the maximum length of wire led out by the cosine of the wire angle at the moment when the maximum amount of wire has been let out. Finally, to get a reliable estimation of ichthyoplankton densities or abundances, it is necessary to homogeneously sample the water column over the whole haul depth range.

Once the haul is finished, plankton must be concentrated into the cod ends (Figure 5), by gently washing the nets. After that, plankton is transferred into jars and fixed for long-term preservation. The most commonly used preservatives are a 5 percent solution of buffered formalin and seawater, or ethanol at different concentrations. Formalin is more adequate for preserving samples to be used in taxonomic studies, since the egg and larval morphology is better preserved, but presents the problem that formalin is carcinogenic. Ethanol dehydrates both eggs and larvae. Eggs lose their shape, and larvae tend to curl making them difficult to measure. However, it has the advantage that specimens can be used for genetic and for larval growth studies. Other fixatives are liquid nitrogen, used to preserve larvae for biochemical and daily growth analyses, and RNAlater, when it is necessary to stabilize and protect cellular RNA. For some specific studies, larvae must be quickly sorted and identified on board, prior to fixation.

Sample representativeness

There are several papers dealing with problems associated to ichthyoplankton sampling (Hempel, 1974; Smith and Richardson, 1977; Lasker, 1981; Heath, 1992). Specifically, difficulties in obtaining representative samples of ichthyoplankton communities derive from the spatial and temporal heterogeneity in ichthyoplankton distribution and from the interaction of fish eggs and larvae with sampling gears (Ahlstrom *et al.*, 1973).

Fish eggs and larvae are not distributed randomly, but they tend to be concentrated in patches that become part of the plankton during specific periods of the year. This is the result of the distribution of adult fishes, their spawning strategies, hydrodynamic processes, egg and larval density, and larval behaviour, which varies throughout ontogeny. The only way to deal with the non-random distribution of ichthyoplankton is through an adequate sampling design.

The main sources of sampling bias, related to the direct interactions between fish eggs and larvae with the plankton nets, are escapement and avoidance. The escapement is the passage of smaller ichthyoplankton organisms through the meshes of the net. It may be active or passive and it is a function of the size, shape and behaviour of the organisms in relation to mesh size (Vannucci, 1968).

The active escapement is the process by which fish larvae caught in the net may squeeze through the meshes. This involves behavioural patterns that vary with species and with the developmental stage (Vannucci, 1968).

Passive escapement or extrusion is the forced passage of eggs or larvae through the net's meshes. When the organisms are larger than the meshes, extrusion is aided by the compressibility of the organisms and the flexibility of the meshes (Saville, 1958). This source of sampling bias is easily overcome by using net meshes of an adequate size to retain smaller fish eggs and larvae. Considering the fact that most fish eggs have a diameter of over 0.5 mm and that most newly hatched larvae are more than 2.0 mm long, the adequate mesh size for sampling ichthyoplankton is between 300 and 500 microns. However, mesh size should not be too small for avoiding, or at least reducing, mesh clogging produced by plankton. Net clogging reduces the filtration efficiency of the net.

Avoidance is the process by which larger fish larvae avoid capture, swimming out of the path of the approaching net or migrating below the net's maximum sampling depth (Morse, 1989). This is probably the most important source of sampling bias (Clutter and Ankaru, 1968). Evidence of this phenomenon is the observed difference in larval fish abundances between night and day samples (Russell, 1976; Bridger, 1956; Ahlstrom, 1954, 1959). However, it seems that avoidance occurs both day and night (Murphy and Clutter, 1972). Larvae are not only able to see the approaching nets (visual avoidance), but they are capable of detecting the water vibrations produced by the towing wires and also the wave pressure produced by the net ahead of it (Smith and Clutter, 1965; Mahnken and Joss, 1967; Tranter and Smith, 1968). Thus, to reduce or minimize net avoidance, it is useful to use nets without bridles in front of the net mouth, such as Bongo-type nets (McGowan and Brown, 1966).

Ichthyoplankton sorting

For the taxonomic identification of ichthyoplankton or for other analyses, fish eggs and larvae are usually sorted from the plankton samples. The first step in ichthyoplankton sorting is to eliminate formalin from plankton samples. To do this, samples must be sieved through meshes (of smaller sizes than those used for sampling at sea), washed with seawater and placed into jars with seawater. This task must be carried out under a fume hood to avoid breathing the carcinogenic formalin vapours. Then, the sample can be placed in Petri dishes and analysed under a stereoscopic microscope, at low magnification (10x is adequate), to detect and sort fish eggs and larvae.

Considering the low abundances of larvae of some species, it is recommendable, for studies on ichthyoplankton communities, to analyse the whole sample. However, for specific studies focusing on eggs or larvae of more abundant species, it is acceptable to analyse 50 or 25 percent of the sample or even less, depending on the abundance of the early life stages of the target species. Fish eggs and larvae must be handled very carefully, with soft tweezers, thin brushes or pipettes, to separate and keep them in vials with the appropriate preservative medium.

Taxonomic identification of fish eggs and larvae

The taxonomic identification of fish eggs and larvae is not an easy task. It is more difficult than identifying the juvenile and adult stages of fishes. This is due to several reasons. First, because of the small size of fish eggs and larvae, characters useful for their identification can only be visualized under a stereoscopic microscope. Then, in the case of fish larvae, the main problem is that they undergo continuous and, in some cases, dramatic morphological, meristic, morphometric and pigmentary changes throughout their development. In addition, other characters, such as pigmentation patterns, can present an important geographical and even individual variability. This has generally prevented the building of dichotomous keys, such as those existing for adult fishes, although partial dichotomous keys were developed for the western Mediterranean Sea by Abossouan (1964) and Marinaro (1971). However, these keys only include some developmental stages of a relatively small number of the species present in the area. Therefore, they easily lead to identification dead ends or to misidentifications. To overcome this problem, the use of intelligent software, capable of managing extensive databases and integrating all the available information on larval stages of different fish species, including ecological information, such as the distribution of adults, reproduction season, etc. has been proposed (Froese and Papasissi, 1989).

However, the design and implementation of such information systems are not easy, due to the heterogeneity of the available information, or even the lack of information on the early life stages of many marine fish species. Indeed, even in well-studied areas, eggs and larvae of many species are still unknown and, in many cases, some larval stages remain undescribed.

There are two basic ways to describe the early life stages of fishes. One consists of rearing eggs and larvae in captivity, and the other to use ichthyoplankton collections to construct these series, working backwards from juveniles to larvae and, in some cases, to eggs (Moser and Ahlstrom, 1981). More recently, molecular techniques are being used to identify fish eggs and larvae, or for validating previous descriptions of these, but they cannot be routinely applied.

Because of all the above difficulties, the "look-alike" method remains the method//approach usually used to identify fish eggs and larvae. It consists of comparing the individuals with descriptions made by other authors. This elimination process ultimately results in "assigning" an individual to a species. This is also the method followed in this guide.

However, to properly use the "look-alike" method, it is first necessary to compile and analyse all the available information about the ichthyofauna of the study area. That is to say, faunistic lists and all the available information on the spawning strategies, spawning seasons and sites of the fish species inhabiting the study area. Another prerequisite for using this method is being able to accurately determine the developmental stage of the individual under analysis and compare it with the corresponding developmental stage described in the literature.

The nomenclature of the different early developmental stages of fishes varies by author. In this guide, we follow the nomenclature suggested by Kendall *et al.* (1984) (Figure 9), one of the most widely accepted. They divided the early life-history of fishes into three stages: **egg**, from spawning to hatching; **larva**, from hatching to the attainment of complete fin-ray counts and beginning of squamation (juvenile); and **juvenile**, young fish, fundamentally like the adult in the meristic characters (excluding squamation) but smaller and reproductively inactive. Kendall *et al.* (1984)

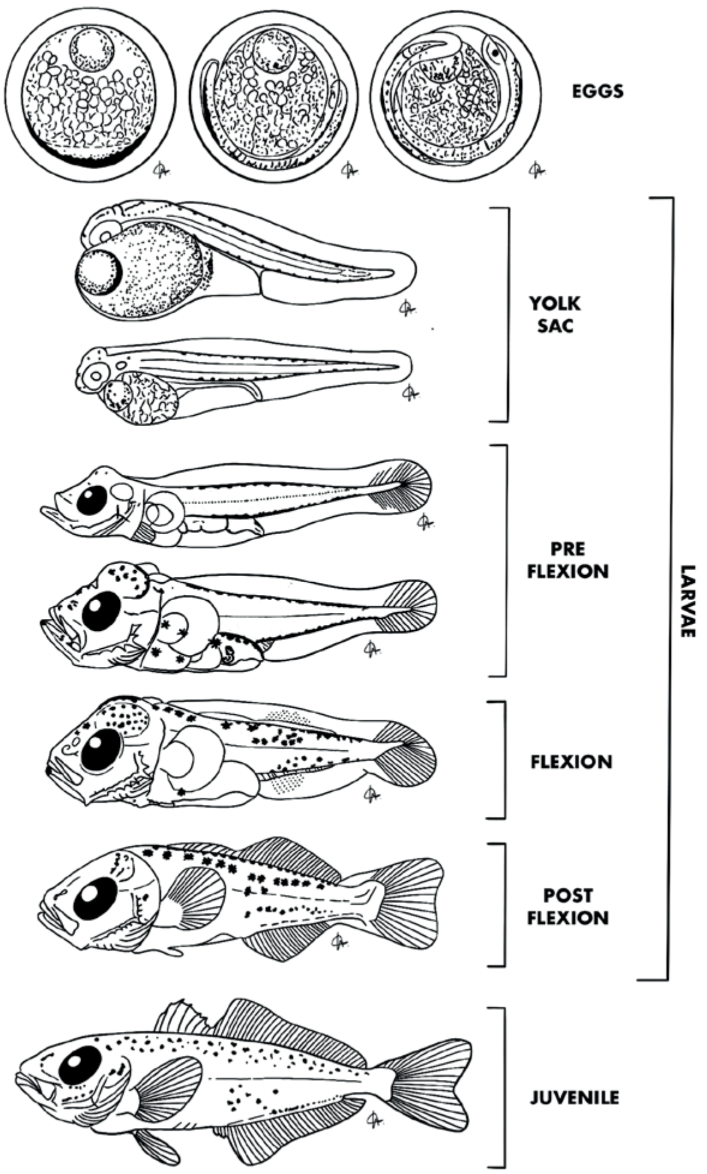


Figure 9. Early life history stages of *Trachurus symmetricus*

Source: redrawn by L. Rodriguez after Kendall *et al.* 1984. Early life history of fishes and their characters. *In* G. Moser, W.J. Richards, D.M. Cohen, M.P. Fahay, A.W. Kendall Jr. & S.L. Richardson, eds. *Ontogeny and systematics of fishes*. Spec. Publ. No. 1, pp. 11-22. American Society of Ichthyologists and Herpetologists, La Jolla, California also divided the larval stage into four sub-stages: **yolk-sac larva**, from hatching to exhausting of yolk reserves; **preflexion larva**, from yolk exhausting to the beginning of upward flexion of the notochord; **flexion larva**, that ends when the urostyle is in its final position, at approximately 45° from the notochord axis and **post-flexion larva**, that ends when metamorphosis begins. The transformation, or metamorphosis is a transitional stage between larva and juvenile during which the young fish loses larval characters and acquires those of the adult (Kendall *et al.*, 1984; Moser, 1996).

Most marine fish eggs encountered in plankton samples are spherical and transparent, with a diameter of about 1.0 mm. Eggs are enclosed by a thin membrane or chorion. There is a space between the chorion and the yolk sac, the perivitelline space. Most fish eggs have oil globules (Figure 10).

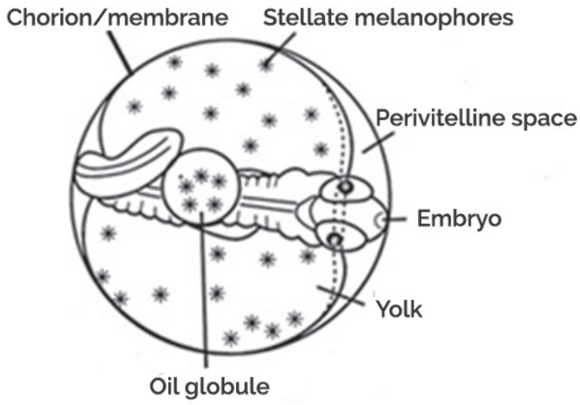


Figure 10. Main characters of a fish egg

Source: adapted from Munk, P. & Nielsen, J.G. 2005. *Eggs and larvae of North Sea fishes*. Biofilia, Frederiksberg, Demark. 215 pp.

The main anatomical, morphological and morphometric features used in fish egg identification are: egg shape (spherical or elliptic); egg size (ranges from 0.5 to more than 5.5 mm in diameter); type of surface membrane (smooth, sculptured, with a single protuberance or filaments); the presence of a second internal membrane; type of yolk (homogeneous or segmented); the size of the perivitelline space; absence/presence, number, position and colour (for live individuals) of oil globules. When the embryo is well developed, embryonic characters, such as morphological features, pigment patterns and special structures are also used to identify fish eggs (Rass, 1946; Russell, 1976; Matarese and Sandknop, 1984; Ahlstrom and Moser, 1980).

Scanning electron microscopy has proved to be a good tool for the taxonomic identification of fish eggs, but cannot be used in routine analysis (Boehlert, 1984).

The identification of fish eggs is usually a more difficult task than larval fish identification. This is due to the low number of fish species with the egg stage described. In the Mediterranean Sea, it is worth mentioning the pioneer identification guide to fish eggs developed by Marinaro (1971), which has been recently revised and extended by Crec'hriou *et al.* (2015).

In most fish species with pelagic eggs, the newly hatched larvae are in general less than 4 mm long (Russell, 1976). The size and state of development at hatching are generally related to yolk-sac size. Typically, the body length at hatching is 2.5 to 3.0 times the diameter of the yolk sac (Moser, 1996). In general, yolk-sac larvae hatched from eggs less than 1.5 mm in diameter have an unformed mouth, unpigmented eyes and pectoral-fin buds, while yolk-sac larvae hatched from larger eggs are comparatively well developed, with the mouth formed, eyes pigmented and pectoral fins developed (Moser, 1996). In both cases, the locomotion is aided by a prominent fin-fold that extends from the top of the head, around the caudal region, and ventrally forward to the posterior margin of the yolk sac (Figure 11).

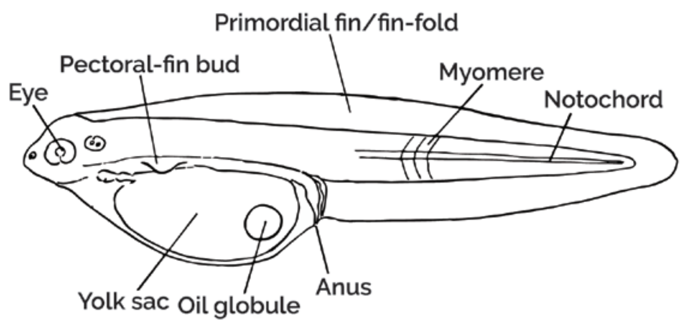


Figure 11. Main anatomic features of a yolk sac larva

Source: modified after Russell, F.S. 1976. *The eggs and planktonic stages of British marine fishes*. Academic Press, London. 524 pp.

The identification of yolk-sac larvae is very difficult because some structures, such as fins and most of the specialized larval characters, resulting from the evolutionary adaptation to the plankton realm, are not yet well developed. Consequently, yolk-sac larvae of different species may be very similar. The yolk-sac stage is characterized by the migration, coalescence and rearrangement of pigment cells or melanophores (Moser, 1996). Melanophores are amoeboid and capable of migrating from their point of origin in the neural crest to various sites in the larva, to establish the species-specific larval pigmentation pattern, at the end of the yolk-sac stage. Useful characters for the identification of yolk-sac larvae are the shape and relative size of the yolk sac, the presence and the relative position of oil globules in the yolk sac, the position of the anus in relation to the yolk sac and, in some, the species-specific pigmentation patterns.

The complete utilization of the yolk marks the end of the yolk-sac stage. By this time, most of the organs and the sensory system required to capture prey are functional. The mouth and gut are formed, the anus is open at the margin of the ventral fin-fold, the eyes are pigmented, and the primordial and pectoral fins are present. It is now an early larva and during the larval development, the fish gradually acquires the characters of the adult, thus facilitating its identification (Moser, 1996; Russell, 1976). At first, the body is still surrounded by the primordial fin, the urostyle is straight and rudiments of the hypural elements are visible in its ventral side. As the larva grows, the urostyle bends upwards, the hypural elements become defined, caudal-fin rays develop, and the first signs of the formation of the dorsal and anal fins appear as interspinous areas. At this stage, both the meristic characters and the pigmentation patterns that are characteristic of the adult of the species, have usually appeared (Russell, 1976). The main anatomical features of a larva are shown in figure 12.

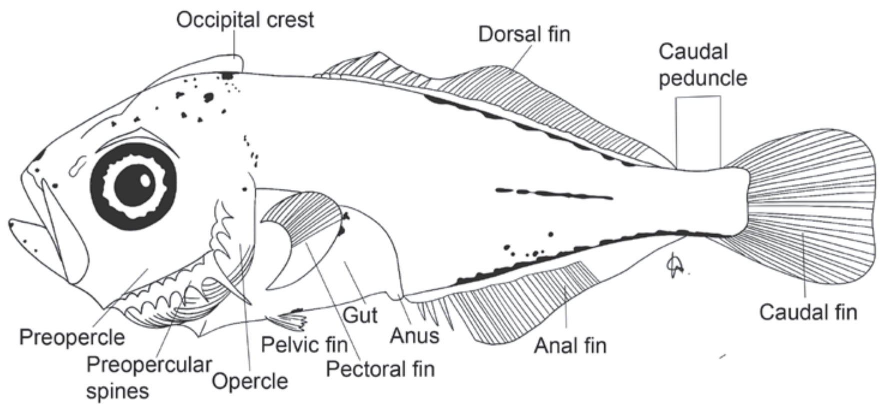


Figure 12. Main anatomic features of a fish larva

Source: author's own elaboration

The main characters used in larval fish identification are the body form, the pigmentation pattern and the meristic and morphometric characters. The body form allows for separating larvae into several major groups (Russell, 1976). For example, larvae with narrow, elongated bodies (e.g. Families Clupeidae, Engraulidae, Stomiidae, etc.); larvae with laterally compressed bodies (includes all flatfishes, e.g. Families Bothidae, Pleuronectidae, Soleidae, etc.); bodies with the typical fish shape (includes larvae of most fish species, e.g. Families Gadidae, Triglidae, Gobiidae); bodies with aberrant shapes (e.g. Family Belonidae) or showing specialized larval characters for the plankton life, such as cranial armatures (e.g. Family Scorpaenidae), elongate fin rays (e.g. Families Carapidae, Lophiidae), stalked eyes (e.g. some Myctophidae species) or early developed and large fins (e.g. Family Trachinidae).

Meristic characters are countable structures appearing in series, such as the number of myomeres, vertebrae or fin rays. They have a high diagnostic value (at least the combination of several counts), because they are species-specific. However, they have the disadvantage that some of them, such as fin rays, are completely formed only in older larvae, which are scarce in plankton samples. Others, such as myomeres or vertebrae, are difficult to visualize, even using staining methods, or other techniques, such as X-rays (Pothoff, 1984; Tucker and Laroche, 1984).

Morphometric characters include the different measurements of a larva. The main measurements of a larva, shown in figure 13, are the total length (TL), or the distance from the tip of the snout to the caudal-fin end; the standard length (SL), or the distance between the tip of the snout and

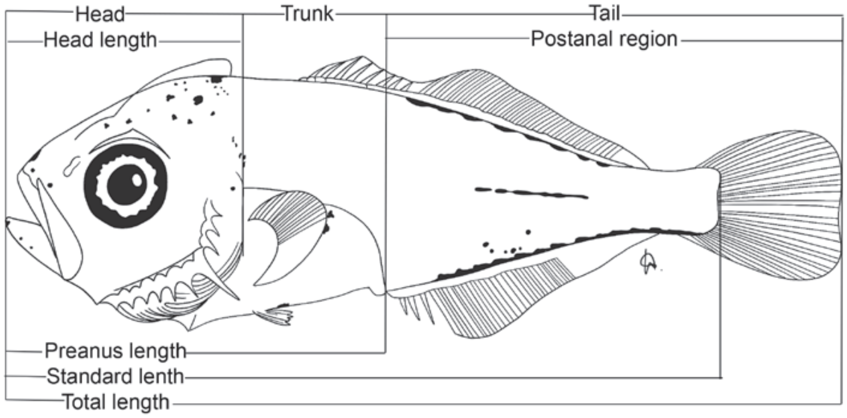


Figure 13. Body regions and the most important measurements of a fish larva

Source: author's own elaboration

the urostyle end; the preanus length, or the distance between the tip of the snout and the anus; the head length, or the distance from the tip of the snout to the border of the cleitrum, and the eye diameter, or the maximum diameter of the eye. When measuring the different body regions for identification purposes, the stage of development of the larvae must be taken into account, since larval growth is allometric. It must be noted that formalin-preserved larvae suffer shrinkage that increases with the time of preservation and decreases with larval growth (Theilacker, 1978).

Fish larvae show a variety of pigmentary cells or chromatophores. Those containing black or brown pigments are known as melanophores; those with yellow pigments, xanthophores and those with red pigments, erythrophores (Russell, 1976). However, in formalin-preserved specimens, only black pigmented cells or melanophores remain. For this reason, the latter are usually the only ones used in ichthyoplankton identification. Melanophores are situated in different parts of the body, defining species-specific pigmentation patterns. These patterns are one of the chief diagnostic characters used for the identification of the larval stage of fish species. Often, the identification of species with similar larvae is made possible thanks to the presence or absence of a single melanophore or by its position (Russell, 1976). The general appearance of preserved specimens will differ very much according to the degree of expansion or contraction of the melanophores. Moreover, in specimens preserved for a long time, the pigmentation will fade, especially if kept in the light (Russell, 1976). Besides, there may be an intraspecific and geographical variability in pigmentation patterns.

The importance of proper taxonomic identification of ichthyoplankton

The first step in any ichthyoplankton study is the proper taxonomic classification of eggs and/or larvae since, as Powles and Markle (1984) pointed out, small errors in their identification can result in important misinterpretations about the biology and ecology of fish species. Moreover, there are several examples in the literature showing that wrong identifications of fish eggs or larvae have led to biased stock evaluations and, subsequently, inadequate management measures (Daniel and Graves 1994; Armstrong *et al.* 2001; Fox *et al.* 2005). Unfortunately, these identification errors are probably more frequent and important than desirable. For example, a recent study focusing on the ability of researchers from five different laboratories in Taiwan to identify fish larvae determined that the average accuracy of identification was 80.1, 41.1 and 13.5 percent at the family, genus and species levels, respectively (Ko *et al.* 2013). Recently, Puncher *et al.* (2015a) revealed that the Atlantic bluefin tuna (*Thunnus thynnus*) larvae have been misidentified in the Mediterranean Sea. These authors demonstrated, through genetic analysis, that more than half of the larvae, submitted by three Mediterranean institutions to a bluefin tuna research project, funded by the International Commission for the Conservation of Atlantic Tunas (ICCAT), were misidentified.

Some of the errors in identifying ichthyoplankton are caused by the persistence in the literature of wrong descriptions. However, it can also happen that in species whose larvae are accurately described, the inexperience or lack of training of the people in charge of the taxonomic identification of the ichthyoplankton can lead to massive misidentifications (Puncher *et al.*, 2015b). Because of this, it is of paramount importance to produce identification guides with accurate descriptions, taking advantage of molecular genetic techniques, to validate doubtful identifications, as well as to organize courses given by experienced ichthyoplanktologists, and aimed at properly training new generations of technicians and researchers in charge of the taxonomic classification of fish eggs and larvae.

The study area

The geographical area covered by this guide (Figure 14) includes one of the most important coastal upwelling areas of the world: the Canary Current upwelling system that extends from about 10°N to the Strait of Gibraltar.

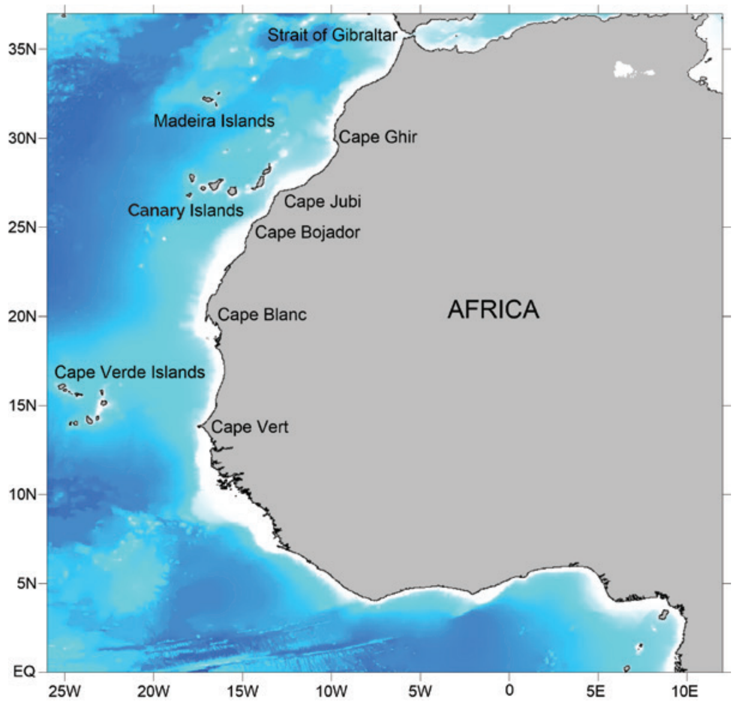


Figure 14. Geographic area covered in this guide

Source: authors' own elaboration, conforms to UN Map of the World, 2022

The upwelling between Gibraltar and Cape Blanc is produced by favourable northeasterly winds throughout the year, although winds and upwelling are more intense during the summer months. Between Cape Blanc and Cape Vert, the upwelling has a marked seasonal periodicity, reaching its peak of intensity during winter (Arístegui *et al.*, 2004, Mittlelstaedt, 1991).

In coastal upwelling areas, the wind blows parallel to the coastal line or at a slight angle to it. As the wind begins to blow across the surface of the ocean, it transmits its force by friction to the surface layer of the sea, and a thin surface slab of water (25 - 50 m thick) is set in motion (Figure 15). As a result of the Coriolis force, the wind-driven layer (named Ekman layer) has a net movement 90° to the right (left) of the wind in the Northern (Southern) Hemisphere. To replace the surface water mass that moves offshore, subsurface, cool and rich nutrient waters, at a depth of 200 m at most, flow inshore and up to the surface layer, and then offshore in the surface divergence layer (Barber and Smith, 1988; Mann and Lazier, 2006).

The Ekman layer transports offshore the cool, nutrient-rich upwelled water with its load of phytoplankton, zooplankton and ichthyoplankton. The upwelling has a limit, between 50-100 Kms offshore, where the interface between the upwelled water and the offshore waters is located (Man and Lazier, 2006). This interface constitutes the upwelling front (Barber and Smith, 1988).

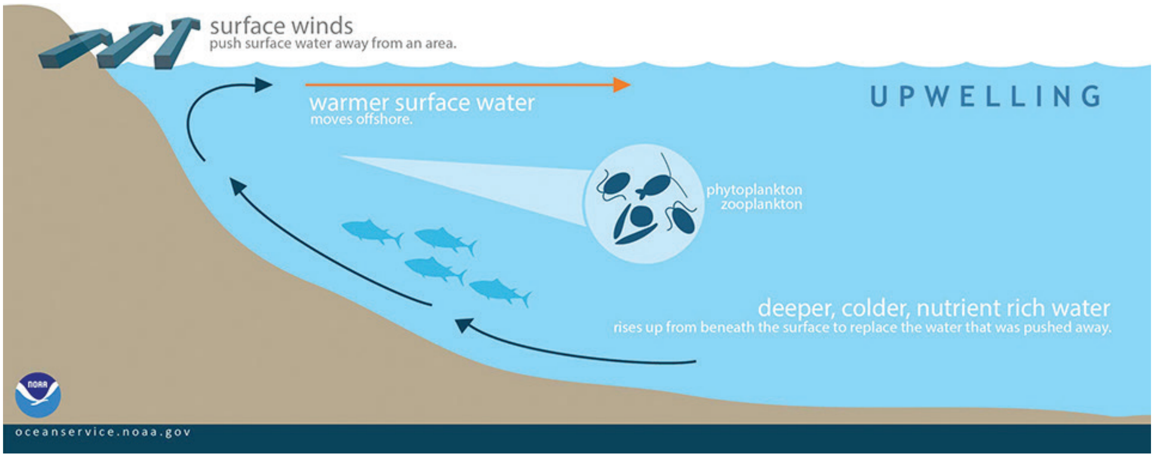


Figure 15. Schematic representation of the coastal upwelling phenomenon

Source: NOAA. What is upwelling?. National Ocean Service website, https://oceanservice.noaa.gov/facts/upwelling.html, accessed on 9/9/23

Upwelling fronts are recognized as an important part of the coastal upwelling processes (Brink, 1987) that have an enormous biological importance. These are zones of high primary production, where the zooplankton and the ichthyoplankton accumulate (e.g. Le Febre, 1986; Owen, 1981; Sabatés and Masó, 1990), and are even used by some fish species as spawning and nursery areas (Olivar, 1990). Moreover, they work as a barrier preventing fish larvae from being transported into the open sea, where they would die of starvation.

In upwelling regions, fish larvae of inshore-shelf spawning species may follow different strategies to remain within the appropriate areas for the development and avoid the offshore advection by the Ekman layer. They may migrate vertically between the two flow regimes, associated with the upwelling process, daily (Parrish *et al.*, 1981; Myers and Drinkwater, 1989; Landaeta and Castro, 2002) or ontogenetically (Gorbunova *et al.*, 1986), or spawning may take place during upwelling relaxation or adult fish may spawn demersal eggs (Parrish *et al.*, 1981). In the case of ontogenetic migration, early fish larvae are transported offshore by the Ekman layer, to the upwelling front where late larvae migrate to the deep, onshore flow, to reach the neritic region again. Moreover, fish larvae of offshore spawning species may use the deep onshore currents to reach the inshore nursery areas (Smith and Suthers, 1999; Landaeta and Castro, 2002, 2012).

Nevertheless, the natural barriers accounted by the upwelling front for the offshore transport of fish larvae may be broken down by the upwelling filaments. These are extensions of coastally upwelled water that reach hundreds of kilometers offshore. They are associated with narrow, elongated currents arising on the continental shelf and that extend long distances into the sea (Brink, 1983). Upwelling filaments are offshore transport mechanisms for nutrients and plankton, fish larvae included (Nelson *et al.*, 1998, Rodriguez *et al.*, 1999; Rodriguez *et al.*, 2004). In the case of the northwestern African coastal upwelling, numerous upwelling filaments are distributed along the coastal-offshore upwelling boundary. Nevertheless, only two, Cape Ghir and Cape Blanc giant filaments, remain as major, permanent features that stretch several hundreds of kilometers offshore (Arístegui *et al.*, 2004). Another important filament is the one that forms just north of Cape Bojador and extends 150 Km towards Gran Canaria (Barton *et al.*, 1998). This filament has been demonstrated to transport fish larvae, which can reach the Canary archipelago, and probably contributes to the replenishment of the fish populations of the Canary Islands waters (Rodríguez *et al,* 1999, Rodríguez *et al.*, 2004; Brochier *et al.*, 2011).

The coastal upwelling regions only cover 1 percent of the total area of the world's oceans, but they provide about 50 percent of the fish captures of the world fisheries. Fish catches in the Northwest African upwelling region fluctuated between 1.3 Mt and 2.6 Mt over the period

1970-2000. Fisheries landings are mostly based on pelagic fish species (Figure 16), dominated by *Sardina pilchardus*, (Figure 17) that accounts on average for 70 percent of the total catches (Arístegui *et al.*, 2004).

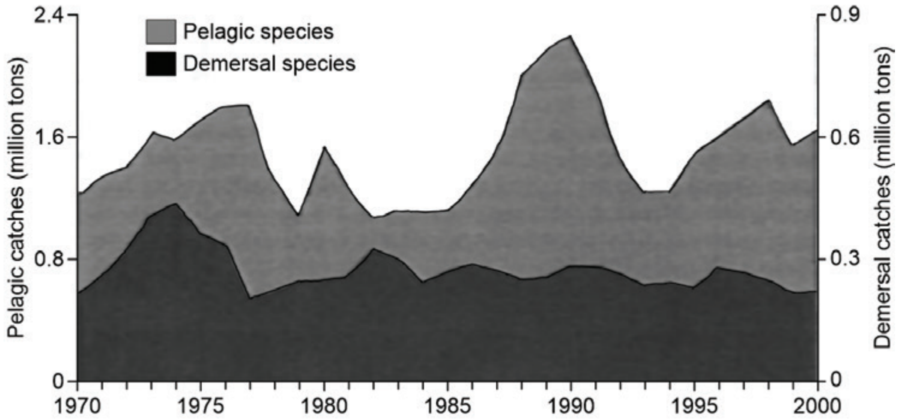


Figure 16. Annual catches of pelagic and demersal fish species in the Canary Current region, from 1970 to 2000

Source: FAO-CECAF (Eastern Central Atlantic) capture production 1970-2000.

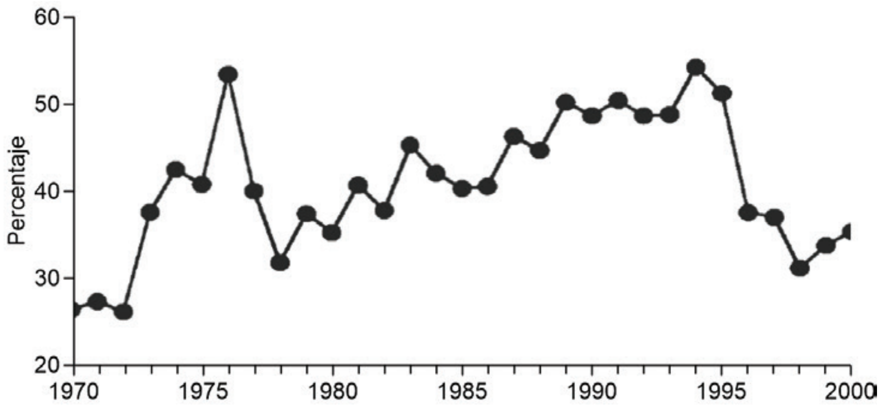
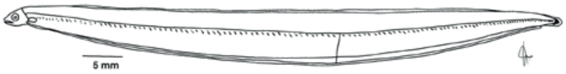


Figure 17. Contribution of the European sardine (*Sardina pilchardus*) to the total pelagic catches in the Canary Current from 1970 to 2000

Source: FAO-CECAF (Eastern Central Atlantic) capture production 1970-2000

2. ILLUSTRATIONS OF REPRESENTATIVE LARVAE OF BONY FISH FAMILIES INCLUDED IN THIS GUIDE

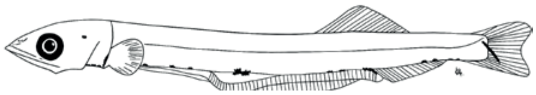
ORDER ANGUILLIFORMES p. 24



Congridae

ORDER CLUPEIFORMES p. 26

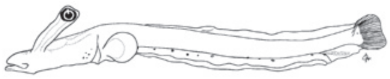
Clupeidae



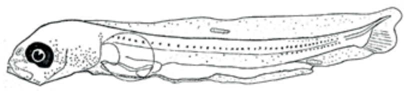
Engraulidae

ORDER ARGENTINIFORMES p. 32

Argentinidae



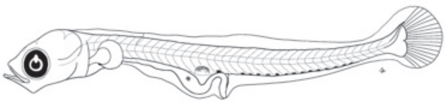
Bathylagidae



Microstomatidae

ORDER STOMIIFORMES p. 42

Phosichthyidae



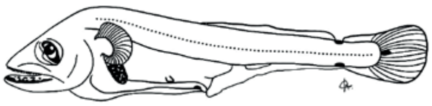
Gonostomatidae

Sternoptychidae

Stomiidae

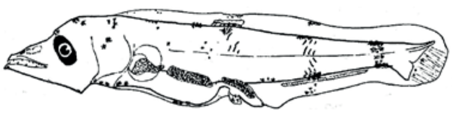
ORDER AULOPIFORMES p. 72

Synodontidae



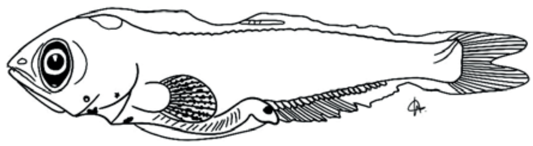
Scopelarchidae

Paralepididae



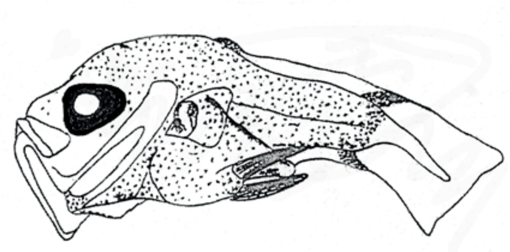
Evermannellidae

ORDER MYCTOPHIFORMES p. 92



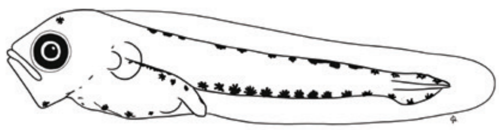
Myctophidae

ORDER ZEIFORMES p. 146

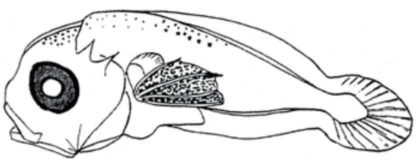


Zeidae

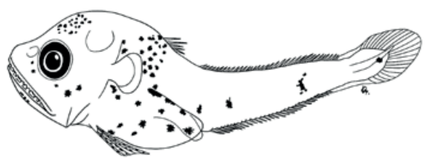
ORDER GADIFORMES p. 148



Gadidae

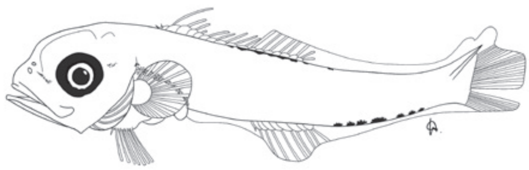


Lotidae



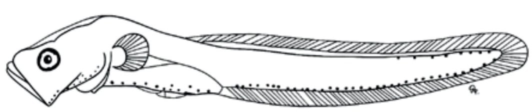
Merlucciidae

ORDER BERYCIFORMES p. 162

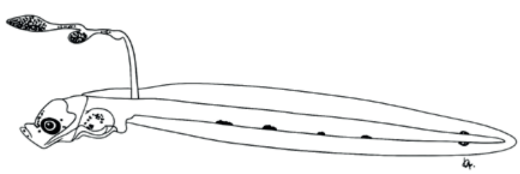


Melamphaidae

ORDER OPHIDIIFORMES p. 164

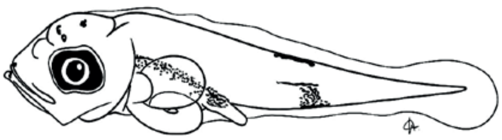


Ophidiidae

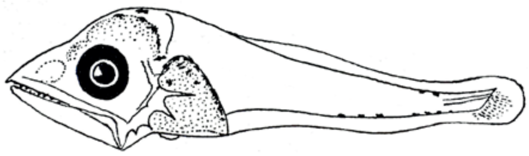


Carapidae

ORDER SCOMBRIFORMES p. 168

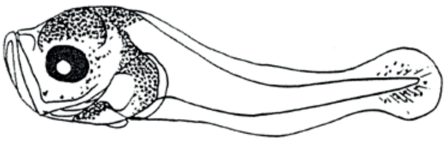


Nomeidae

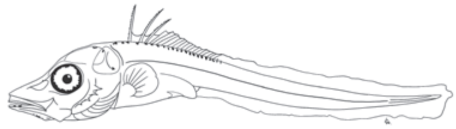


Scombridae

Gempyilidae

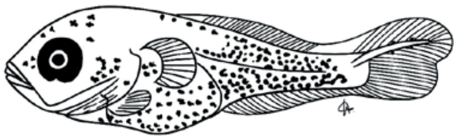


Bramidae

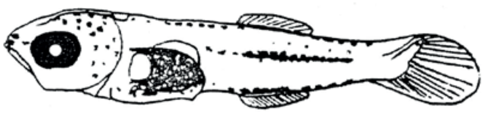


Trichiuridae

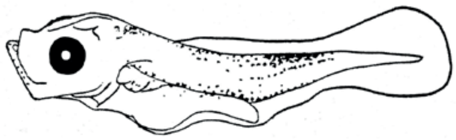
ORDER SYGNATHIFORMES p. 192



Callionymidae

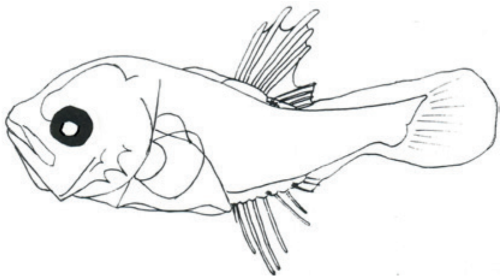


Mullidae



Centriscidae

ORDER KURTIFORMES p. 200

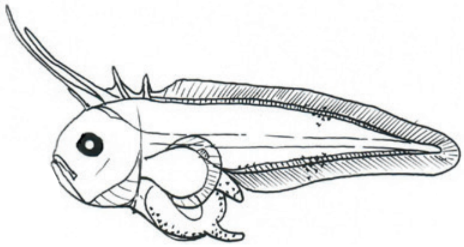


Apogonidae

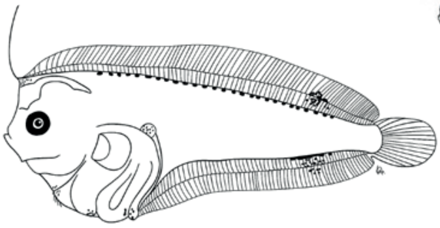
ORDER GOBIIFORMES p. 202

Gobiidae

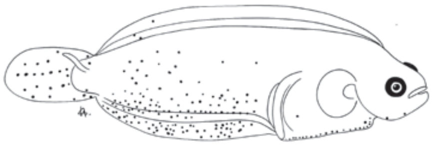
ORDER PLEURONECTIFOMES p. 208



Cynoglossidae

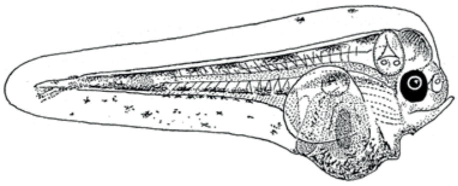


Bothidae



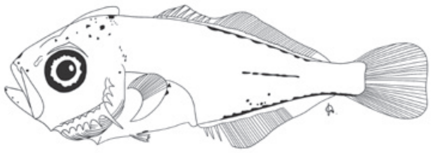
Pleuronectidae

Scophthalmidae



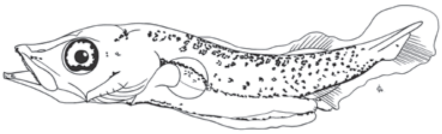
Soleidae

ORDER CARANGIFORMES p. 234



Carangidae

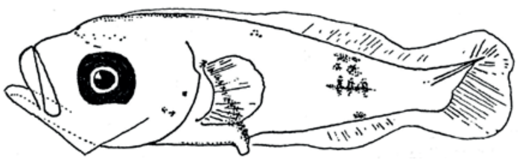
Coryphaenidae



Sphyraenidae

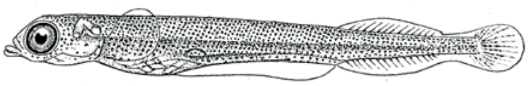
Xiphiidae

ORDER CICHLIFORMES p. 250

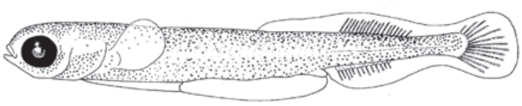


Pomacentridae

ORDER BELONIFORMES p. 252

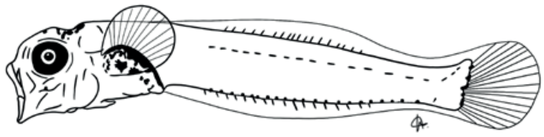


Belonidae



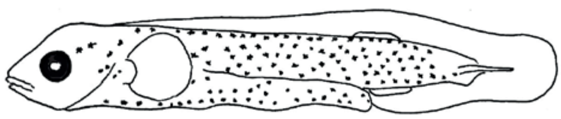
Scomberesocidae

ORDER BLENNIIFORMES p. 256



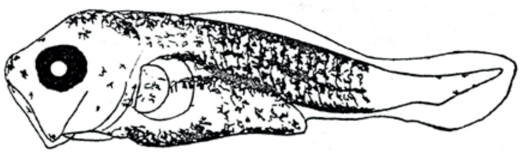
Blenniidae

ORDER GOBIESOCIFORMES p. 264



Gobiesocidae

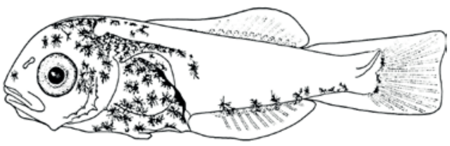
ORDER MUGILIFORMES p. 266



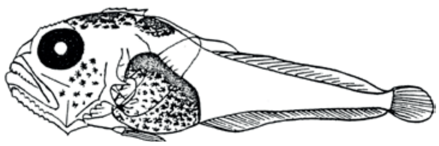
Mugilidae

ORDER PERCIFORMES p. 268

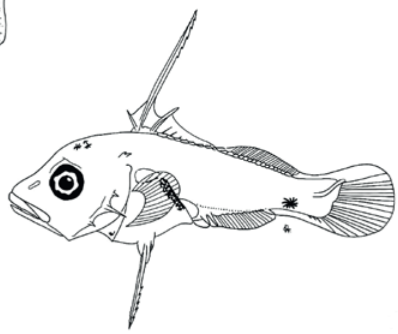
Moronidae



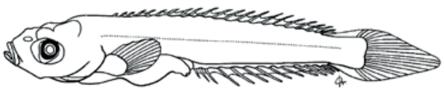
Sparidae



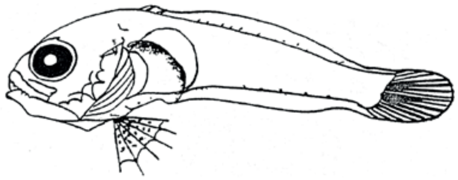
Cepolidae



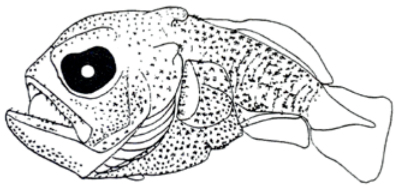
Serranidae



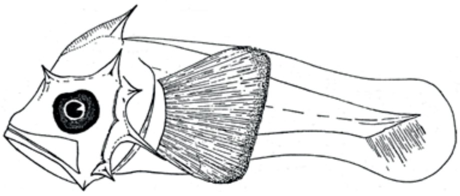
Labridae



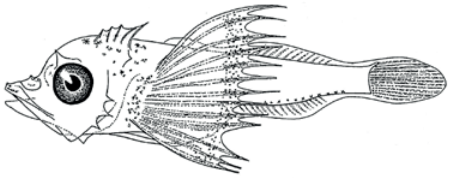
Trachinidae



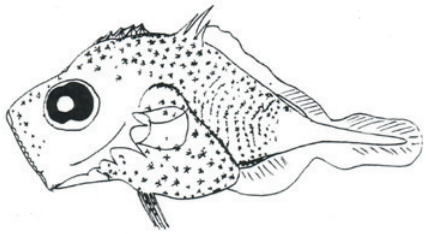
Uranoscopidae



Scorpaenidae

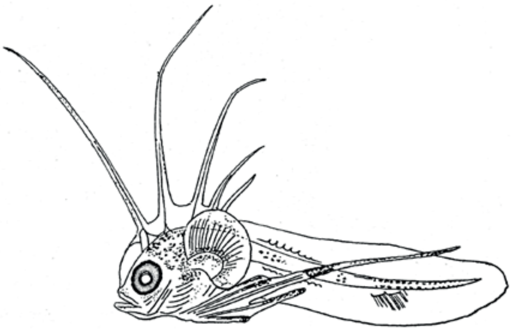


Triglidae



Caproidae

ORDER LOPHIIFORMES p. 322



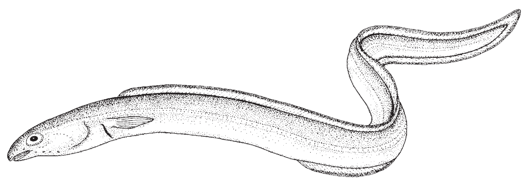
Lophiidae

3. IDENTIFICATION SHEETS

Ariosoma balearicum (Delaroche, 1809) — Bandtooth conger - Congre des Baléares

Habitat: neritic, benthic, between 20 and 100 m depth
Distribution: Atlantic and western Indian oceans. Eastern Atlantic, from Angola to Portugal, and the Mediterranean Sea
Spawning season: August to September (Mediterranean Sea)

Meristic characters
Myomeres: 120-137
Vertebrae: 120-136
Dorsal fin: NA
Anal fin: NA



EGGS

Habitat: pelagic
Shape: spherical
Chorion: double capsule, smooth; diam. about 2.0 mm
Perivitelline space: large
Yolk: segmented; unpigmented
Oil globules: one; unpigmented
Colour: transparent

YOLK–SAC LARVAE

Hatch size: < 5.0 mm
Body: elongate
Yolk sac: elongate
Oil globule location: no information
Anus: no information
Preanus length: no information
Pigmentation: unpigmented

LARVAE

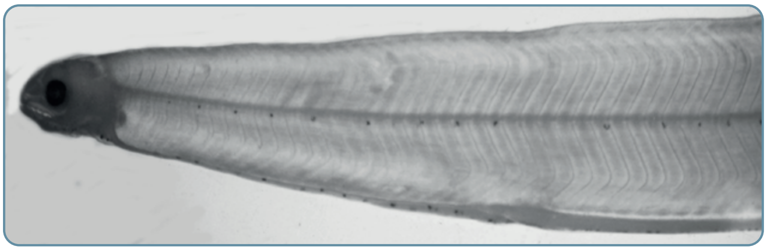
Figs. A-D

Body: very elongate, compressed dorso-laterally, and transparent (leptocephalus larvae); deepest region located slightly behind mid-length; tail moderately pointed; dorsal-fin origin located near posterior end of body; maximum body size 200 mm SL
Head: small (characteristic of leptocephalus larvae) with short snout; 4 prominent needle-like teeth in early larvae, in both jaws
Eye: round and small
Gut: straight, narrow and very long, almost reaching caudal region
Preanus length: about 95% SL
Air bladder: absent
Spination: none

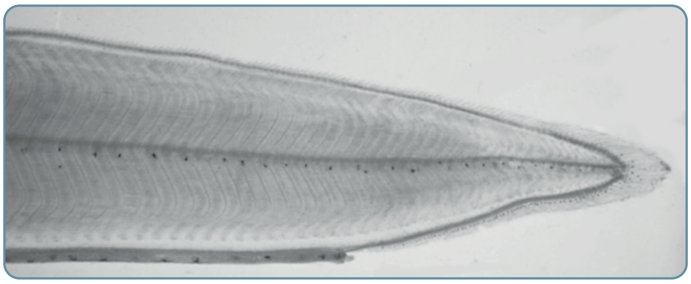
Pigmentation: early larvae (8.0 mm SL), 5-6 melanophores on each side of gut; at about 10 mm SL, 5 large melanophores appear dorsally on body (dorsal and ventral melanophores disappear with development); notochord tip pigmented; late larvae, lateral minute melanophores outlining myosepta, immediately below midline, forming a series of short diagonal lines from head to tail; small, ventral row of melanophores below gut anteriorly, switching to top of gut, behind liver; a series of small melanophores on dorsal midline, from head to tail; head unpigmented
Length at flexion: flexion does not occur
Length at transformation: unknown

PHOTOS

by J.M. Rodriguez

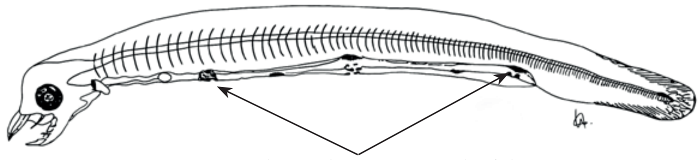


Leptocephalus larva (anterior region), not sized

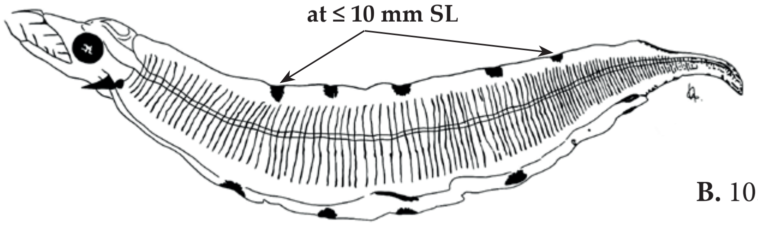


Leptocephalus larva (end of tail), not sized

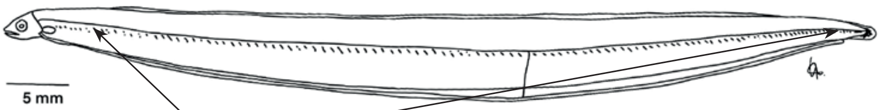
Ariosoma balearicum (Delaroche, 1809)



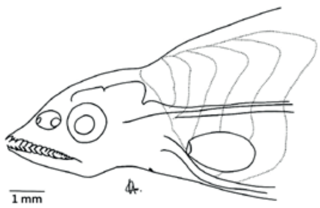
A. 8.0 mm SL



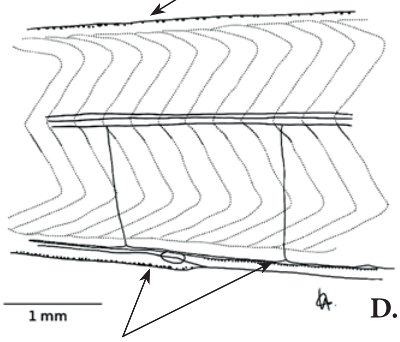
B. 10.0 mm SL



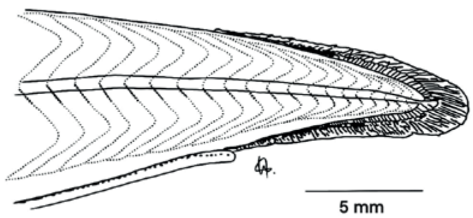
C. 69.0 mm SL



D. 167.0 mm SL, head



D. Gastric region



D. Caudal region

Literature: Bauchot and Saldanha (1984), D'Ancona (1931b), Fahay (2007), Froese and Pauly (2022), Smith (1979)

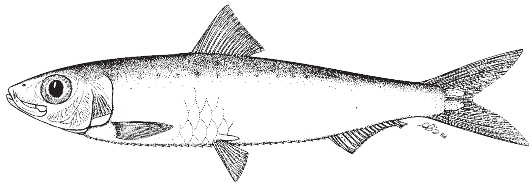
Illustrations' sources: A-D: L. Rodríguez (**A, B:** redrawn from D'Ancona, 1931b; **C, D:** redrawn from Smith, 1979)

CLUPEIDAE

Sardina pilchardus (Walbaum, 1792) European pilchard – Sardine commune

Habitat: neritic, pelagic, between 15 and 55 m depth
Distribution: eastern Atlantic Ocean, from Dakar (Senegal) to the North Sea, and the Mediterranean Sea
Spawning season: September to May

Meristic characters
Myomeres: 50-53
Vertebrae: 50-53
Dorsal fin: 17-18
Anal fin: 17-21



EGGS Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 1.30-1.90 mm
Perivitelline space: large
Yolk: segmented; unpigmented
Oil globules: one; diam. 0.14-0.18 mm; unpigmented
Colour: transparent

YOLK–SAC LARVAE Fig. B

Hatch size: 3.3–4.0 mm
Body: very elongate and slender (clupeid shape*)
Yolk sac: ovoid
Oil globule location: at post-ventral edge of yolk sac
Anus: far behind yolk sac, reaches finfold border
Preanus length: about 83% TL
Pigmentation: two parallel, dorsal rows of small melanophores from head to tail; a ventral melanophore on caudal region

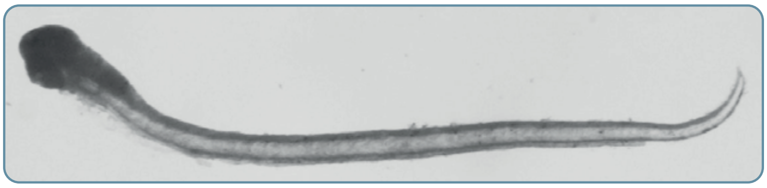
LARVAE Figs. C-H

Body: very elongate and slender (clupeid shape*); head length included at least six times in TL; dorsal fin located ahead of anus, migrates forward during development
Head: small, short and somewhat high; mouth terminal and relatively large
Eye: round and relatively large
Gut: straight, tube-like; differentiated into two sections
Preanus length: about 80% SL
Air bladder: present in late larvae
Spination: none

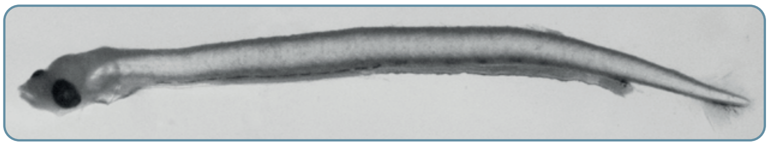
Pigmentation: no dorsal melanophores; ventral melanophores aligned on both sides of body, above gut; ventral rows of melanophores in posterior section of gut; caudal fin pigmented; some melanophores between anus and caudal fin (this character helps to distinguish this species from *Sardinella aurita*)
Length at flexion: 10.0 mm
Length at transformation: unknown

***Clupeid shape:** body elongate and slender and long, tube-like gut

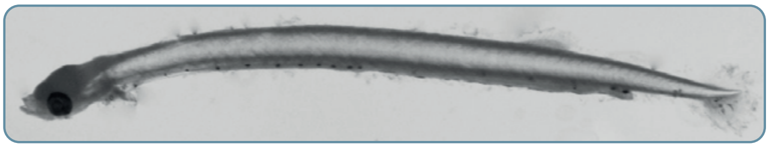
PHOTOS by J.M. Rodriguez



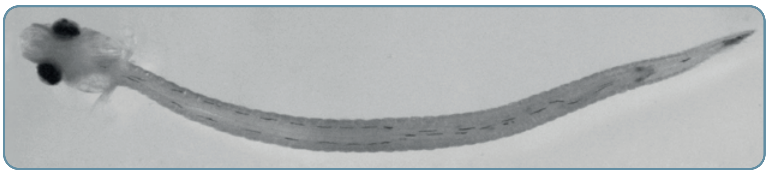
4.5 mm SL



6.9 mm SL



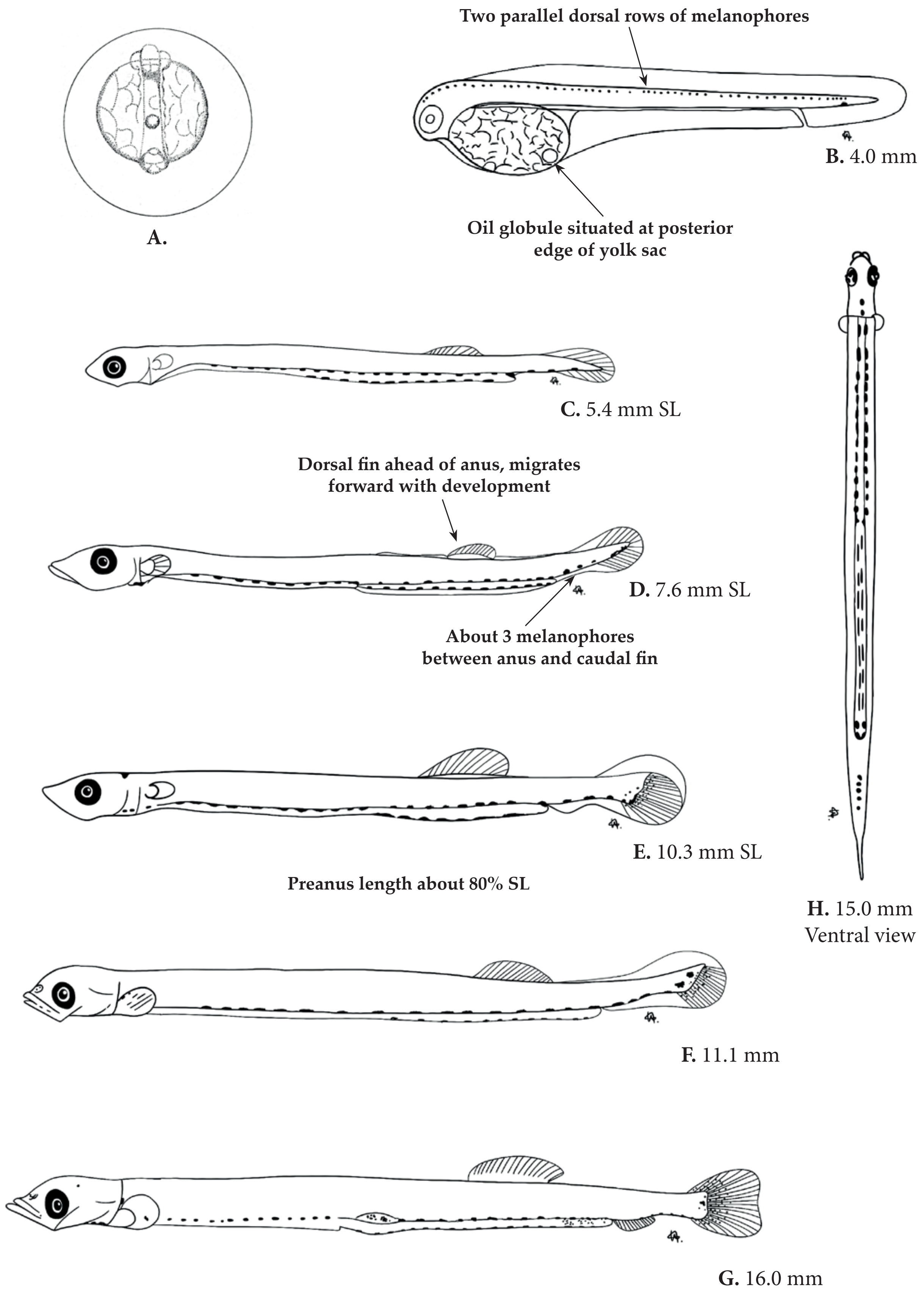
11.0 mm SL



6.7 mm SL, ventral view

CLUPEIFORMES

Sardina pilchardus (Walbaum, 1792)



Literature: D'Ancona (1931a), Fage (1920), Russell (1976), Whitehead (1984a)

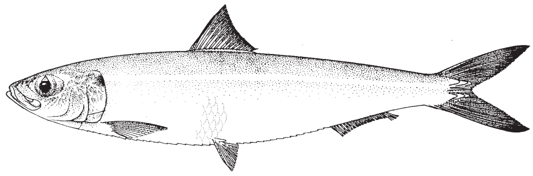
Illustrations' sources: A: D'Ancona (1931a); **B-H:** L. Rodríguez (**B, H:** redrawn from Russell, 1976; **C-E:** redrawn from Alemany, 1997; **F, G:** redrawn from Fage, 1920)

CLUPEIDAE

Sardinella aurita Valenciennes, 1847 — Round sardinella – Allache

Habitat: neritic, coastal, pelagic, between 0 and 300 m depth
Distribution: Atlantic Ocean and the Mediterranean Sea; eastern Atlantic from South Africa to Cadiz
Spawning season: April to November

Meristic characters
Myomeres: 45-48
Vertebrae: 45-49
Dorsal fin: 17-20
Anal fin: 16-20



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 1.20-1.35 mm
Perivitelline space: large
Yolk: segmented; unpigmented
Oil globules: one; diam. 0.10-0.12 mm; unpigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

Hatch size: about 2.5 mm
Body: elongate and slender (clupeid shape)
Yolk sac: spherical
Oil globule: at ventral edge of yolk sac
Anus: far behind yolk sac, reaches border of finfold
Preanus length: about 85% SL
Pigmentation: two parallel, dorsal rows of small melanophores, extending from head to tail

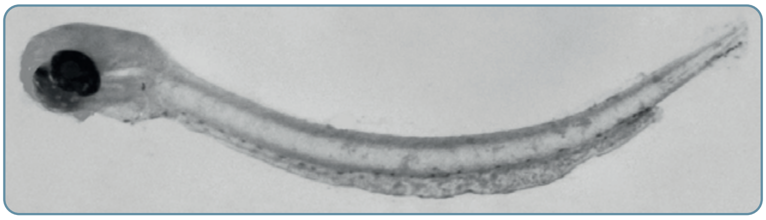
LARVAE — Figs. C-F

Body: elongate and slender (clupeid shape*); head length included less than 6 times in TL; dorsal fin located ahead of anus migrates forward during development
Head: relatively small; mouth large, terminal, extends to mid-eye level
Eye: round and relatively large
Gut: straight, tube-like; differentiated into two sections
Preanus length: ranges between 83 and 89% SL
Air bladder: present in late larvae

Spination: none
Pigmentation: no dorsal melanophores; ventral melanophores aligned on both sides of body, above gut; ventral rows of melanophores in posterior section of gut; caudal fin pigmented; no melanophores between anus and caudal fin in early larvae (this character helps to distinguish this species from *S. pilchardus*)
Length at flexion: 7.5-9.5 mm
Length at transformation: 16.0-23.0 mm

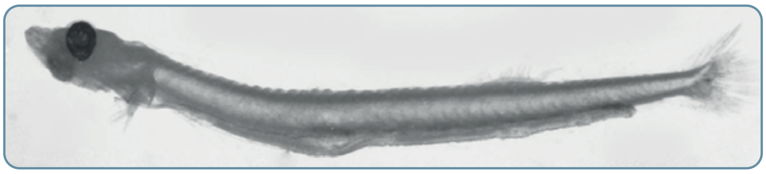
***Clupeid shape:** body elongate and slender and long, tube-like gut

PHOTOS — by J.M. Rodriguez



3.6 mm SL

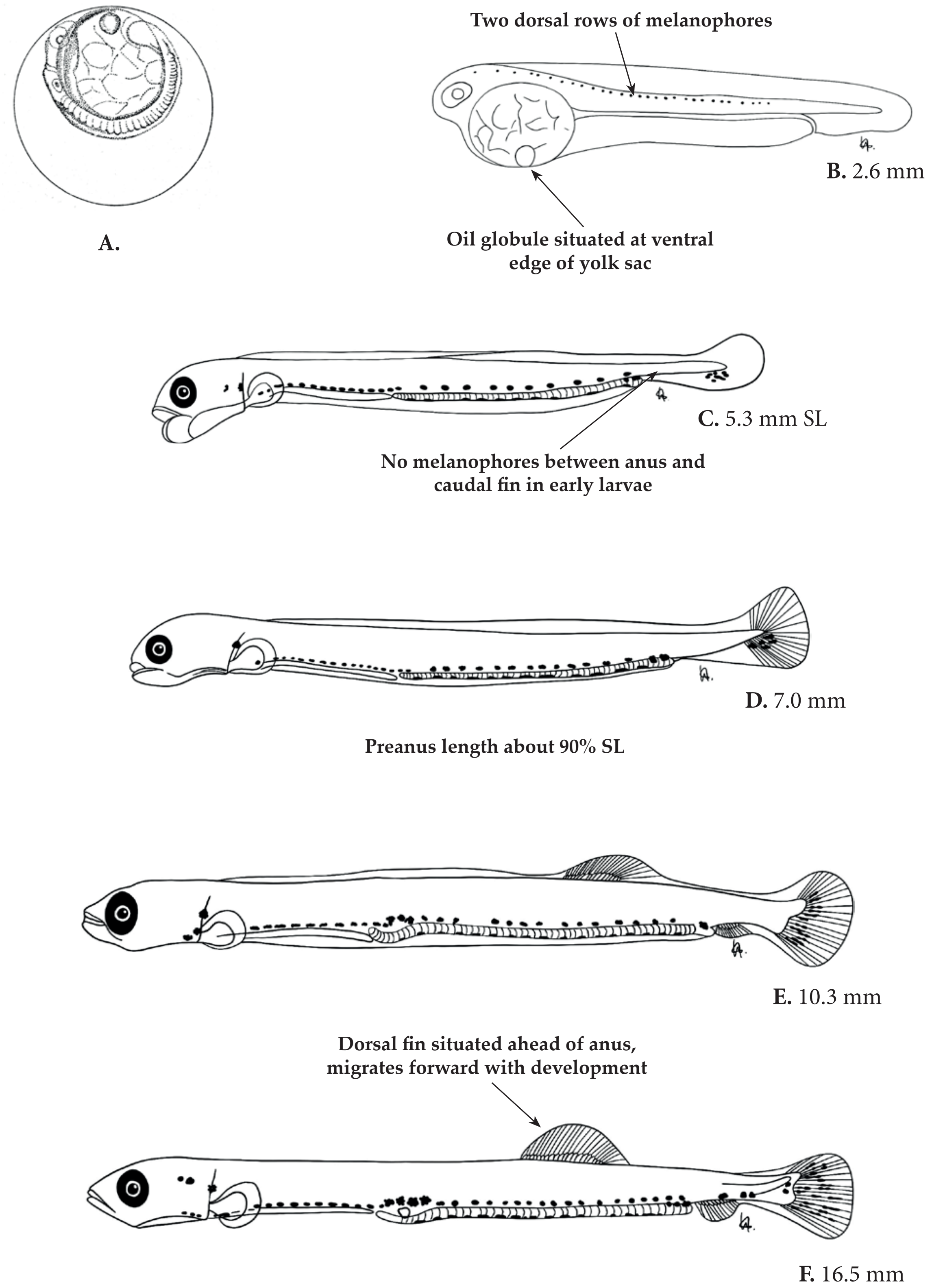
7.3 mm SL



8.6 mm SL

CLUPEIFORMES

Sardinella aurita Valenciennes, 1847



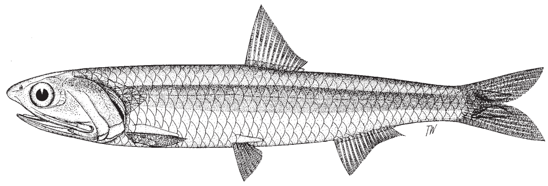
Literature: Conan and Fagetti (1971), D'Ancona (1931a), Fage (1920), Fahay (2007), Olivar and Fortuño (1991), Whitehead (1984a)

Illustrations' sources: A: D'Ancona (1931a); **B-F:** L. Rodríguez (**B:** redrawn from D'Ancona, 1931a; **C-F:** redrawn from Conan and Fagetti, 1971)

Engraulis encrasicolus Linnaeus, 1758 — European anchovy - Anchois

Habitat: neritic, coastal, pelagic, euryhaline
Distribution: eastern Atlantic Ocean, from South Africa to Norway, and the Mediterranean Sea
Spawning season: spring and summer

Meristic characters
Myomeres: 47
Vertebrae: 45-47
Dorsal fin: 16-18
Anal fin: 16-18



EGGS — Fig. A

Habitat: pelagic
Shape: ovoid
Chorion: smooth; diam. 1.2-1.9 x 0.5-1.2 mm
Perivitelline space: small
Yolk: segmented; unpigmented
Oil globules: none
Colour: transparent

YOLK–SAC LARVAE — Fig. B

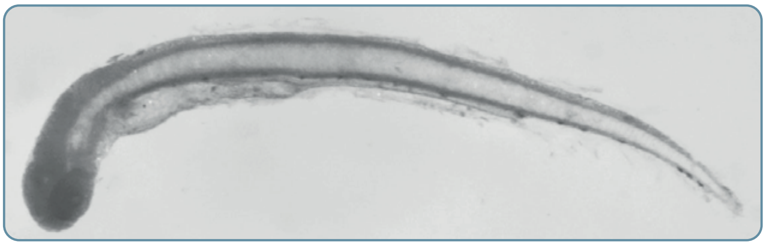
Hatch size: 3.0-4.0 mm
Body: elongate and slender (clupeid shape)
Yolk sac: very elongated
Anus: close behind yolk sac, reaches finfold border
Preanus length: about 75% SL
Pigmentation: recently hatched larvae unpigmented, late hatched larvae start to develop pigmentation of larvae

LARVAE — Figs. C-G

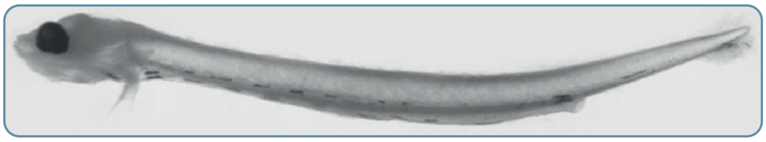
Body: elongate and slender (clupeid shape); dorsal fin over anus
Head: relatively small; mouth large, terminal, extends to middle of eye
Eye: round and relatively large
Gut: tube-like; differentiated into two sections; forms a small curve above gas bladder in late larvae
Preanus length: about 75% SL in early larvae, decreases during development
Air bladder: prominent in late larvae

Spination: none
Pigmentation: no dorsal melanophores; ventral melanophores aligned on both sides of body, above gut; ventral rows of melanophores in posterior section of gut; caudal fin and air bladder pigmented; some ventral melanophores between anus and caudal fin
Length at flexion: 7.5-9.5 mm
Length at transformation: 35.0-40.0 mm

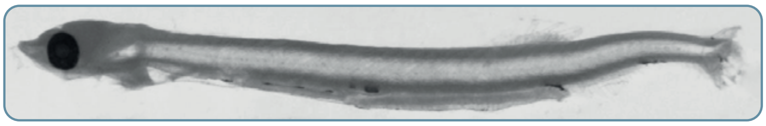
PHOTOS — by J.M. Rodriguez



3.8 mm SL



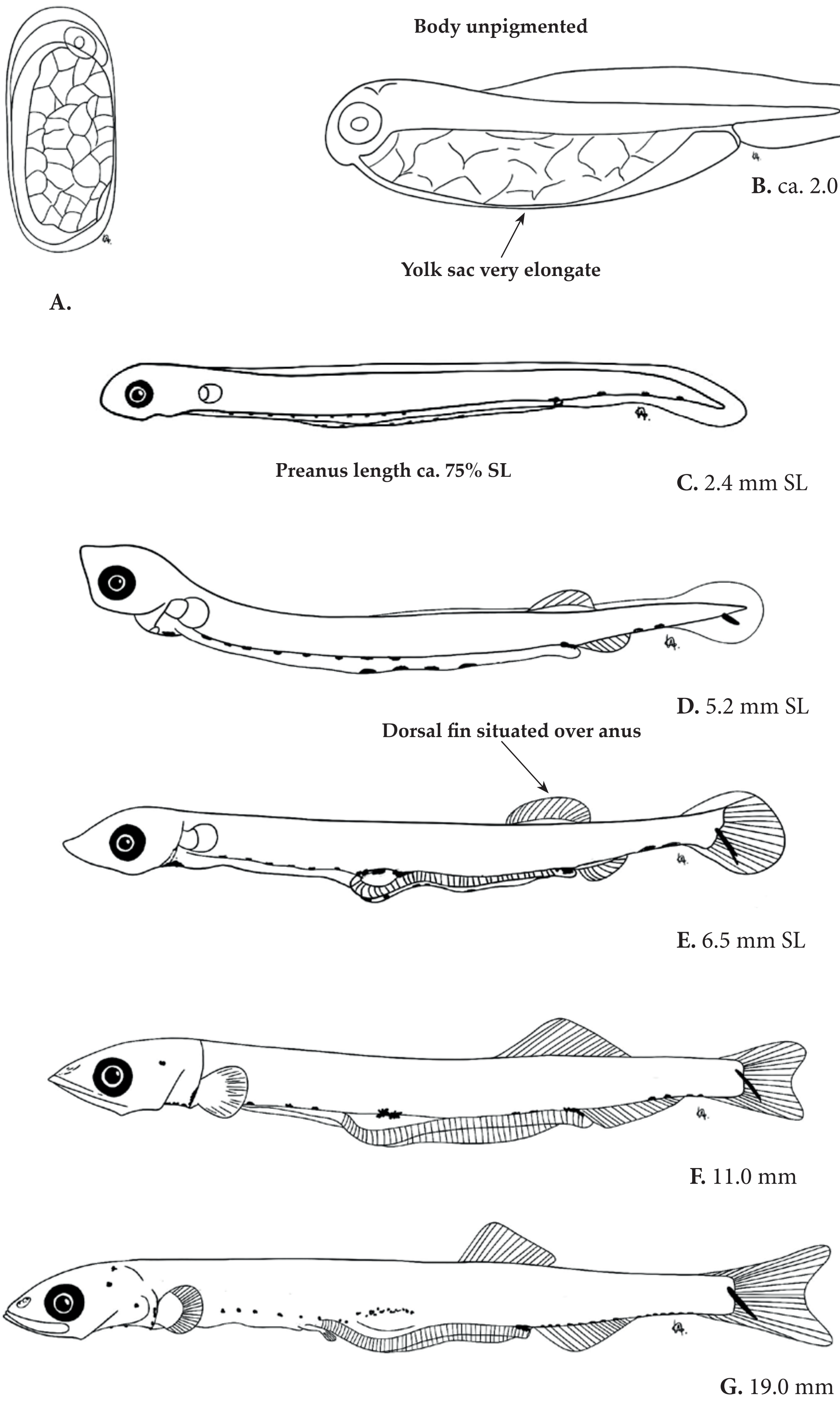
5.5 mm SL



8.2 mm SL

11.0 mm SL

Engraulis encrasicolus Linnaeus, 1758



Literature: Fage (1920), Froese and Pauly (2022), Olivar and Fortuño (1991), Russell (1976), Whitehead (1984b)

Illustrations' sources: A-G: L. Rodríguez (**A, B:** redrawn from D'Ancona, 1931c; **C-E:** redrawn from Alemany, 1997; **F, G:** redrawn from Fage, 1920)

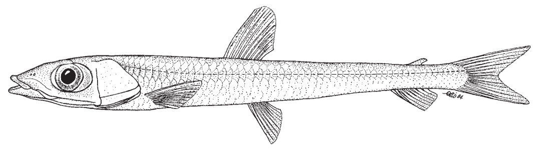
ARGENTINIDAE

Argentina sphyraena Linnaeus, 1758

Argentine – Petite argentine

Habitat: neritic and upper slope, demersal, between 50 and 700 m depth
Distribution: eastern Atlantic Ocean, from Western Sahara to northern Norway, and the Mediterranean Sea
Spawning season: winter and spring

Meristic characters
Myomeres: 53-55
Vertebrae: 53-55
Dorsal fin: 10
Anal fin: 12
Adipose fin: present after transformation



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 1.30-1.90 mm
Perivitelline space: small
Yolk: segmented; pigmented
Oil globules: one; diam. 0.37-0.47 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

Hatch size: about 7.5 mm
Body: elongate and slender
Yolk sac: elongate
Oil globule location: at post-ventral edge of yolk sac
Anus: far away from yolk sac, reaches finfold border
Preanus length: about 67% TL
Pigmentation: large stellate melanophores on yolk sac and groups of melanophores along dorsal side of gut; caudal–dorsal and ventral groups of melanophores; oil globule pigmented

LARVAE — Figs. C-F

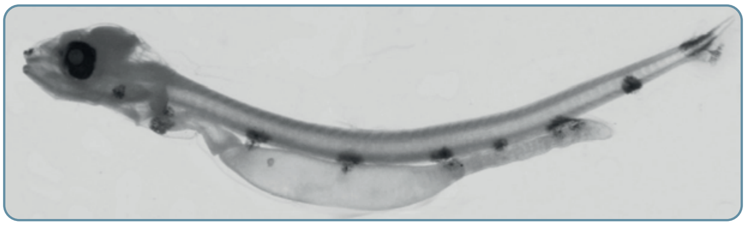
Body: long and slender (clupeid shape)
Head: relatively small; mouth terminal and small
Eye: round and relatively large
Gut: long, tube-like, slightly wavy
Preanus length: about 72% SL
Air bladder: absent
Spination: none

Pigmentation: 6 groups of melanophores, approximately equidistant, situated along ventral region of trunk and tail (5 above gut and one on tail); 2 opposing groups of caudal melanophores; tips of upper and lower jaw pigmented; caudal fin pigmented; a melanophore on dorsal surface of terminal gut
Length at flexion: begins at about 13.0 mm
Length at transformation: unknown

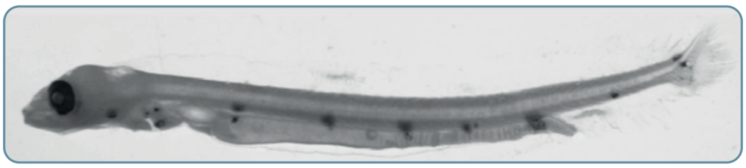
PHOTOS

by J.M. Rodriguez

6.0 mm SL



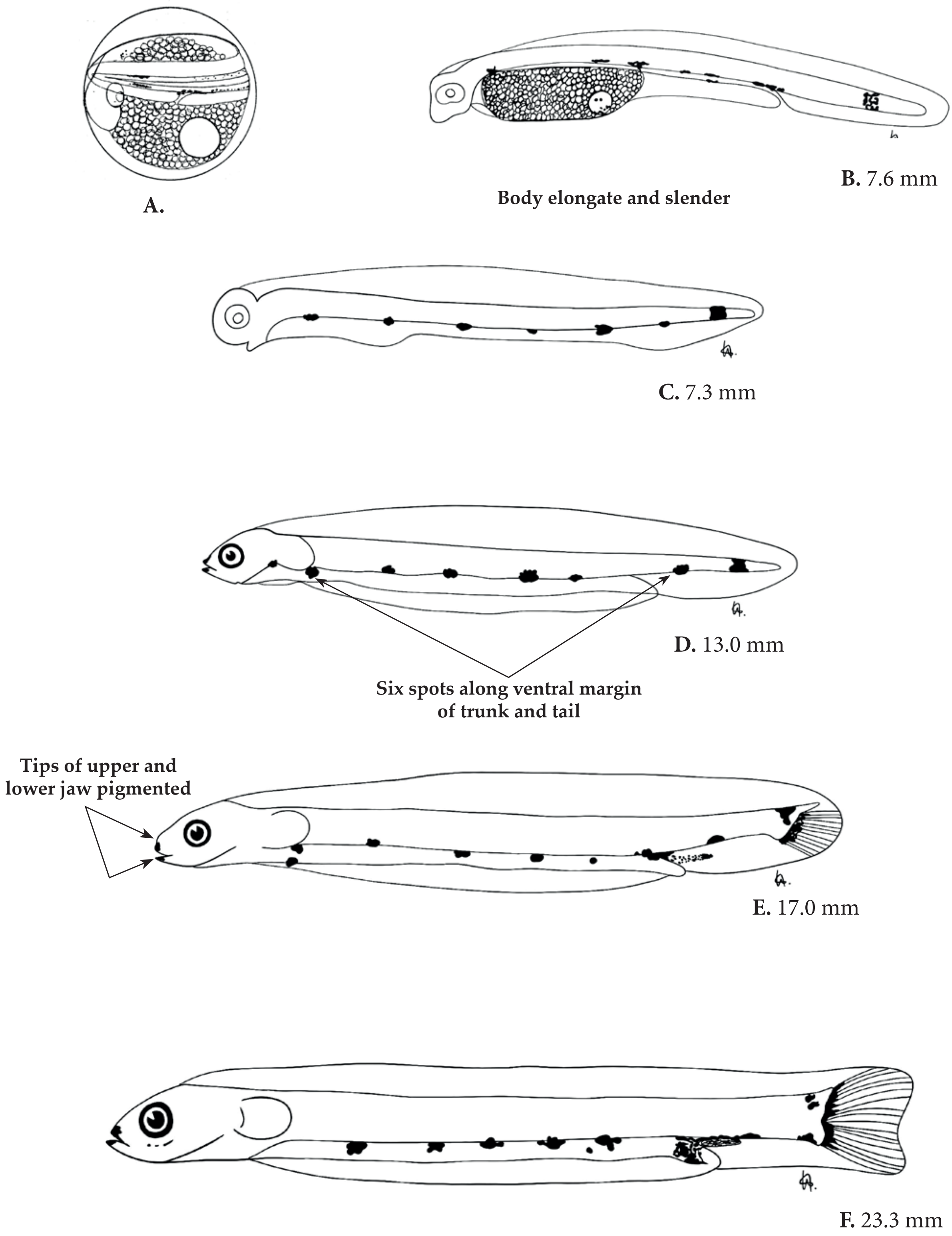
10.7 mm SL



12.3 mm SL

ARGENTINIFORMES

Argentina sphyraena Linnaeus, 1758



Literature: Cohen (1984), Froese and Pauly (2022), Russell (1976), Sanzo (1931a), Schmidt (1918)

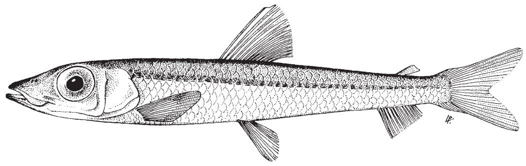
Illustrations' sources: A: Sanzo (1931a); **B-F:** L. Rodríguez (redrawn from Sanzo, 1931a)

ARGENTINIDAE

Glossanodon leioglossus (Valenciennes, 1848) Smalltoothed argentine - Argentine à petites dents

Habitat: demersal, outer shelf and slope, between 50 and 700 m depth
Distribution: eastern Atlantic Ocean, from Mauritania to southern Spain, and the western Mediterranean Sea
Spawning season: September to March (Mediterranean Sea)

Meristic characters
Myomeres: 51-52
Vertebrae: 51-52
Dorsal fin: 13-14
Anal fin: 11-12
Adipose fin: present



EGGS

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 1.44-1.52 mm
Perivitelline space: small
Yolk: segmented
Oil globules: one; diam. 0.36 mm; unpigmented
Colour: transparent

YOLK–SAC LARVAE Fig. A

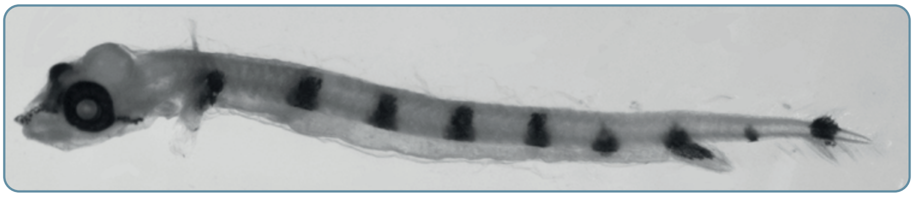
Hatch size: unknown
Body: elongate and slender
Yolk sac: ovoid
Oil globule location: at mid-ventral edge of yolk sac
Anus: far away from yolk sac, reaches finfold border
Preanus length: about 80% SL
Pigmentation: a large patch in caudal region, over primordial fin; 3 large melanophores over gut, yolk sac unpigmented

LARVAE Figs. B-D

Body: long and slender (clupeid shape); dorsal fin located at about middle of body; anal fin located at end of body
Head: relatively small; mouth terminal and oblique
Eye: round and large
Gut: long, tube-like; end of gut detached from body, over anal fin
Preanus length: about 85% SL
Air bladder: absent
Spination: none

Pigmentation: 8 strips of pigment along latero-ventral sides of body, first one anterior to pectoral fin, one prolonged over terminal gut; a large melanophore at caudal end, spreading through caudal fin in late larvae; 2 large spots on head, one over upper jaw and another behind eye, over opercle
Length at flexion: unknown
Length at transformation: unknown

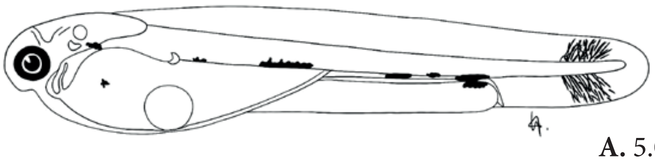
PHOTOS by J.M. Rodriguez



9.5 mm SL

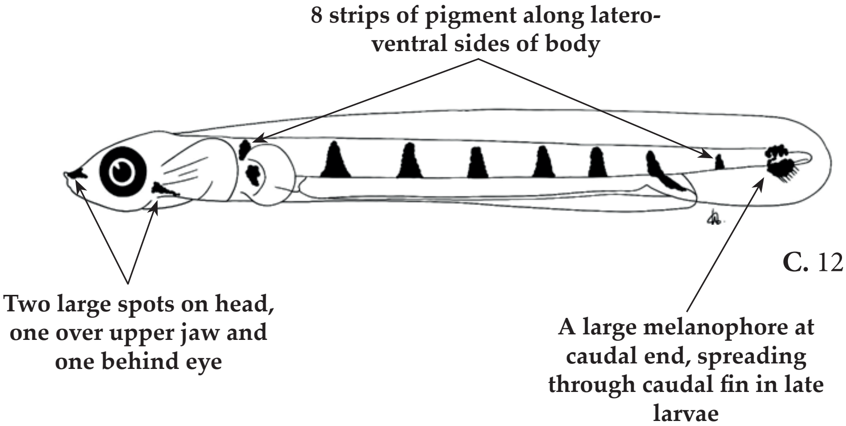
ARGENTINIFORMES

Glossanodon leioglossus (Valenciennes, 1848)

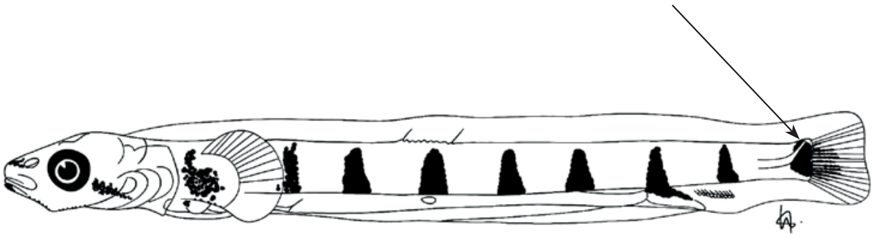


A. 5.0 mm

B. 6.7 mm



C. 12.5 mm



D. 19.1 mm

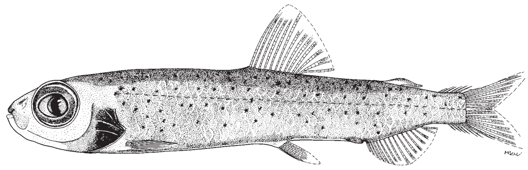
Literature: Alemany (1997), Cohen (1984, 1990a), Crec'hriou *et al.* (2015), Marinaro (1971), Sabatés (1997), Sanzo (1931a), Schmidt (1918)

Illustrations' sources: A-D: L. Rodríguez (redrawn from Sanzo, 1931a)

Bathylagoides argyrogaster (Norman, 1930) — Silver deepsea smelt

Habitat: oceanic, mesopelagic, usually between 200 and 300 m depth
Distribution: worldwide in tropical and subtropical waters. Eastern Atlantic, from South Africa to Mauritania
Spawning season: unknown

Meristic characters
Myomeres: 43-44
Vertebrae: 43-44
Dorsal fin: 12-13
Anal fin: 15-16



EGGS

Undescribed

YOLK–SAC LARVAE

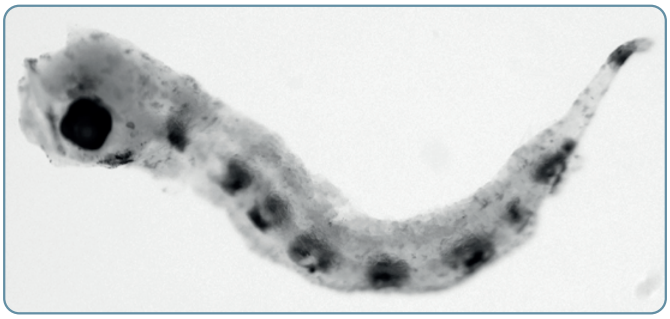
Undescribed

LARVAE — Figs. A-E

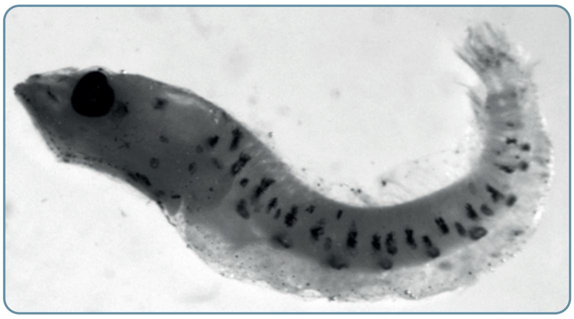
Body: elongate; primordial finfold persists throughout all larval stages
Head: rather elongate, increases in length with development; snout blunt and relatively wide; jaws reach anterior margin of eye; teeth develop in lower jaw at 6.0 mm SL (6 teeth in larvae of 10.0 mm SL)
Eye: sessile; slightly oval in early larvae, becomes rounded and smaller with development
Gut: elongate, tube-like
Preanus length: increases from 80% SL in early larvae to 90% SL in late larvae
Air bladder: absent
Spination: none

Pigmentation: early larvae, 7-8 ventral melanophores, dorso-lateral to gut, between pectoral-fin base and anus, increasing to 10 with development; ventral streak of melanophores on notochord tip, complemented by a dorsal one in some larvae; body unpigmented; late larvae, melanophores appear over body and head, increasing in number with development; gut unpigmented; dorsal and ventral melanophores over urostyle; caudal-fin rays pigmented
Length at flexion: 8.5-10.2 mm SL
Length at transformation: unknown

PHOTOS — by S. Isari



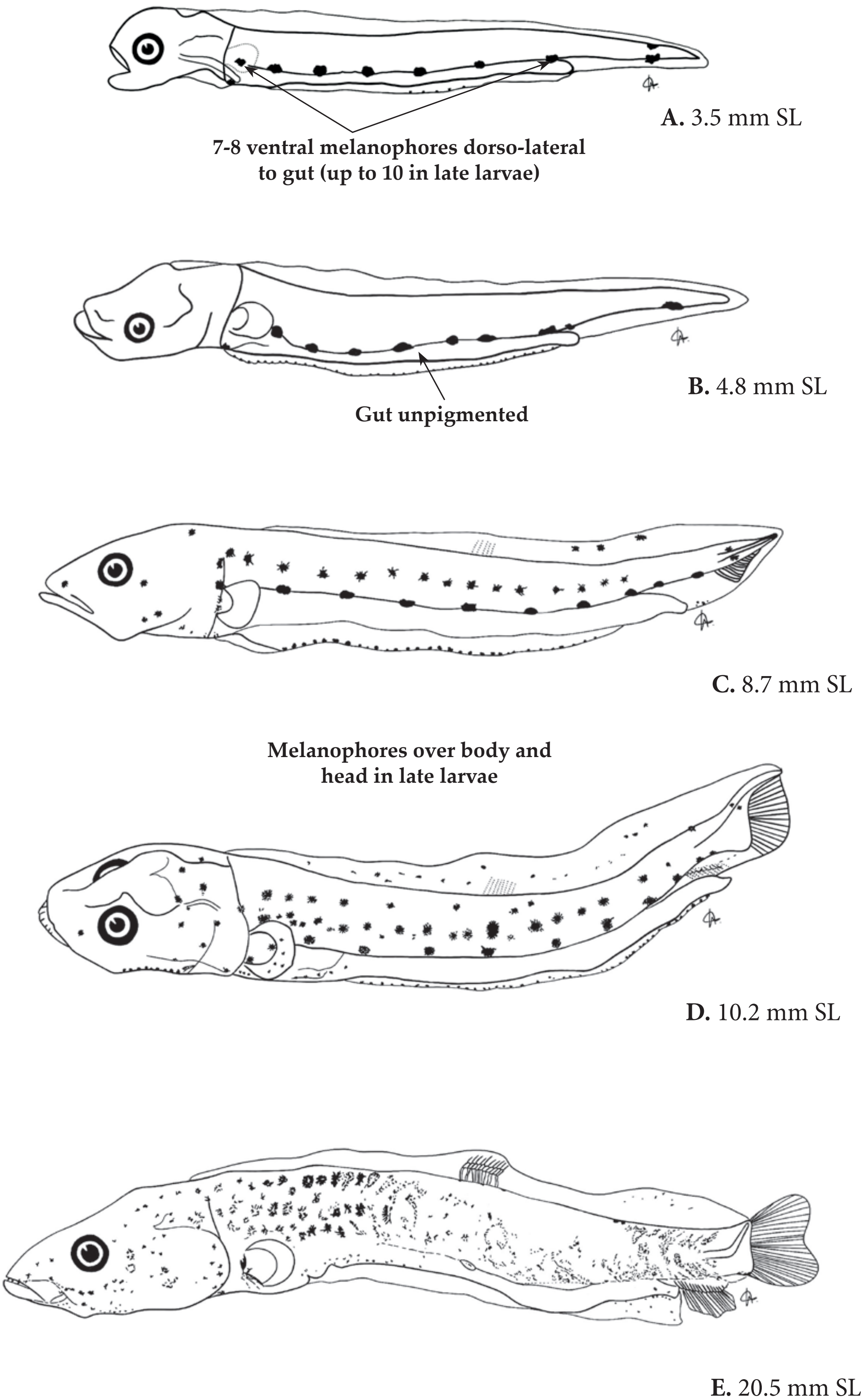
4.5 mm SL



4.8 mm SL

7.7 mm SL

Bathylagoides argyrogaster (Norman, 1930)



Literature: Cohen (1990b), Hermes and Olivar (1987), Olivar and Fortuño (1991)

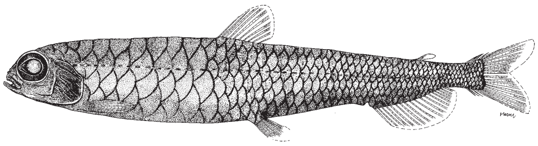
Illustrations' sources: A-E: L. Rodríguez (**A-D:** redrawn from Hermes and Olivar, 1987; **E:** redrawn from Olivar and Fortuño, 1991)

BATHYLAGIDAE

Melanolagus bericoides (Borodin, 1929) Bigscale deepsea smelt

Habitat: oceanic, mesopelagic, between 100 and 1 700 m depth
Distribution: worldwide in tropical and subtropical waters (not reported for the Mediterranean Sea)
Spawning season: unknown

Meristic characters
Myomeres: 48-54
Vertebrae: 48-54
Dorsal fin: 9-12
Anal fin: 18-23



EGGS

Undescribed

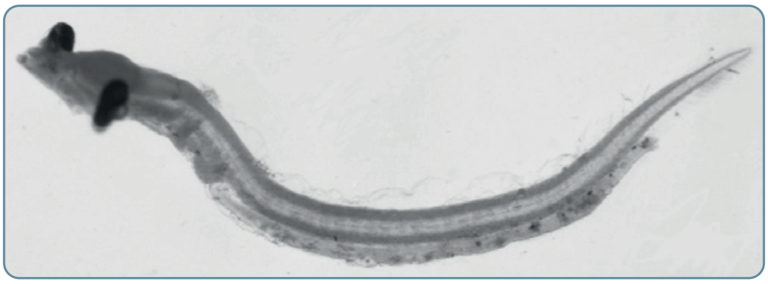
YOLK–SAC LARVAE

Undescribed

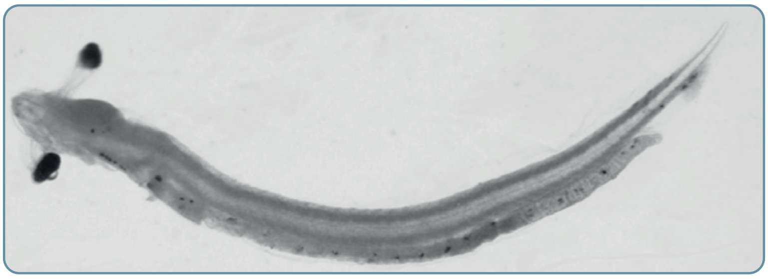
LARVAE Figs. A-E

Body: elongate
Head: extremely elongate and pointed; lower jaw protruding
Eye: stalked and vertically elliptical, large; stalks very long before transformation
Gut: extremely long, especially in postflexion stage; tube-like; moderately wavy
Preanus length: 85-90% SL
Air bladder: absent
Spination: none
Pigmentation: restricted to series of large melanophores along lateral sides of gut in early larvae; late larvae show scattered spots on lower opercle, a single melanophore at pectoral-fin base and a few melanophores at caudal-fin base
Length at flexion: 14.0 mm
Length at transformation: > 23.0 mm

PHOTOS by J.M. Rodriguez



5.9 mm SL

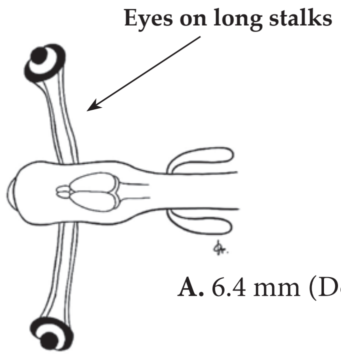


10.0 mm SL

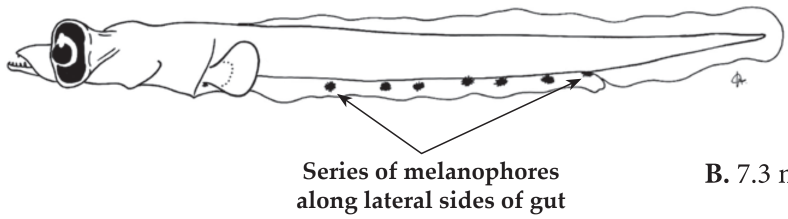
14.2 mm SL

ARGENTINIFORMES

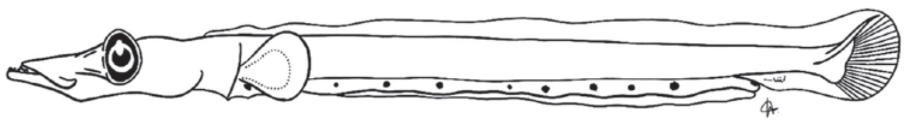
Melanolagus bericoides (Borodin, 1929)



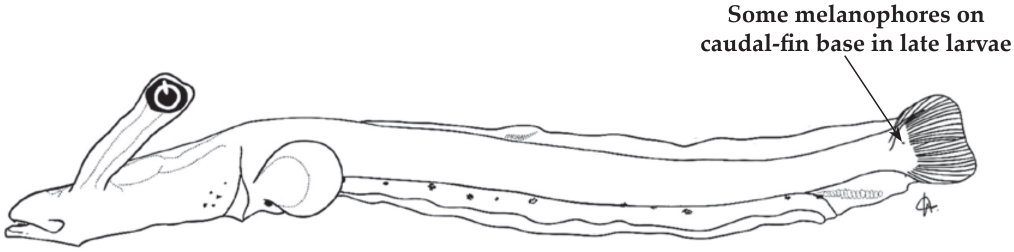
A. 6.4 mm (Dorsal view of head)



B. 7.3 mm



C. 14.5 mm



D. 17.7 mm

Literature: Fahay (2007), Froese and Pauly (2022), Moser and Ahlstrom (1996a), Olivar and Fortuño (1991)

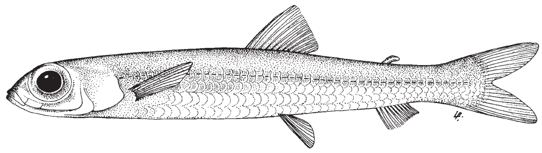
Illustrations' sources: A-D: L. Rodríguez (redrawn from Moser and Ahlstrom, 1996)

MICROSTOMATIDAE

Nansenia oblita (Facciolà, 1887)

Habitat: mesopelagic, oceanic, between 300 and 500 m depth
Distribution: North Atlantic Ocean and western Mediterranean Sea; eastern Atlantic from about 24° N to southwest of Ireland
Spawning season: winter (Mediterranean Sea)

Meristic characters
Myomeres: 42-45
Vertebrae: 42-45
Dorsal fin: 10-11
Anal fin: 9-10



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: with 'pustules' on inner surface; diam. 1.48-1.50 mm
Perivitelline space: small
Yolk: segmented
Oil globules: one; diam. 0.40-0.43 mm; unpigmented
Colour: no information

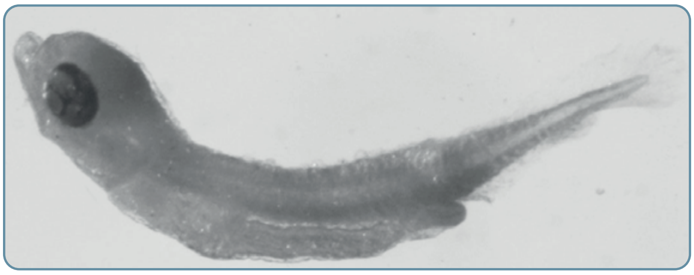
YOLK–SAC LARVAE — Fig. B

Hatch size: about 4.0 mm
Body: relatively elongate
Yolk sac: large and ovoid
Oil globule: at ventral side of yolk sac
Anus: detached from yolk sac reaches finfold border
Preanus length: about 77% SL
Pigmentation: unpigmented

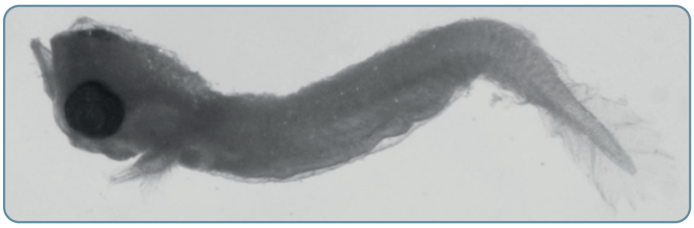
LARVAE — Figs. C-G

Body: moderately elongate and laterally compressed in early larvae, becomes rounded in late larvae
Head: relatively large; mouth terminal and small; snout rounded
Eye: round and relatively large
Gut: elongate, tube-like in early larvae; coiled anteriorly and detached from body at its end in late larvae
Preanus length: about 75% TL
Air bladder: absent
Spination: none
Pigmentation: row of melanophores above and below notochord; scattered melanophores on head appear as a horizontal bar through eye; rows of small melanophores along ventral side of trunk and tail, from pectoral–fin base to level of anus; row of melanophores along lower jaw; pigment spreads over most of body during development, except on caudal peduncle
Length at flexion: 7.0-11.0 mm SL
Length at transformation: > 20.0 mm SL

PHOTOS — by J.M. Rodriguez



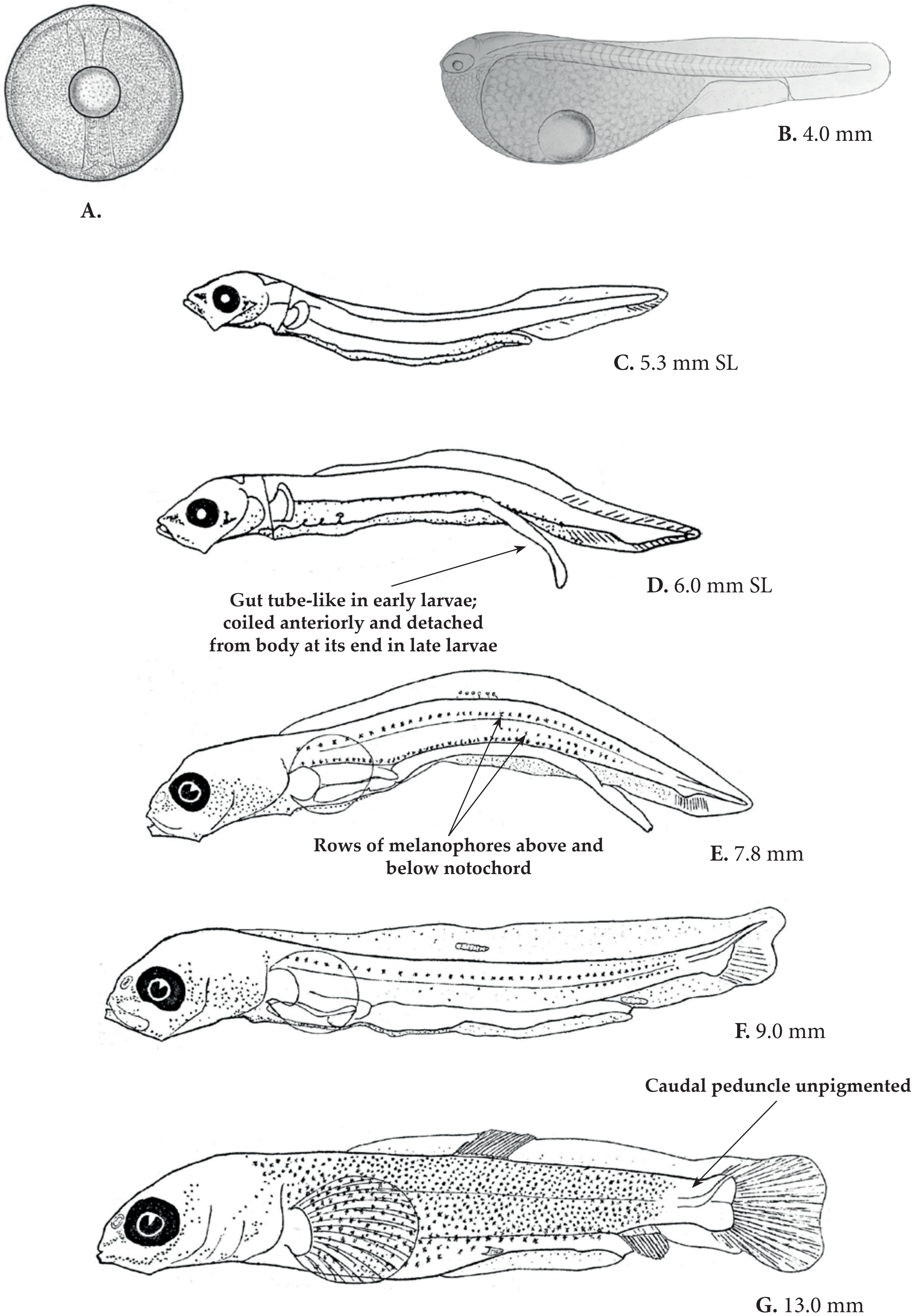
3.4 mm SL



3.5 mm SL

ARGENTINIFORMES

Nansenia oblita (Facciolà, 1887)



Literature: Alemany (1997), Cohen (1984), Fahay (2007), Froese and Pauly (2022), Sanzo (1931a), Schmidt (1918)

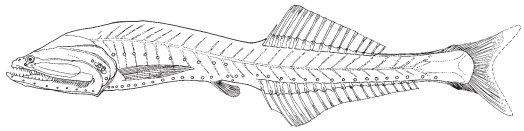
Illustrations' sources: A, B: Sanzo (1931a); **C, D:** Alemany (1997); **E-G:** Schmidt (1918)

GONOSTOMATIDAE

Cyclothone acclinidens Garman, 1899 — Benttooth bristlemouth

Habitat: oceanic, mesopelagic, between 0 and 1 200 m depth
Distribution: worldwide in tropical and subtropical waters (absent from the Mediterranean Sea)
Spawning season: unknown

Meristic characters
Myomeres: 30-32
Vertebrae: 30-32
Dorsal fin: 14-15
Anal fin: 18-20



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

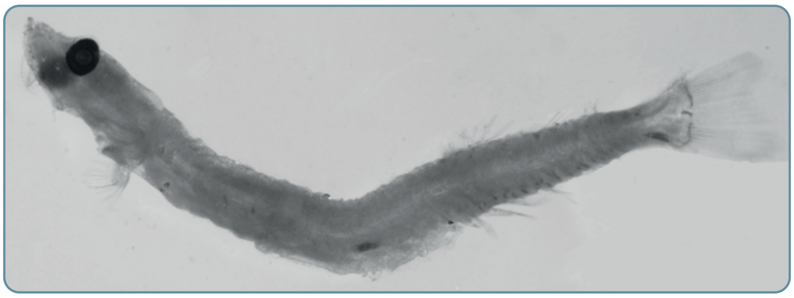
LARVAE — Figs. A-D

Body: elongate and slender; dorsal and anal fins opposite
Head: relatively small; mouth terminal and large, extending well posterior to eye in late larvae
Eye: relatively small and slightly oval
Gut: elongate, tube-like, forming a slight curve above air bladder in late larvae
Preanus length: > 50% SL
Air bladder: prominent in late larvae, located over posterior gut
Spination: none
Pigmentation: a prominent melanophore on ventral side of caudal peduncle; a melanophore at middle of caudal-fin base; a pair of melanophores along lateral sides of gut: a melanophore over anus; dorsum of air bladder pigmented; a series of 9-13 equidistant melanophores along postanal, ventral region, gradually becoming internal with development; 4-13 melanophores (number increases with development) on myosepta above gut; a few spots on head and lower jaw; none or one melanophore over notochord tip; postanal, dorsal melanophores appear at 6.5 mm behind dorsal-fin origin, spreading forward with development; air bladder pigmented
Length at flexion: 5.0-6.0 mm SL
Length at transformation: between 13.0 mm and 22.0 mm SL

Note: pigmentation is the primary character to distinguish species of the genus *Cyclothone*

PHOTOS — by J.M. Rodriguez

6.1 mm SL

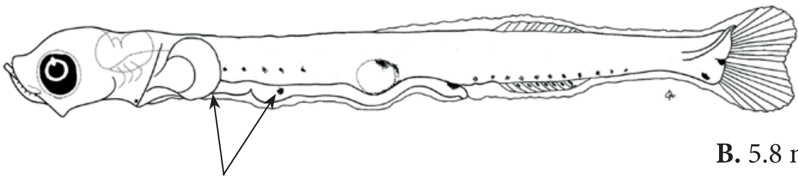


6.7 mm SL

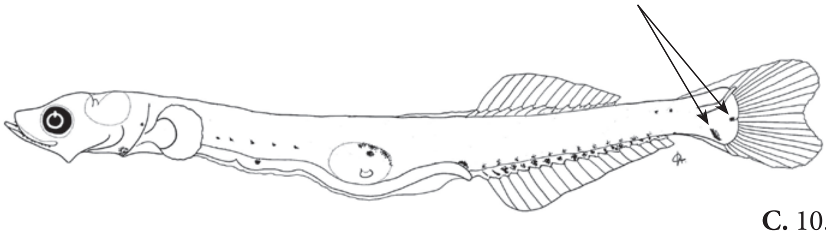
STOMIIFORMES

Cyclothone acclinidens Garman, 1899

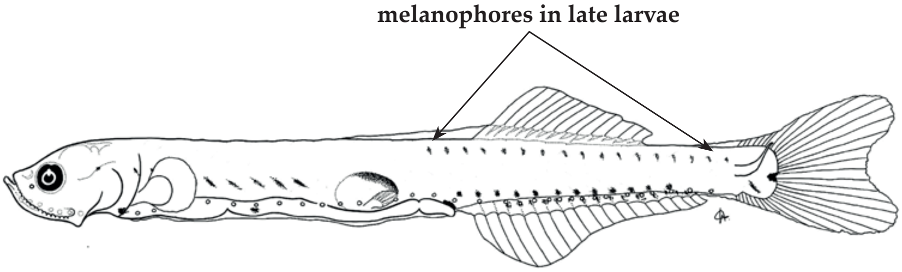
A. 5.8 mm SL



B. 5.8 mm SL



C. 10.0 mm SL



D. 13.7 mm SL

Literature: Badcock (1984a), Fahay (2007), Olivar and Fortuño (1991), Richards (2006a), Watson (1996a)

Illustrations' sources: A-D: L. Rodríguez (redrawn from Watson, 1996a)

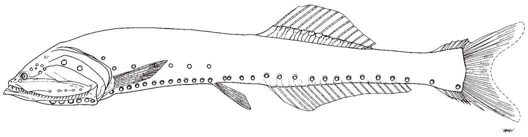
GONOSTOMATIDAE

Cyclothone braueri Jespersen & Tåning, 1926

Garrick

Habitat: oceanic, mesopelagic, between 250 and 900 m depth
Distribution: worldwide in tropical and subtropical waters, and the Mediterranean Sea
Spawning season: April to October

Meristic characters
Myomeres: 30-32
Vertebrae: 30-32
Dorsal fin: 13-14
Anal fin: 18-20



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

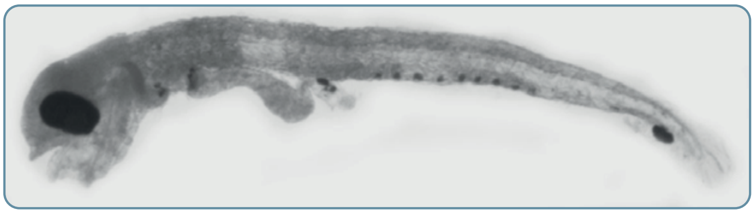
LARVAE

Figs. A-F

Body: elongate and slender; dorsal and anal fins located at same level
Head: relatively small; mouth terminal and large, extending well posterior to eye in late larvae
Eye: round and small
Gut: elongate, tube-like, forming a slight curve above air bladder
Preanus length: about 50% SL
Air bladder: prominent (absent in very early larvae), located over posterior of gut
Spination: none
Pigmentation: prominent spot on ventral side of caudal peduncle; three pairs of melanophores along lateral sides of gut: one close to pectoral-fin base, another about at level of first 1/3 of gut, and a third one over anus; dorsum of air bladder pigmented; a series of 9 to 12 equidistant melanophores along postanal, ventral region in early larvae; late larvae show a regular ventral, postanal row of internal melanophores in correspondence with external postanal row; row of 5-6 internal melanophores on ventrolateral anterior region of body, over gut, following myosepta, and about 3 internal melanophores on upper part of caudal peduncle; dorsum of air bladder pigmented
Length at flexion: about 4.8 mm
Length at transformation: > 12.0 mm

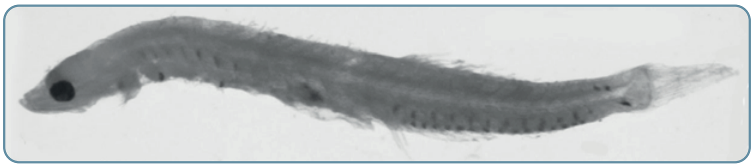
PHOTOS

by J.M. Rodriguez



3.6 mm SL

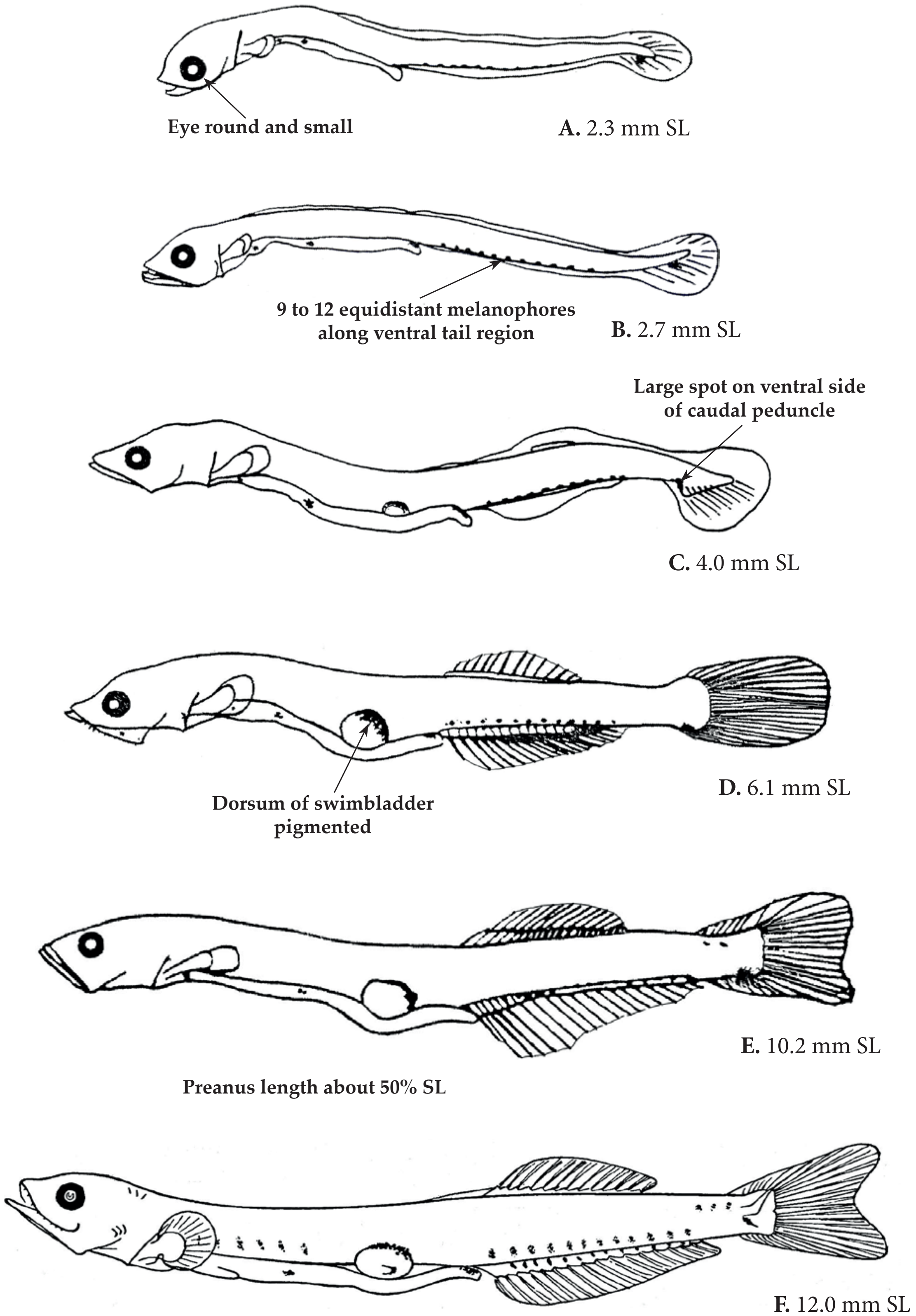
5.0 mm SL



10.5 mm SL

STOMIIFORMES

Cyclothone braueri Jespersen & Tåning, 1926



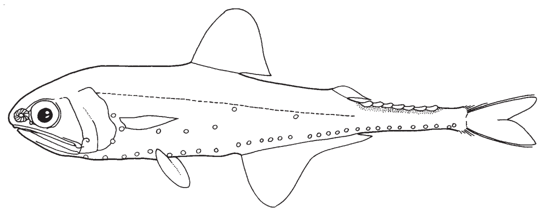
Literature: Badcock (1984a), Fahay (2007), Jespersen and Tåning (1926)

Illustrations' sources: A-E: Alemany (1997); **F:** Jespersen and Tåning (1926)

Gonostoma atlanticum Norman, 1930 — Atlantic fangjaw

Habitat: oceanic, mesopelagic, between 50 and 1 350 m depth
Distribution: eastern Atlantic Ocean, from the Gulf of Guinea to Morocco. Absent from the Mediterranean Sea
Spawning season: August to September (northwestern Atlantic Ocean)

Meristic characters
Myomeres: 37-40
Vertebrae: 38
Dorsal fin: 16-18
Anal fin: 28-30



EGGS

Undescribed

YOLK–SAC LARVAE

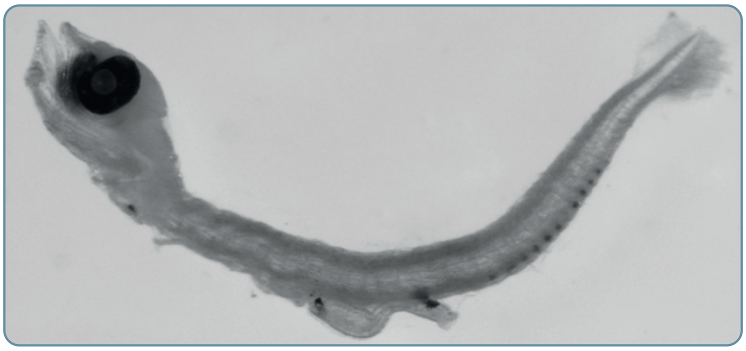
Undescribed

LARVAE — Figs. A-D

Body: slender; anal-fin origin anterior to dorsal-fin origin; pectoral fin forms on peduncle
Head: relatively small; mouth large and slightly oblique; forehead and snout convex; teeth on maxilla in larvae > 12.0 mm SL
Eye: oval and moderately large
Gut: tubular, forms a loop below gas bladder; terminal gut makes a right angle with body in early larvae; anus protruding
Preanus length: about 55-60% SL
Air bladder: present and large
Spination: none

Pigmentation: in early larvae, 5-13 melanophores along ventral tail region; a pair of ventral melanophores on gut, close to pectoral-fin base and two lateral, at beginning of gut loop: a melanophore on terminal gut; melanophores over gas bladder in larvae > 5.0 mm SL; sparse melanophores on caudal fin; in late larvae, add a row of melanophores along anal-fin base; a row of melanophores on each side of gut; some melanophores on caudal peduncle
Length at flexion: about 4.5-6.0 mm SL
Length at transformation: about 15.0-21.0 mm SL

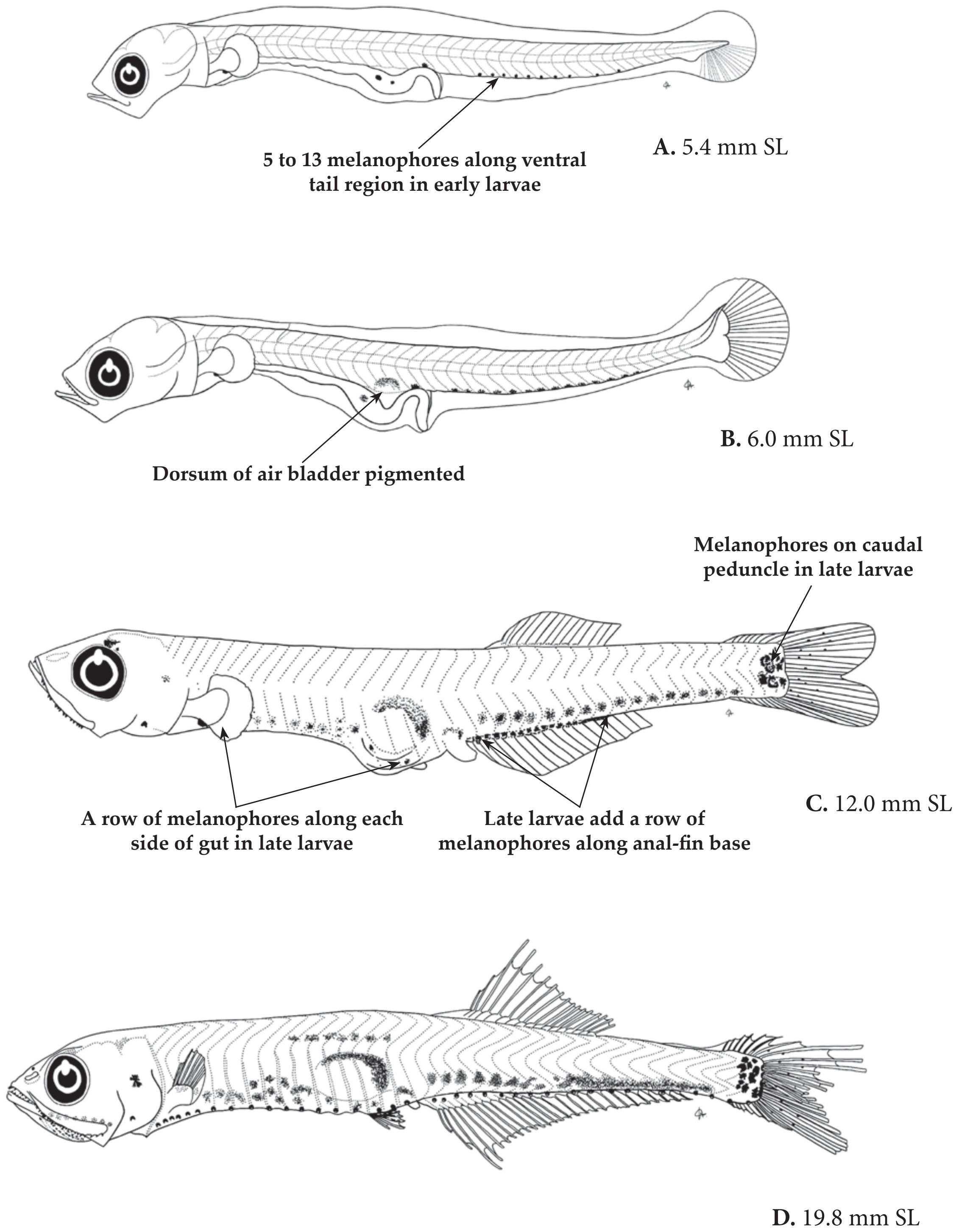
PHOTOS — by J.M. Rodriguez



4.7 mm SL

5.4 mm SL

Gonostoma atlanticum Norman, 1930



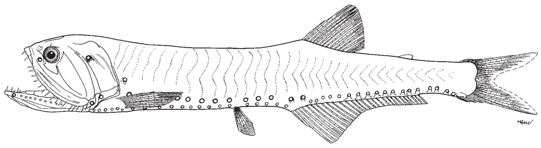
Literature: Ahlstrom (1974), Fahay (2007), Froese and Pauly (2022), Quéro *et al.* (1990a), Richards (2006e), Watson (1996a)

Illustrations' sources: A-D: L. Rodríguez (**A, B, D:** redrawn from Watson, 1996a; **C:** redrawn from Ahlstrom, 1974)

Gonostoma denudatum Rafinesque, 1810

Habitat: oceanic, mesopelagic, between 100 and 700 m depth
Distribution: Atlantic Ocean, from Angola to Portugal, and the Mediterranean Sea
Spawning season: unknown

Meristic characters
Myomeres: 38-39
Vertebrae: 39
Dorsal fin: 14-15
Anal fin: 28-30
Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

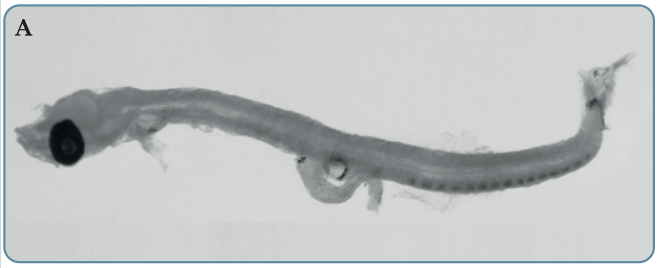
LARVAE

Figs. A-E

Body: slender; dorsal- and anal-fin origin at about the same level
Head: relatively small; mouth large and slightly oblique; snout relatively short
Eye: slightly oval, and moderately large
Gut: tubular, forms a loop under air bladder; anus protruding; terminal gut makes a right angle with body in early larvae
Preanus length: just > 50% SL
Air bladder: prominent
Spination: none
Pigmentation: early larvae, 0-2 melanophores on gut loop; a series of melanophores along ventral margin of tail; usually a large melanophore behind eye; dorsum of air bladder pigmented; a melanophore over terminal gut; late larvae add a series of melanophores along lower part of body, from pectoral fin to air bladder; a diagonal streak of pigment over caudal peduncle; two pairs of melanophores on dorsum, one under dorsal-fin base and another behind; a single dorsal melanophore posterior to head
Length at flexion: about 7.0 mm
Length at transformation: unknown

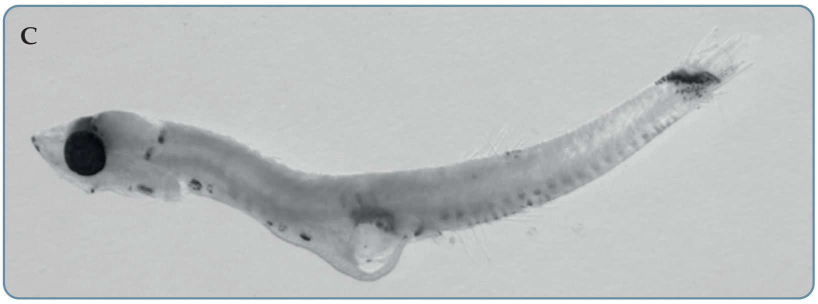
PHOTOS

A, B: J.M. Rodriguez; **C:** S. Isari



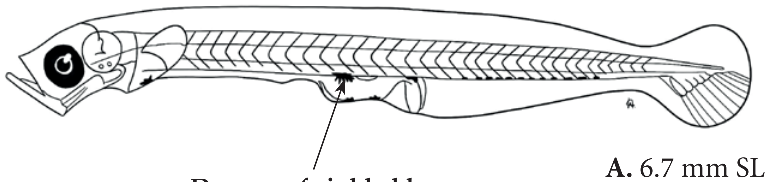
6.7 mm SL

6.9 mm SL

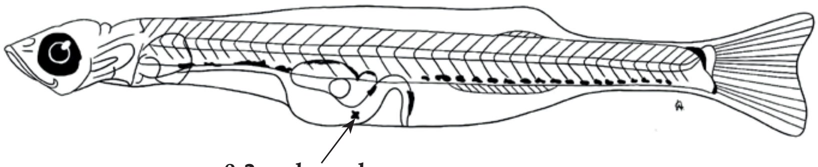


12.2 mm SL

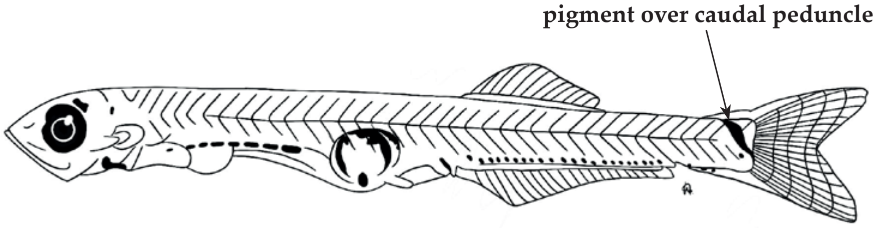
Gonostoma denudatum Rafinesque, 1810



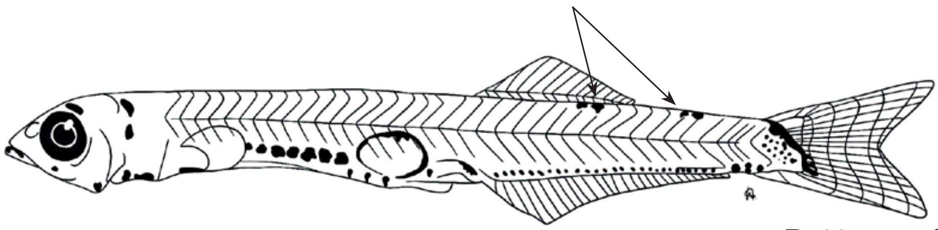
A. 6.7 mm SL



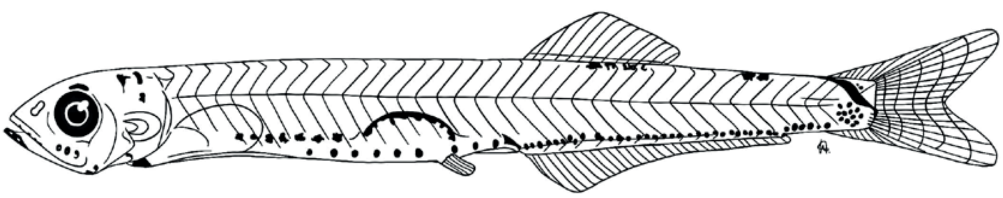
B. 10.5 mm SL



C. 18.5 mm SL



D. 20.7 mm SL



E. 24.5 mm SL

Literature: Ahlstrom *et al.* (1984), Fahay (2007), Froese and Pauly (2022), Sanzo (1931b)

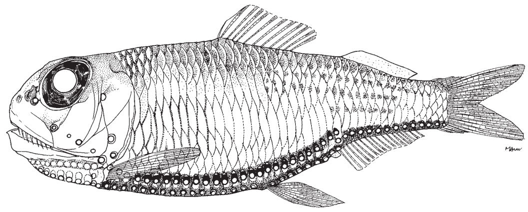
Illustrations' sources: A-E: L. Rodríguez (redrawn from Sanzo, 1931b)

PHOSICHTHYIDAE

Ichthyococcus ovatus (Cocco, 1838) — Lightfish

Habitat: oceanic, mesopelagic, between 0 and 750 m depth
Distribution: subtropical waters of the Atlantic Ocean and the Mediterranean Sea (uncommon north of the Gulf of Cadiz)
Spawning season: late spring and early summer

Meristic characters
Myomeres: 38-42
Vertebrae: 38-42
Dorsal fin: 11-12
Anal fin: 15-17
Adipose fin: present



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.80 mm
Perivitelline space: small
Yolk: segmented; unpigmented
Oil globules: single; diam. 0.24 mm
Colour: transparent

YOLK–SAC LARVAE

Undescribed

LARVAE — Figs. B-E

Body: elongate, slender, and rounded; dorsal and ventral margins of body almost parallel; lower pectoral-fin rays very elongate in early larvae; anal-fin origin well posterior to dorsal-fin origin; pelvic fin under dorsal-fin origin
Head: long; snout broad, depressed and pointed; mouth larger in early larvae
Eye: oval
Gut: tubular, slender and almost constant in diameter throughout its length, detached from body at its end, extending above anal fin

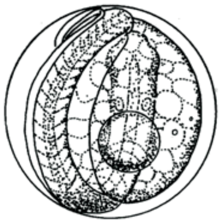
Preanus length: about 80% SL
Air bladder: absent
Spination: none
Pigmentation: melanophores distributed on miomeres below midline of body; a few spots on snout, on detached section of gut, and on caudal peduncle; pectoral fins pigmented
Length at flexion: unknown
Length at transformation: unknown

PHOTOS — by J.M. Rodriguez

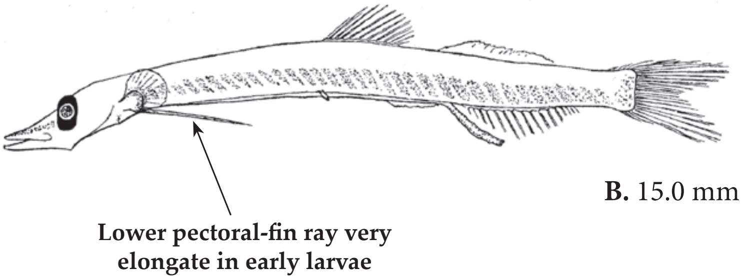
Not sized

STOMIIFORMES

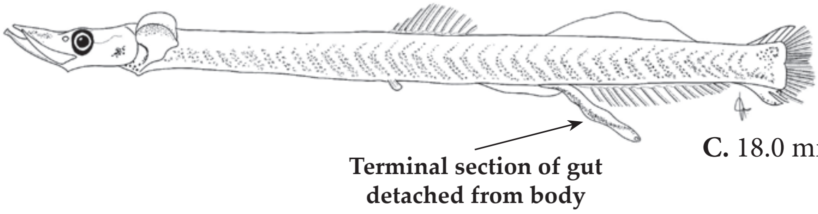
Ichthyococcus ovatus (Cocco, 1838)



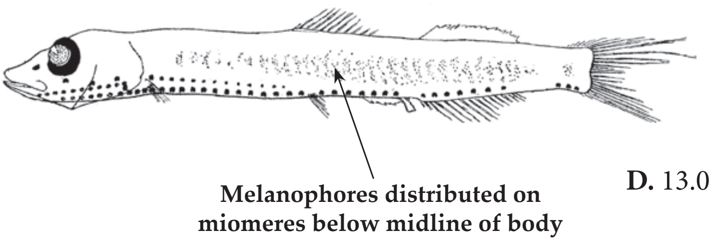
A.



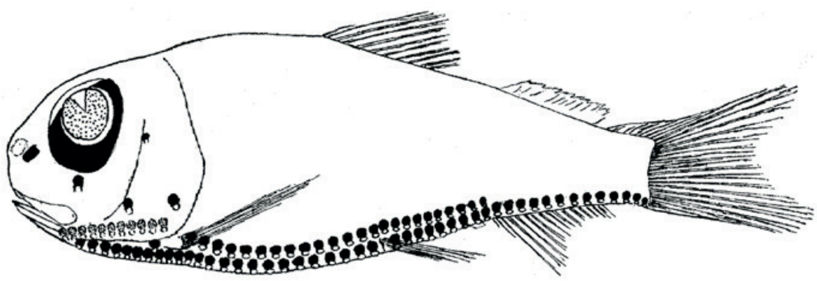
B. 15.0 mm SL



C. 18.0 mm SL



D. 13.0 mm SL



E. 20.0 mm SL

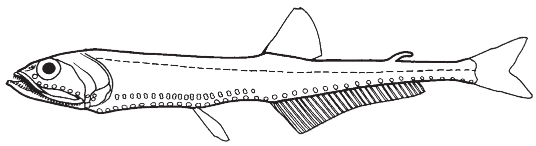
Literature: Badcock (1984b), Fahay (2007), Jespersen and Tåning (1926), Olivar and Fortuño (1991), Richards (2006f)

Illustrations' sources: A: Sanzo (1930); **B, D, E:** Jespersen and Tåning (1926); **C:** L. Rodríguez (redrawn from Ahlstrom *et al.*, 1984)

Pollichthys mauli (Poll, 1953) — Stareye lightfish

Habitat: oceanic, mesopelagic, between 100 and 500 m depth
Distribution: worldwide in tropical and subtropical waters. Eastern Atlantic, from 34°S to 60°N (absent from the Mediterranean Sea)
Spawning season: peaks in summer

Meristic characters
Myomeres: 40-44
Vertebrae: 40-44
Dorsal fin: 10-12
Anal fin: 25-26
Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE — Figs. A-F

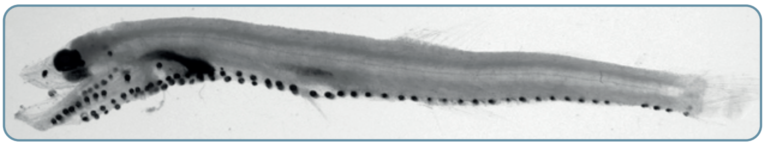
Body: very elongate and slender (clupeid shaped); anal fin located very posteriorly in early larvae, migrates forward to under dorsal fin in late larvae; pectoral fins pedunculated
Head: small and relatively depressed; mouth large; snout sharply pointed; teeth appear on maxilla at 3.5 mm SL
Eye: oval, slightly directed forward, with ventral mass of choroid tissue, becomes rounded with development
Gut: tube-like, very elongate, and straight

Preanus length: increases with development from 80% SL in early larvae to 88% SL in late larvae
Air bladder: small in early larvae, visible at 5.0 mm SL, just behind mid-body
Spination: none
Pigmentation: none until transformation*
Length at flexion: 3.6-7.0 mm SL
Length at transformation: 16.0-18.0 mm SL

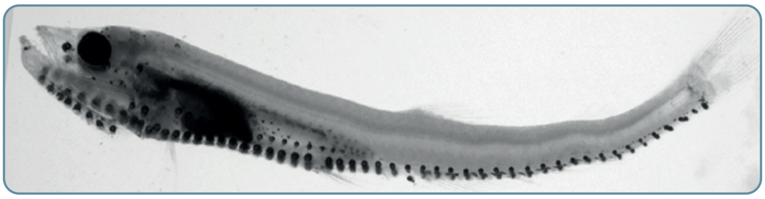
*Some early larvae collected in the Eastern Atlantic Ocean have the dorsum of the air bladder pigmented

PHOTOS — by S. Isari

18.5 mm SL

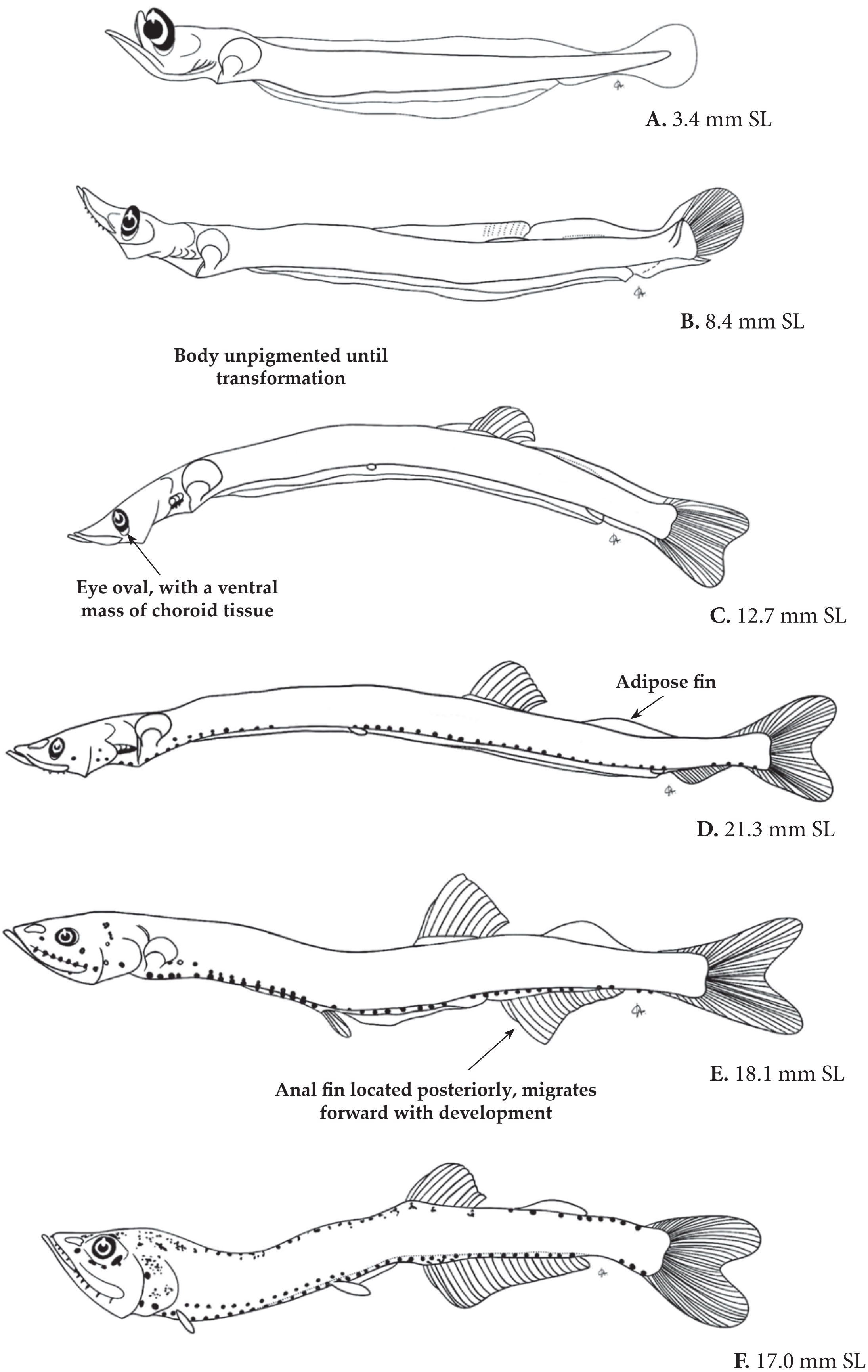


19.0 mm SL



20.0 mm SL

Pollichthys mauli (Poll, 1953)



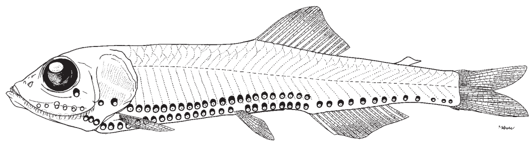
Literature: Badcock (1984b), Fahay (2007), Ozawa (1976), Quéro *et al.* (1990b), Richards (2001, 2006f)

Illustrations' sources: A-F: L. Rodríguez (redrawn from Ozawa, 1976)

Vinciguerria attenuata (Cocco, 1838) — Silvery lightfish

Habitat: oceanic, meso- to bathypelagic, between 100 and 2 000 m depth
Distribution: worldwide in tropical to temperate waters
Spawning season: spring to summer (Mediterranean Sea)

Meristic characters
Myomeres: 40-41
Vertebrae: 40-41
Dorsal fin: 13-15
Anal fin: 14-16



EGGS

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.84-0.92 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: one; diam. 0.18-0.20 mm; unpigmented
Colour: transparent

YOLK–SAC LARVAE

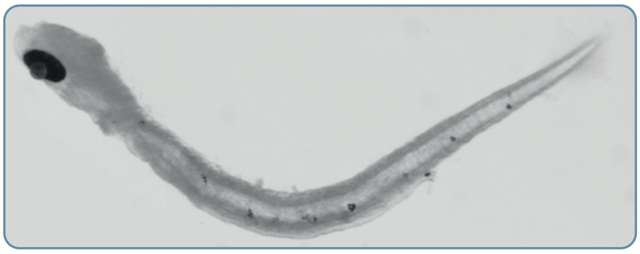
Undescribed

LARVAE — Figs. A-F

Body: very elongate and slender (clupeid shaped); body depth does not exceed 6-9% of body length; anal-fin origin located under 5th-6th dorsal-fin ray (middle), both fins located at level of anus
Head: relatively elongated; mouth large; snout flattened and concave; thin teeth appear in early larvae
Eye: oval and semi-stalked
Gut: tube-like, elongate, forming a small curve above air bladder
Preanus length: about 75% SL, decreases throughout development
Air bladder: not present in early larvae, prominent in late larvae, located at about mid-body
Spination: none
Pigmentation: 6-8 stellate melanophores on both sides of body in larvae < 6.0 mm SL; dorsum of airbladder pigmented; median caudal spot, prominent in late larvae; there may be a melanophore on terminal gut
Length at flexion: unknown
Length at transformation: unknown

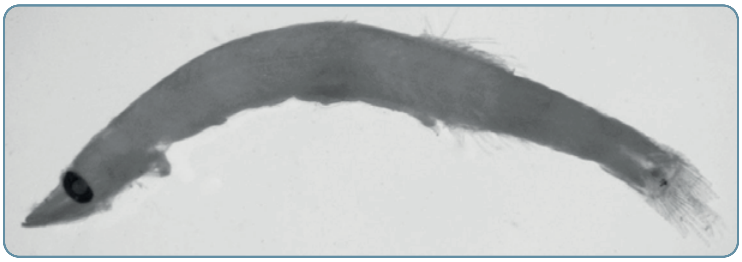
Remarks: adipose fin present in late larvae

PHOTOS — by J.M. Rodriguez



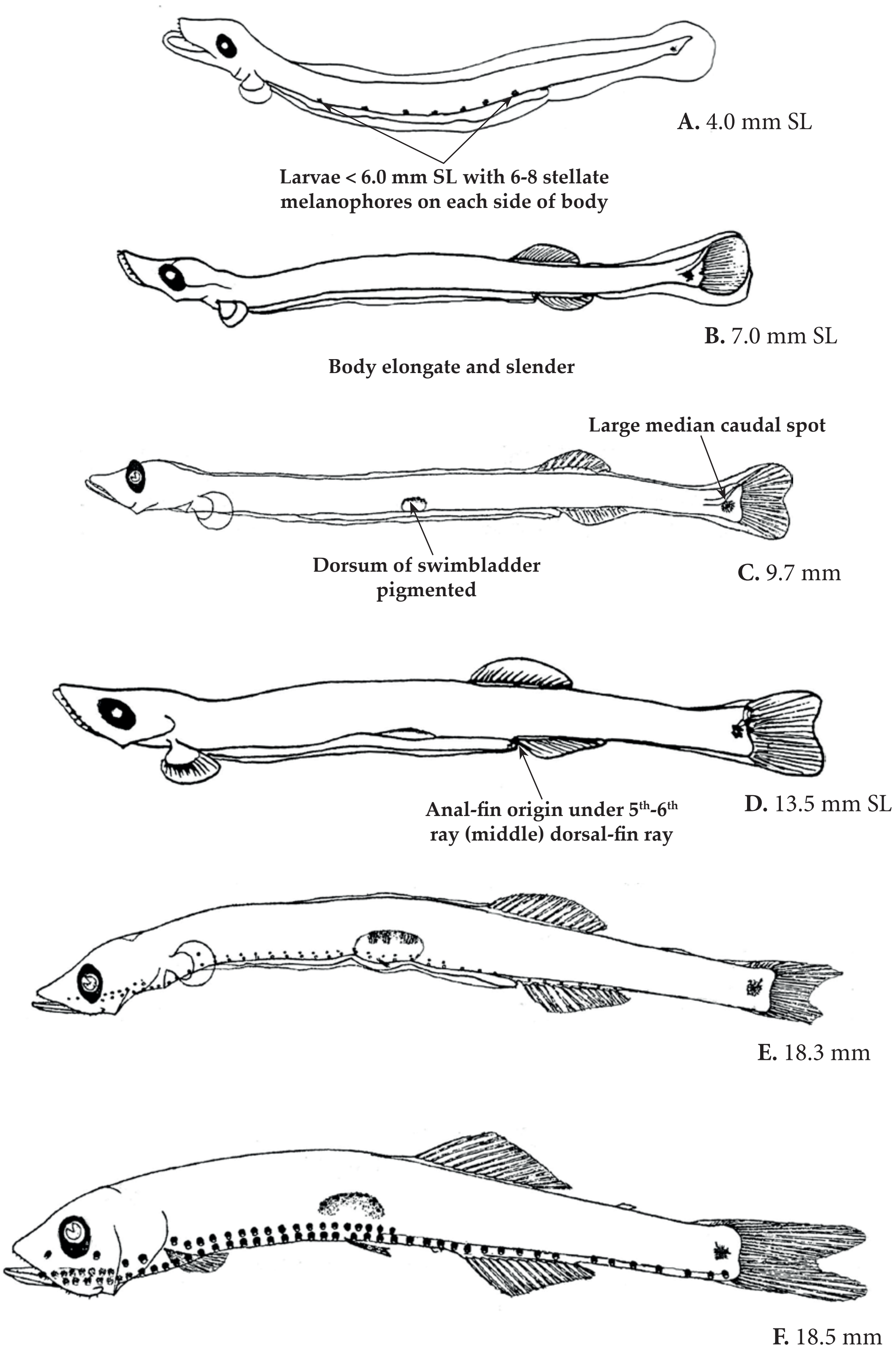
4.6 mm SL

7.1 mm SL



12.0 mm SL

Vinciguerria attenuata (Cocco, 1838)



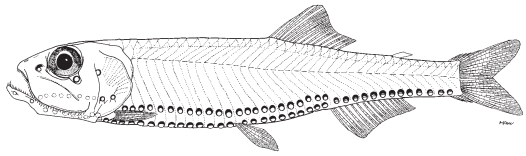
Literature: Badcock (1984b), Fahay (2007), Gorbunova (1981), Jespersen and Tåning (1926), Olivar and Fortuño (1991), Sanzo (1935)

Illustrations' sources: A, B, D: Alemany (1997); **C, E, F:** Jespersen and Tåning (1926)

Vinciguerria nimbaria (Jordan and Williams, 1895) — Oceanic lightfish

Habitat: oceanic, mesopelagic, between 100 and 400 m depth
Distribution: worldwide in tropical to temperate waters. Eastern Atlantic, from the tropical region to 42°N, (absent from the Mediterranean Sea)
Spawning season: year-round (western Atlantic Ocean)

Meristic characters
Myomeres: 40-42
Vertebrae: 40-42
Dorsal fin: 13-14
Anal fin: 13-15
Adipose fin: present



EGGS — Fig. A

Habitat: pelagic
Shape: round
Chorion: smooth; diam. 0.70-0.75 mm
Perivitelline space: small
Yolk: segmented; unpigmented
Oil globules: none
Colour: transparent

YOLK–SAC LARVAE — Fig. B

Hatch size: about 1.4 mm
Body: elongate and slender (clupeid shape)
Yolk sac: very elongated
Anus: close behind yolk sac, reaches finfold border
Preanus length: about 67% SL
Pigmentation: ventro-lateral row of about 14 melanophores

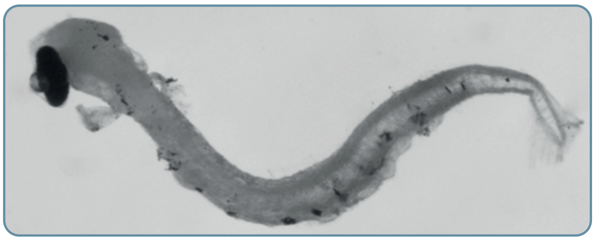
LARVAE — Figs. C-G

Body: elongate and slender (clupeid shaped); anal-fin origin under 11th dorsal-fin ray, both fins located at level of anus
Head: large; mouth large; snout pointed; occiput and snout concave
Eye: oval and semi-stalked
Gut: tube-like, elongated and straight
Preanus length: > 70% SL, decreases during development
Air bladder: not present in early larvae, small in late larvae, located at about mid-body

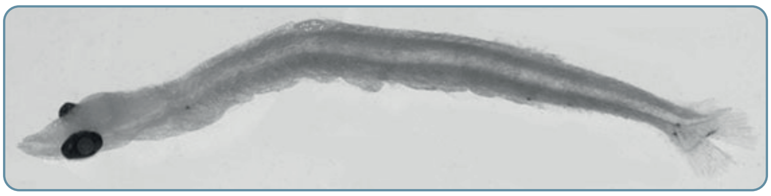
Spination: none
Pigmentation: early larvae, ventro-lateral row of about 14 melanophores; some melanophores over head; late larvae, a large melanophore ventrally on caudal peduncle; 2-3 melanophores over anal fin; base of caudal fin pigmented
Length at flexion: unknown
Length at transformation: unknown

Remarks: adipose fin present in late larvae

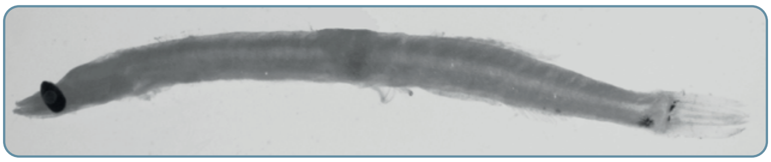
PHOTOS — by J.M. Rodriguez



3.0 mm SL

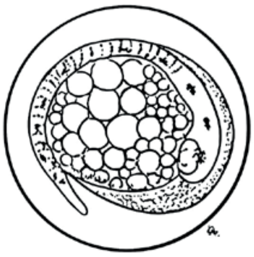


6.6 mm SL

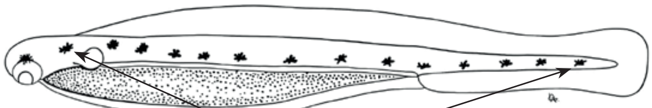


10.1 mm SL

Vinciguerria nimbaria (Jordan and Williams, 1895)

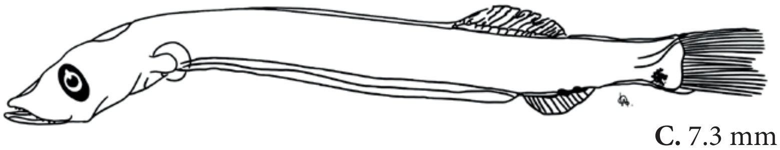


A.

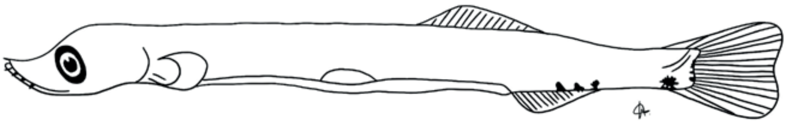


Ventro-lateral row of about 14 melanophores in yolk-sac and early larvae

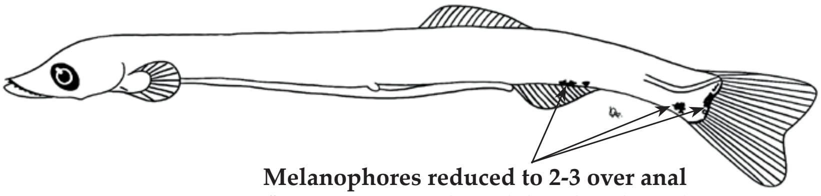
B. 1.4 mm SL



C. 7.3 mm SL

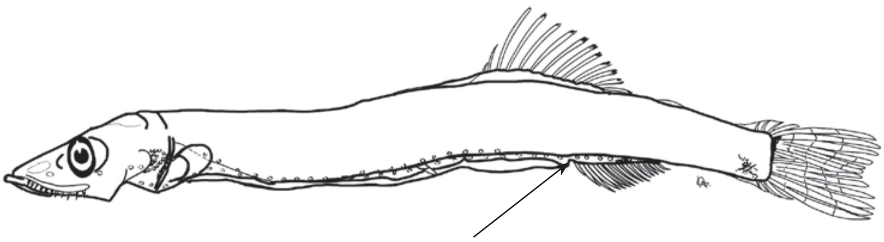


D. 8.5 mm SL



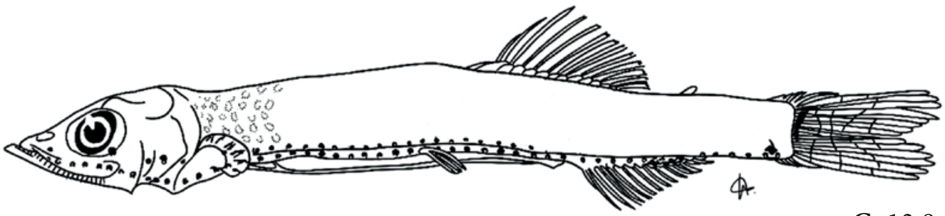
Melanophores reduced to 2-3 over anal fin, one at ventral caudal peduncle and another on caudal fin base

E. 12.1 mm SL



Anal-fin origin under 11th dorsal-fin ray

F. 13.5 mm SL



G. 13.9 mm SL

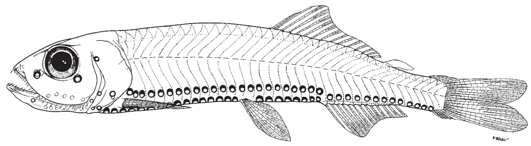
Literature: Badcock (1984b), Fahay (2007), Gorbunova (1968, 1981), Olivar and Fortuño (1991), Quéro *et al* (1990b), Richards (2006f), Rudometkina (1975)

Illustrations' sources: A-G: L. Rodríguez (**A, B:** redrawn from Gorbunova, 1968; **C:** redrawn from Jespersen and Tåning, 1926; **D, E:** redrawn from Gorbunova 1981; **F, G:** redrawn from Okiyama, 1988)

Vincigurria poweriae (Cocco, 1838) — Power's deep-water bristle-mouth fish

Habitat: oceanic, mesopelagic, between 30 and 600 m depth
Distribution: worldwide in tropical to temperate waters, including the Mediterranean Sea. Eastern Atlantic, from Cape Verde to Portugal
Spawning season: peaks in spring and summer

Meristic characters
Myomeres: 38-39
Vertebrae: 38-39
Dorsal fin: 13-15
Anal fin: 12-14
Adipose fin: present



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.76-0.83 mm
Perivitelline space: small
Yolk: unsegmented; unpigmented
Oil globules: one; diam. 0.18-0.20 mm (*V. attenuata*); pigmented
Colour: transparent

YOLK–SAC LARVAE

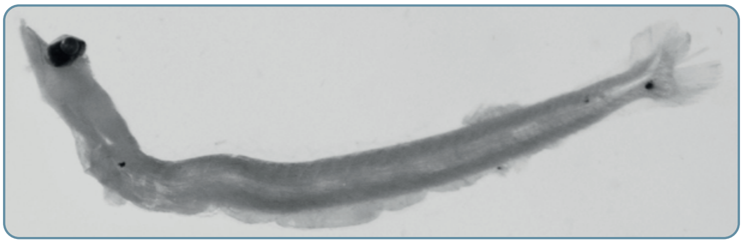
Undescribed

LARVAE — Figs. B-F

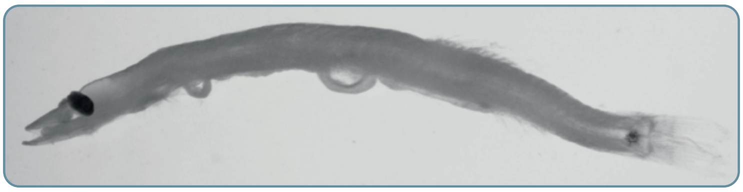
Body: very elongate and slender (clupeid shaped); anal-fin origin under 9th-11th dorsal-fin ray, both fins located at level of anus
Head: relatively elongate; mouth large; snout pointed; occiput and snout concave; head length increases with development
Eye: oval and semi-stalked
Gut: tube-like, elongated, and straight
Preanus length: > 70% SL in early larvae, decreases with development

Air bladder: absent in early larvae, small in late larvae, located at about mid-body
Spination: none
Pigmentation: only a spot at midline of caudal peduncle, on each side of body; air bladder unpigmented
Length at flexion: unknown
Length at transformation: unknown

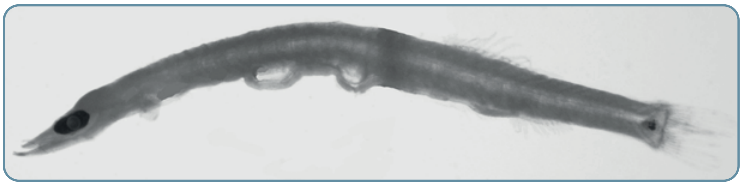
PHOTOS — by J.M. Rodriguez



7.1 mm SL

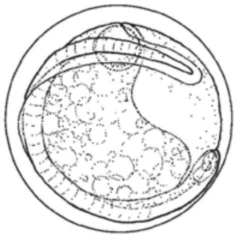


10.2 mm SL



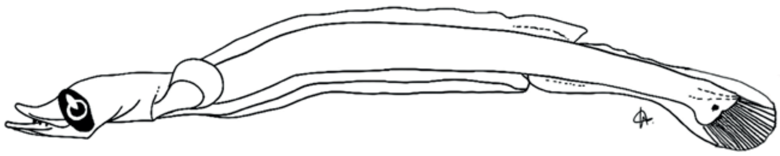
11.0 mm SL

Vinciguerria poweriae (Cocco, 1838)

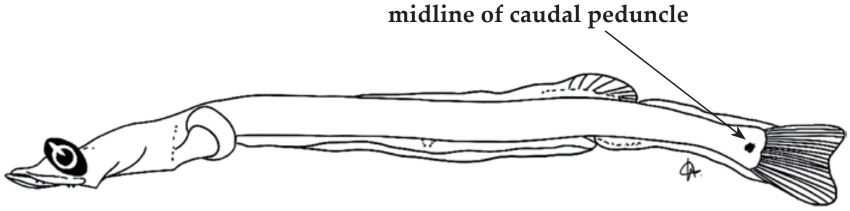


A.

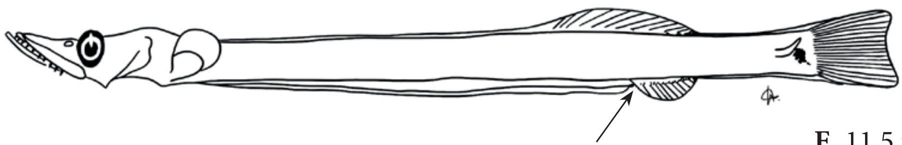
B. 5.0 mm SL



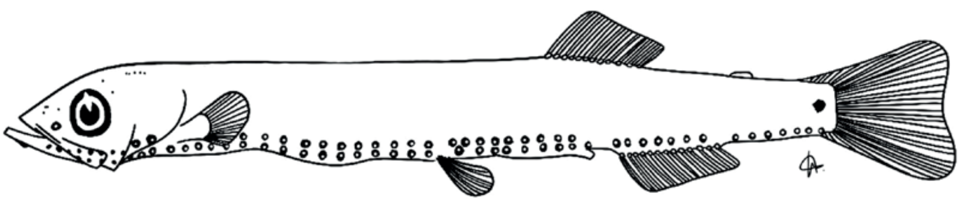
C. 6.6 mm SL



D. 10.1 mm SL



E. 11.5 mm SL



F. 22.5 mm SL

Literature: Ahlstrom and Counts (1958), Badcock (1984b), Fahay (2007), Gorbunova (1981), Jespersen and Tåning (1926), Olivar and Fortuño (1991), Quéro *et al.* (1990b), Richards (2006f), Sanzo (1935), Watson (1996b)

Illustrations' sources: A: Ahlstrom and Counts (1958), **B-F:** L. Rodriguez (**B-D:** redrawn from Watson, 1996; **E, F:** redrawn from Ahlstrom *et al.*, 1984)

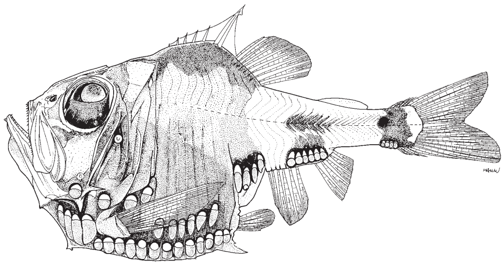
STERNOPTYCHIDAE

Argyropelecus hemigymnus Cocco, 1829

Half–naked hatchetfish

Habitat: oceanic, mesopelagic, between 100 and 800 m depth
Distribution: eastern Atlantic Ocean, from South Africa to north of the British Isles, and the western Mediterranean Sea
Spawning season: throughout the year

Meristic characters
Myomeres: 38-39
Vertebrae: 36-41
Dorsal fin: 8-9
Anal fin: 11-12



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth with inner membrane; diam. 0.92-1.04 mm
Perivitelline space: small
Yolk: segmented; unpigmented
Oil globules: one; diam. 0.26-0.28 mm; unpigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

Hatch size: about 2.5 mm
Body: elongate
Yolk sac: large, ovoid, projected beyond snout
Oil globule location: at ventral side of yolk sac
Anus: detached from yolk sac, reaches border of finfold
Preanus length: about 50% SL
Pigmentation: unpigmented

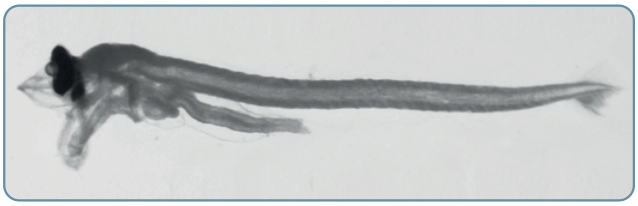
LARVAE — Figs. C-F

Body: very elongate and slender in early larvae, suffers a strong shrinkage during transformation (especially anterior part of body), gut shortens, and head deepens
Head: large with blunt snout; mouth large, extending to middle of eye
Eye: oval and narrow in early larvae, becomes slightly telescopic and directed dorsally in late larvae
Gut: swollen and detached from body
Preanus length: about 50% SL in larvae between 4.0 and 9.0 mm, becoming shorter throughout development
Air bladder: present in late larvae
Spination: none
Pigmentation: unpigmented before flexion; in later larvae, stomach, frontal areas next to eyes, opercle below eye and air bladder pigmented; subsequently pigment increases on head and gut area
Length at flexion: between 10.0 and 11.0 mm
Length at transformation: 7.8-12.0 mm

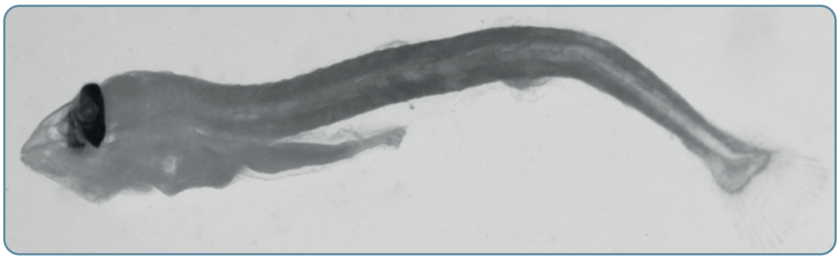
PHOTOS

by J.M. Rodriguez

4.3 mm SL



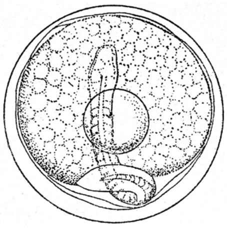
6.2 mm SL



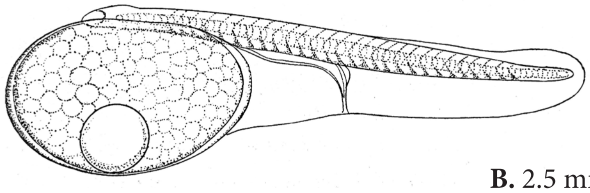
8.8 mm SL

STOMIIFORMES

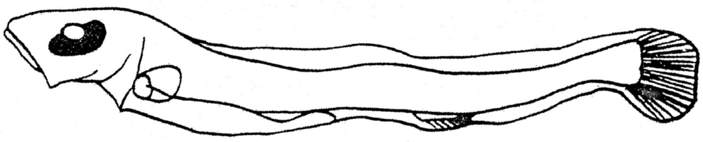
Argyropelecus hemigymnus Cocco, 1829



A.

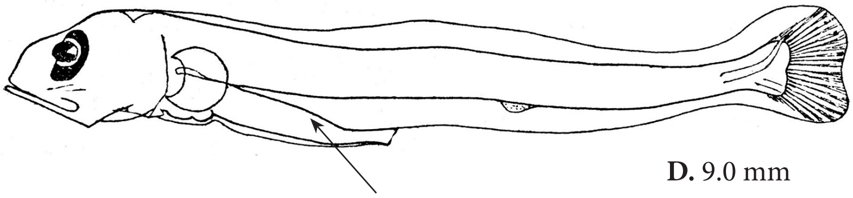


B. 2.5 mm



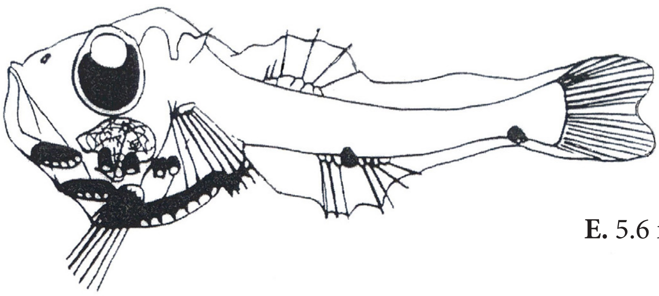
Body unpigmented in preflexion stage

C. 6.9 mm SL

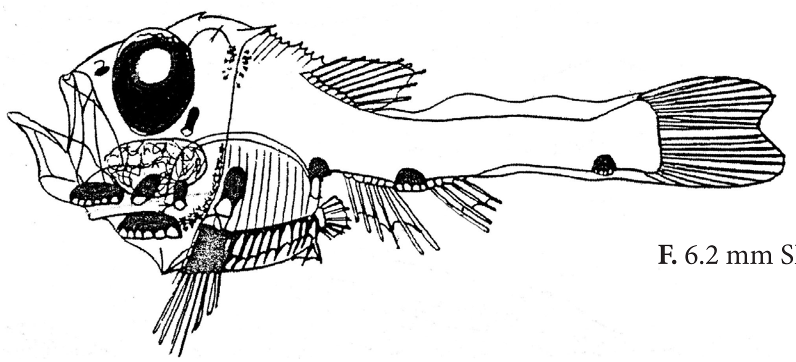


D. 9.0 mm

Gut detached from body



E. 5.6 mm SL



F. 6.2 mm SL

Literature: Badcock (1984c), Belianina (1984), Fahay (2007), Froese and Pauly (2022), Olivar and Fortuño (1991), Richards (2006h), Sanzo (1931b)

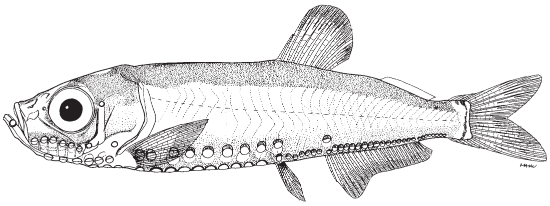
Illustrations' sources: A, B: Sanzo (1931b); **C, E, F:** Alemany (1997); **D:** Jespersen and Tåning (1926)

STERNOPTYCHIDAE

Maurolicus muelleri (Gmelin, 1789) — Silvery lightfish

Habitat: oceanic, mesopelagic, between 10 and 400 m depth
Distribution: Atlantic Ocean; eastern Atlantic Ocean, from Senegal to Norway, and the Mediterranean Sea
Spawning season: throughout the year

Meristic characters
Myomeres: 33-35
Vertebrae: 33-35
Dorsal fin: 10-11
Anal fin: 19-22



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: ornamented with hexagonal sculptures; diam. 1.30-1.53 mm
Perivitelline space: small
Yolk: segmented; unpigmented
Oil globules: one; diam. 0.24-0.28 mm; unpigmented
Colour: transparent

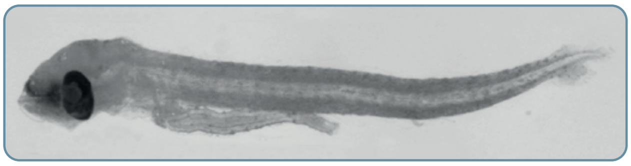
YOLK–SAC LARVAE — Fig. B

Hatch size: 3.0 mm
Body: relatively elongate and slender
Yolk sac: oval, very large; projected beyond snout
Oil globule location: at ventral side of yolk sac
Anus: detached from yolk sac, reaches border of finfold
Preanus length: 60% SL
Pigmentation: unpigmented

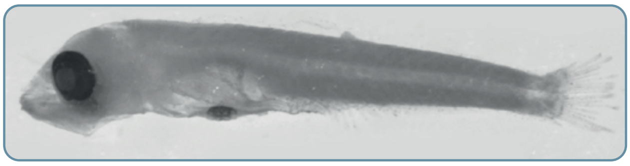
LARVAE — Figs. C-F

Body: elongate and slender
Head: relatively large; mouth large, reaching posterior edge of eye in pre-transformation larvae
Eye: oval, becoming round in late larvae
Gut: tube-like, elongate, forming a small curve over air bladder
Preanus length: about 50% SL
Air bladder: prominent, located at about middle of gut
Spination: none
Pigmentation: early larvae unpigmented; pigmentation limited to dorsum of air bladder (and photophores) in late larvae; Atlantic specimens may have a row of 4-10 melanophores along anal-fin base
Length at flexion: 4.0-6.0 mm
Length at transformation: attained at 13.0-14.0 mm

PHOTOS — by J.M. Rodriguez

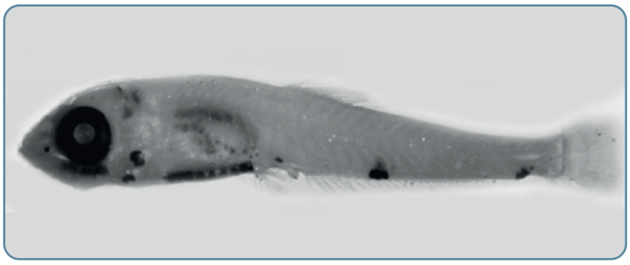


4.3 mm SL



7.6 mm SL

6.5 mm SL

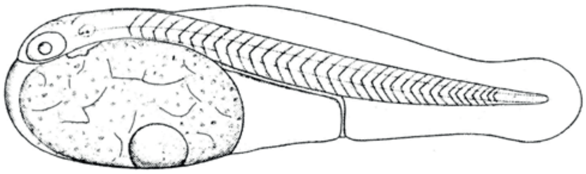


10.5 mm SL

STOMIIFORMES

Maurolicus muelleri (Gmelin, 1789)

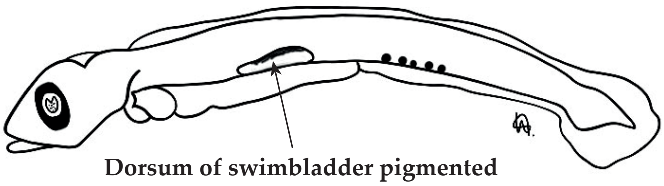
A.



B. 3.0 mm

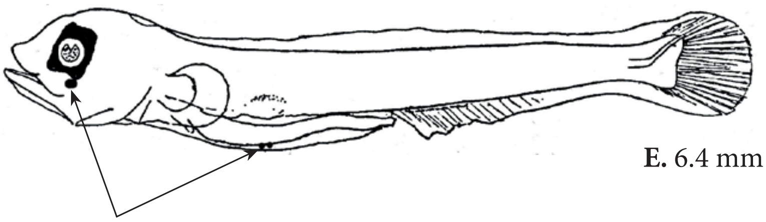
C. 2.9 mm SL

Early larvae unpigmented



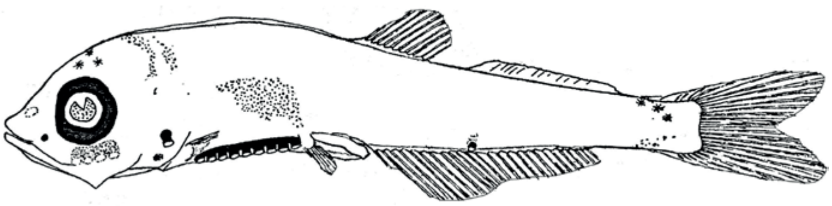
Dorsum of swimbladder pigmented

D. 5.8 mm SL



E. 6.4 mm SL

At about 6 mm SL, a photophore under eye and 2 in ventral region, at level of swimbladder



F. 10.0 mm SL

Literature: Badcock (1984c), Fahay (1983), Jespersen and Tåning (1926), Sanzo (1935)

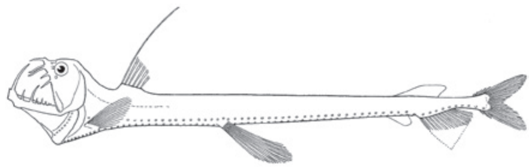
Illustrations' sources: A, B: Sanzo (1935); **C, D:** L. Rodríguez (**C:** redrawn from Alemany, 1997; **D:** redrawn from Halbeisen, 1988); **E, F:** Jespersen and Tåning (1926)

STOMIIDAE

Chauliodus sloani Schneider, 1801 — Sloane's viperfish

Habitat: oceanic, from near the surface (at night) to 1 800 m depth
Distribution: warm and temperate waters of the Atlantic, Pacific and Indian oceans, and the Mediterranean Sea
Spawning season: all year round, peaking in late winter and early spring

Meristic characters
Myomeres: 54-62
Vertebrae: 54-62
Dorsal fin: 5-7
Anal fin: 10-13
Adipose fin: dorsal and anal



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth, double membrane; diam. 2.24-2.52 mm
Perivitelline space: small
Yolk: segmented; unpigmented
Oil globules: none
Colour: transparent

YOLK–SAC LARVAE — Fig. B

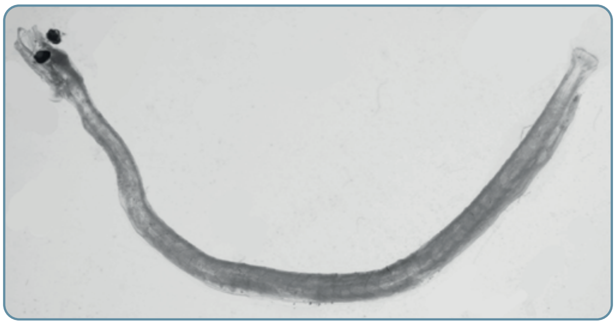
Hatch size: about 7.2 mm
Body: very elongate and slender
Yolk sac: very elongate
Anus: slightly behind yolk sac, reaches finfold border
Preanus length: about 90% SL
Pigmentation: reduced to caudal region of finfold

LARVAE — Figs. C-E

Body: very elongate and slender; body depth about 8% SL; remains of preanal finfold still present after transformation; dorsal fin located anterior to pelvic fins; pelvic fins located slightly anterior to mid-body; ventral adipose fin located before anal fin
Head: small, relatively short and somewhat tilted down; snout pointed; mouth terminal and relatively large
Eye: oval, small
Gut: straight, tube-like
Preanus length: about 90% SL
Air bladder: absent
Spination: none
Pigmentation: very little pigment or none until transformation
Length at flexion: unknown
Length at transformation: 44.0 mm SL (transformation involves shrinkage from about 44.0 mm SL to about 27.0 mm SL)

PHOTOS — by J.M. Rodriguez

16.2 mm SL

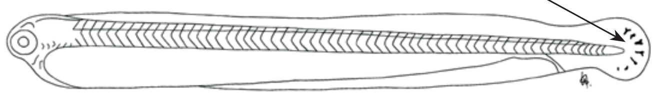


18.3 mm SL

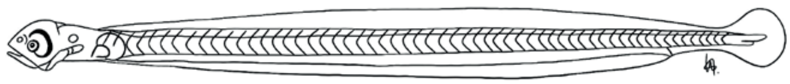
STOMIIFORMES

Chauliodus sloani Schneider, 1801

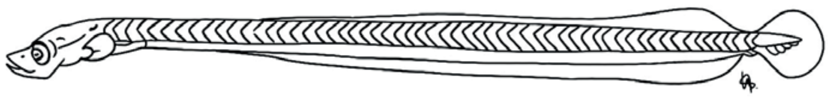
A.



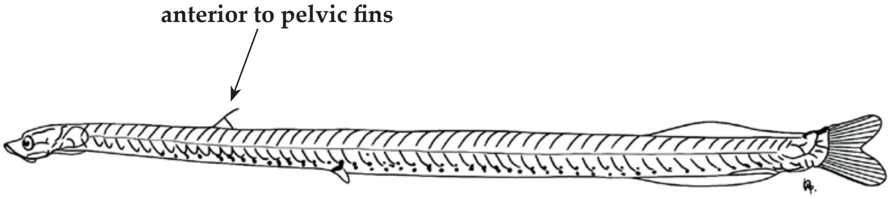
B. 7.2 mm SL



C. 8.7 mm SL



D. 14.0 mm SL



E. 41.6 mm SL

Literature: Fahay (2007), Gibbs (1984a), Richards (2006b), Sanzo (1931c)

Illustrations' sources: A-E: L. Rodriguez (redrawn from Sanzo, 1931c)

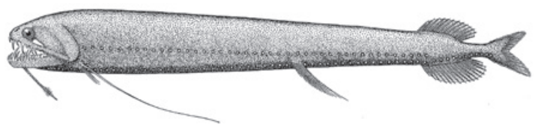
STOMIIDAE

Echiostoma barbatum Lowe, 1843

Threadfin dragonfish

Habitat: oceanic, mesopelagic, from 30 to more than 1 900 m depth
Distribution: worldwide in tropical and subtropical waters. Eastern Atlantic, from South Africa to Portugal, except the Gulf of Guinea (absent from the Mediterranean Sea)
Spawning season: unknown

Meristic characters
Myomeres: about 57-69
Vertebrae: 57-59
Dorsal fin: 11-14
Anal fin: 13-19



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

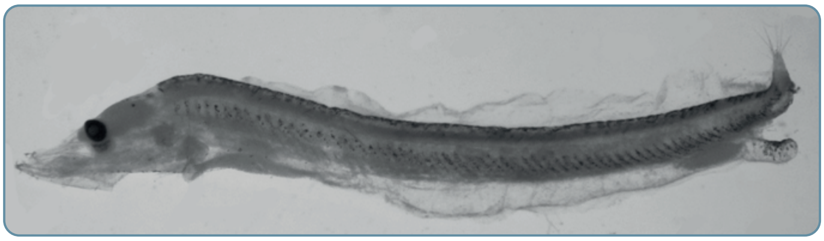
Figs. A-C

Body: elongate and slender; dorsal and anal fins opposite, far posterior on body; pectoral fins present from early larvae on; well-developed dorsal finfold present, even after transformation
Head: large and depressed (duck-billed shaped in early larvae)
Eye: slightly oval, becomes smaller and relatively round with development
Gut: voluminous, very elongate; terminal gut well developed and detached from body, over anal fin
Preanus length: > 90% SL
Air bladder: none

Spination: none
Pigmentation: parallel rows of melanophores along dorsum of body (one per myomere) and on ventro-lateral sides of body (1-5 per myoseptum); a patch of melanophores on dorsal surface of terminal gut; melanophores on top of head, on isthmus and on edge of dorsal finfold (early larvae); scattered melanophores on lower lobe of caudal fin
Length at flexion: about 8.0 mm
Length at transformation: unknown

PHOTOS

by S. Isari

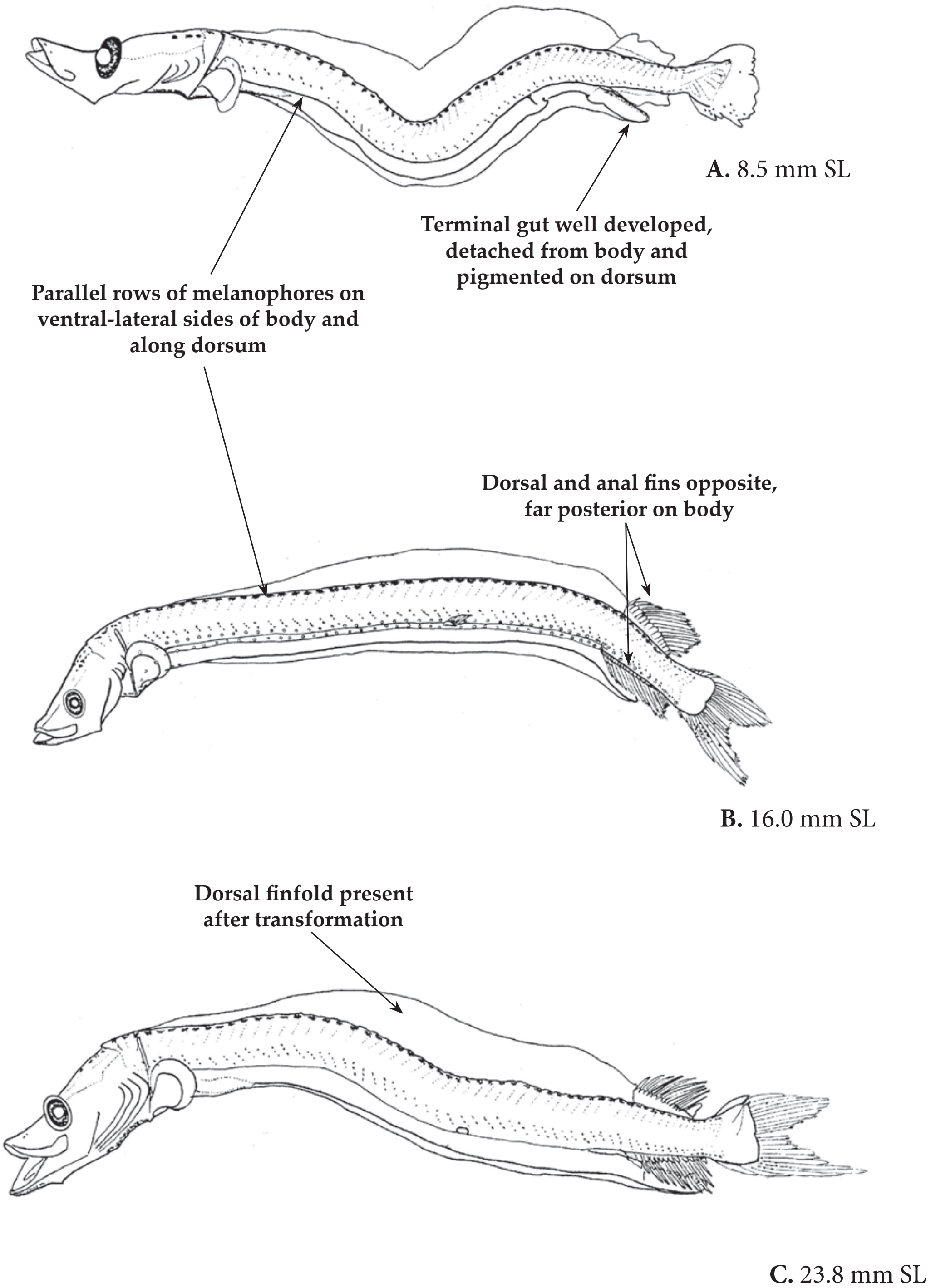


16.0 mm SL

16.0 mm SL (dorsal view)

STOMIIFORMES

Echiostoma barbatum Lowe, 1843



Literature: Fahay (2007), Gibbs (1984b), Gibbs and Barnett (1990)

Illustrations' sources: A-C: Ozawa and Aono (1986)

STOMIIDAE

Photostomias guernei Collett, 1889

Habitat: oceanic, bathypelagic, from 1 100 to 3 100 m depth
Distribution: temperate and subtropical waters of the Atlantic, Pacific and Indian oceans. Eastern Atlantic from 3°58′N to southern Portugal (absent from the Mediterranean Sea)
Spawning season: unknown

Meristic characters
Myomeres: about 52-58
Vertebrae: 52-58
Dorsal fin: 22-29
Anal fin: 25-33

EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

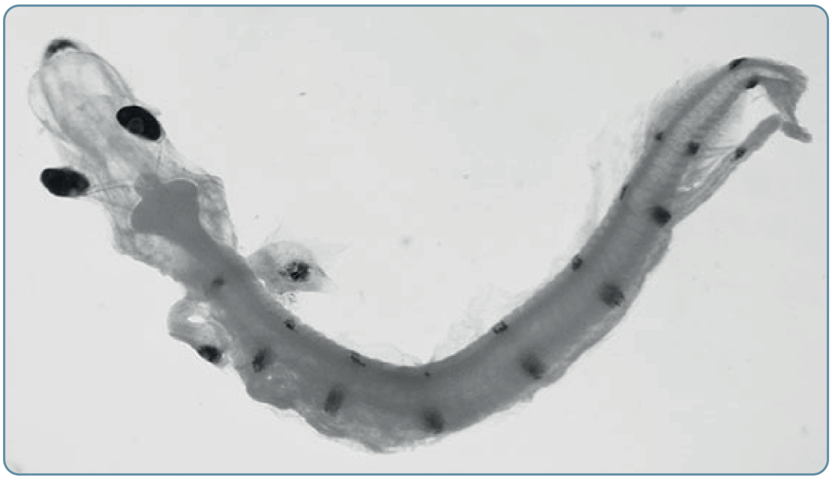
LARVAE

Figs. A-B

Body: elongate and slender; dorsal and anal fins opposite, far posterior on body; pectoral fins present from early larvae on; finfold well developed, present even in late larvae
Head: elongate and depressed; snout pointed; mouth oblique and large; lower jaw slightly protruding
Eye: small and oval, stands out above head
Gut: foregut voluminous in early larvae; terminal gut tube-like, elongated and detached from body, below caudal fin
Preanus length: > 100% SL in late larvae (gut can extend beyond last vertebra)
Air bladder: none
Spination: none
Pigmentation: opposite series of prominent spots along dorsal and ventral margins of body; tip of lower jaw pigmented; a prominent melanophore on pectoral-fin base; melanophores on trailing section of gut in late larvae
Length at flexion: unknown
Length at transformation: 30.0 mm SL

PHOTOS

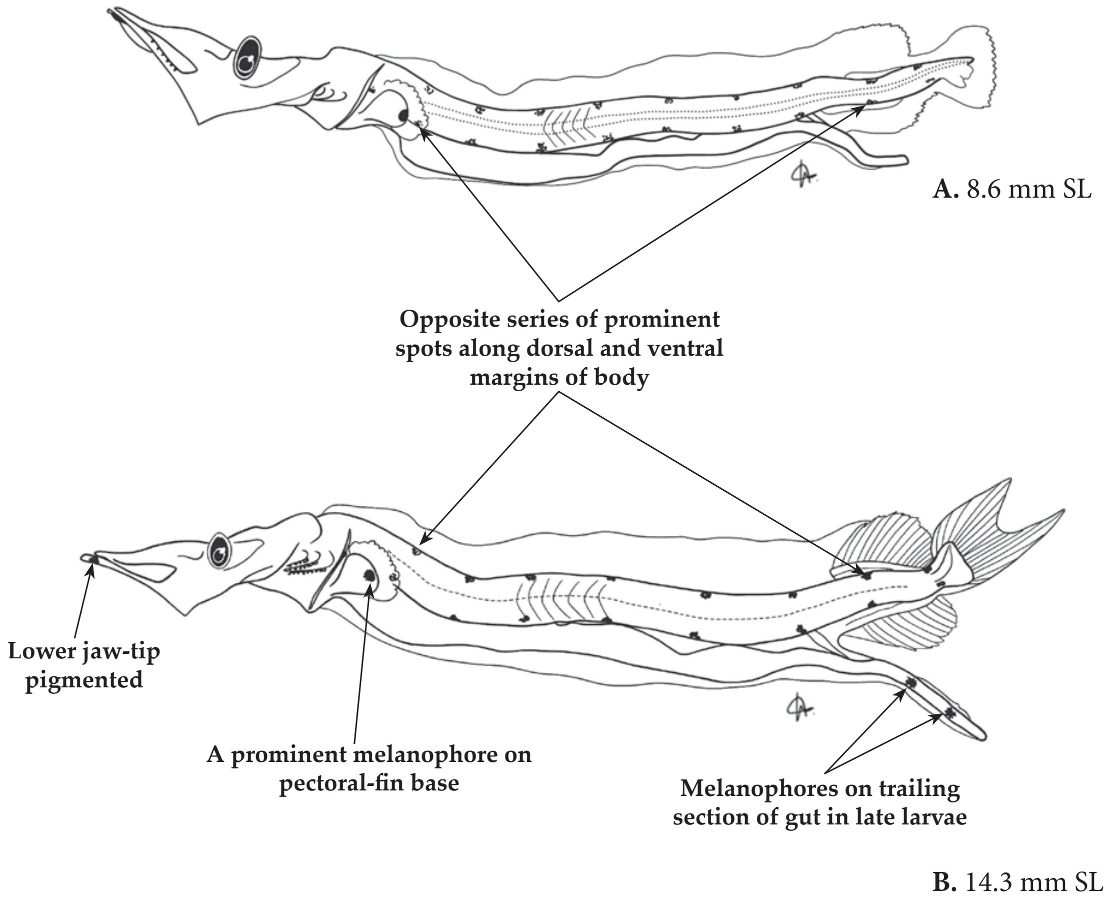
by J.M. Rodriguez



11.6 mm SL

STOMIIFORMES

Photostomias guernei Collett, 1889



Literature: Fahay (2007), Gibbs (1984b), Froese and Pauly (2022), Kenaley and Hartel (2005)

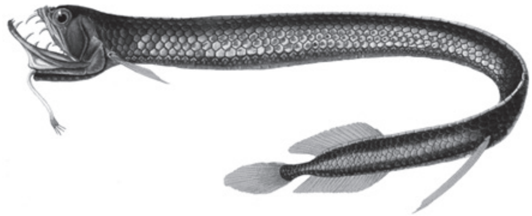
Illustrations' sources: A, B: L. Rodríguez (redrawn from Okiyama, 1988)

STOMIIDAE

Stomias boa (Risso, 1810) — Boa dragonfish

Habitat: oceanic, mesopelagic, to more than 1 000 m depth
Distribution: Atlantic Ocean, eastern Atlantic between 20°N and 65°N, and the western Mediterranean Sea
Spawning season: probably all year round

Meristic characters
Myomeres: 78
Vertebrae: 78
Dorsal fin: 17-22
Anal fin: 18-22



EGGS

Undescribed

YOLK–SAC LARVAE

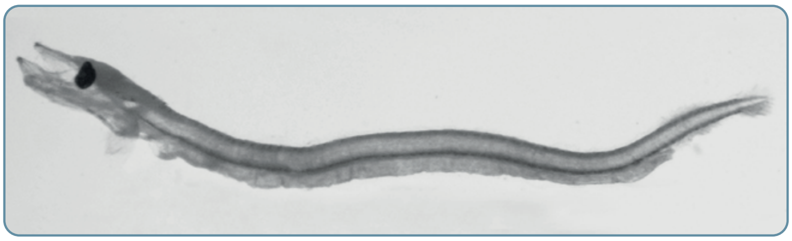
Undescribed

LARVAE — Figs. A-F

Body: very elongate and slender; dorsal and anal fins far posterior on body; pectoral fins present from early larvae on; pelvic fins absent
Head: long with prominent jaws (duck-billed shape); lower jaw forms a sharply marked angle
Eye: oval and small
Gut: tube-like, very elongate and slightly trailing; terminal section slightly detached from body
Preanus length: about 87-90% SL
Air bladder: absent
Spination: none
Pigmentation: row of small melanophores over gut, between pectoral and caudal–fin base; some melanophores appear in dorsal–caudal region in larvae of about 6.0 mm SL, extending forward during development; dorsal and ventral series of melanophores disappear in late larvae
Length at flexion: unknown
Length at transformation: about 44.0 mm

PHOTOS — by J.M. Rodriguez

6.0 mm SL

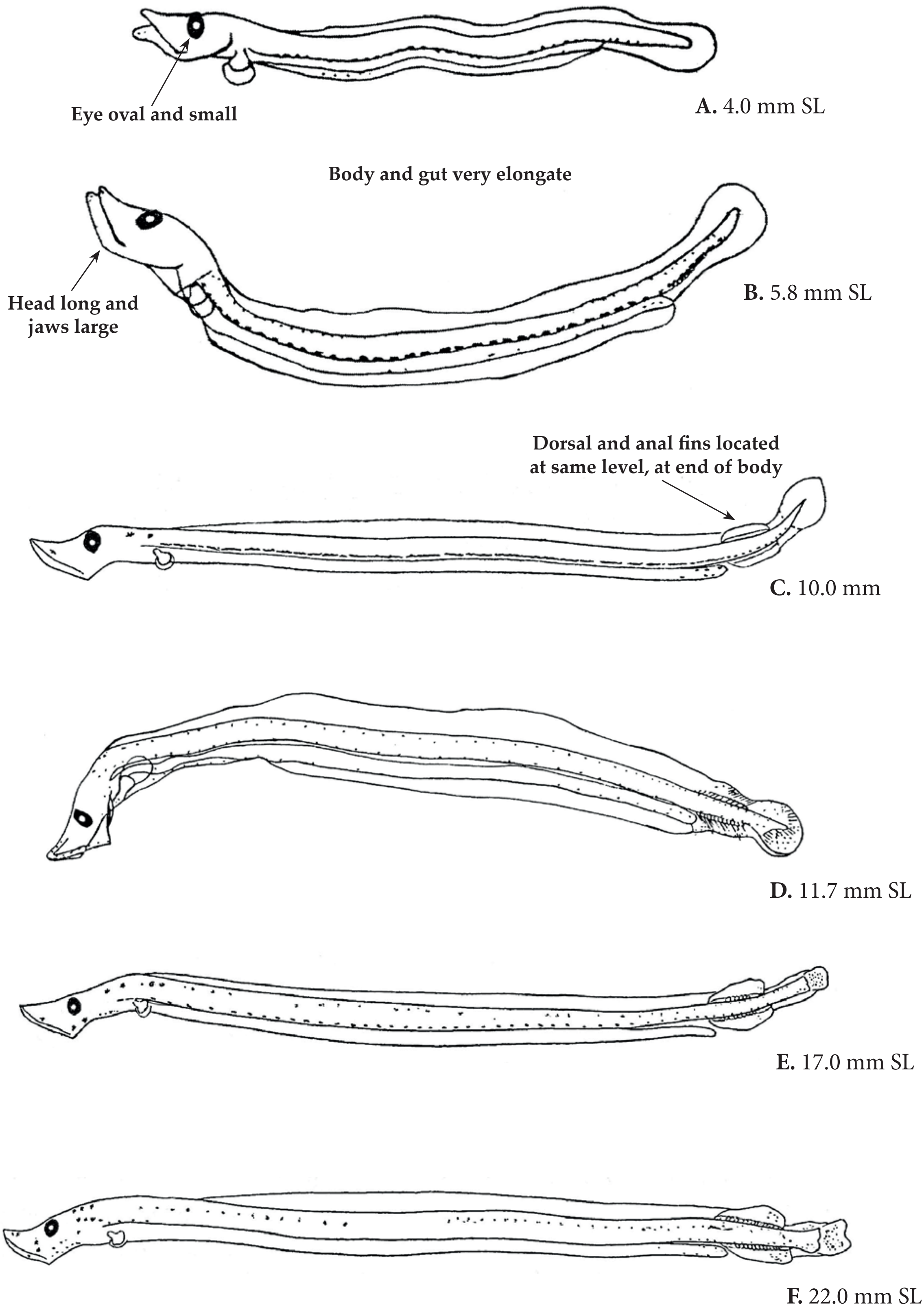


8.7 mm SL

22.8 mm SL

STOMIIFORMES

Stomias boa (Risso, 1810)



Literature: Ege (1918), Fahay (2007), Froese and Pauly (2022), Gibbs (1984), Sabatés (1988), Sanzo (1931c)

Illustrations' sources: A, B, D: Alemany (1997); **C, E, F:** Fage (1918)

SCOPELARCHIDAE

Benthalbella infans Zugmayer, 1911 — Zugmayer's pearleye

Habitat: oceanic, meso- to bathypelagic, at depths greater than 500 m

Distribution: in tropical and subtropical regions of all oceans. Eastern Atlantic, mainly between 20°N and 30°N. Absent from the Mediterranean Sea

Spawning season: all year round (western Atlantic Ocean)

Meristic characters

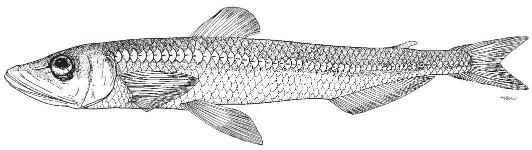
Myomeres: 54-56

Vertebrae: 55-58

Dorsal fin: 8-10

Anal fin: 19-25

Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE — Figs. A-F

Body: elongate, moderately deep anteriorly, tapers gradually to caudal peduncle; translucent, almost transparent; dorsal-fin base short

Head: large; snout large and pointed; jaws large and curved, with hooked teeth on tongue

Eye: oval, narrower in early larvae, with a ventral bulb of whitish tissue (similar to larvae of some myctophid species); lenses, in lateral position in early larvae, migrate dorsally in late larvae

Gut: tubular, detached from body

Preanus length: about 60% SL

Air bladder: absent

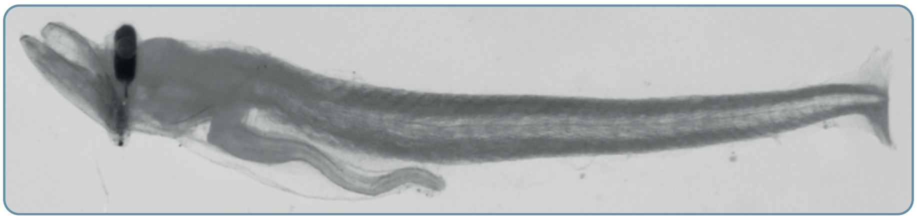
Spination: none

Pigmentation: body unpigmented until transformation

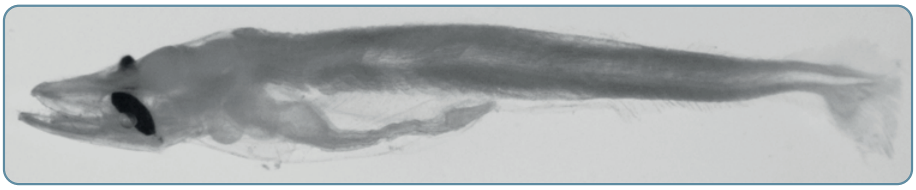
Length at flexion: about 15.0 mm

Length at transformation: > 50.0 mm SL, abrupt

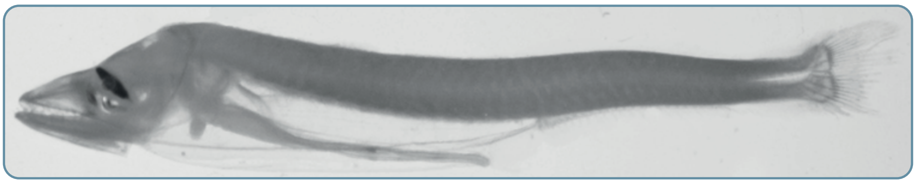
PHOTOS — by J.M. Rodriguez



5.9 mm SL



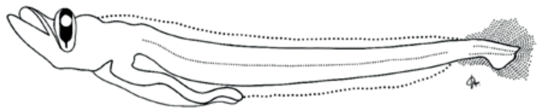
8.3 mm SL



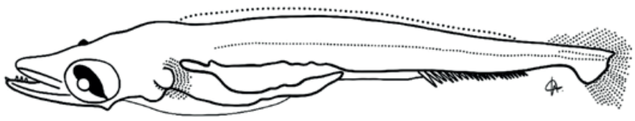
10.7 mm SL

AULOPIFORMES

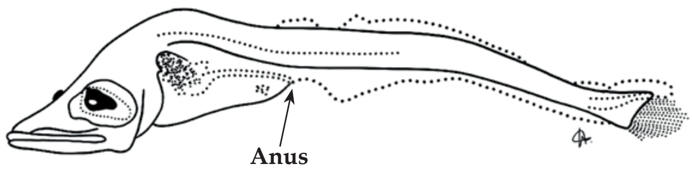
Benthalbella infans Zugmayer, 1911



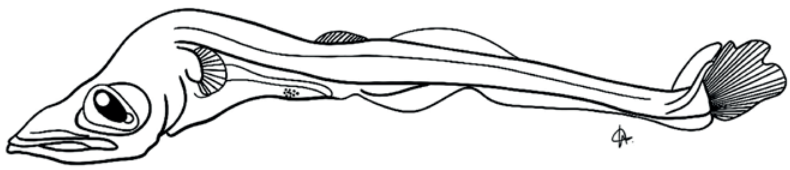
A. 5.9 mm SL



B. 8.3 mm SL

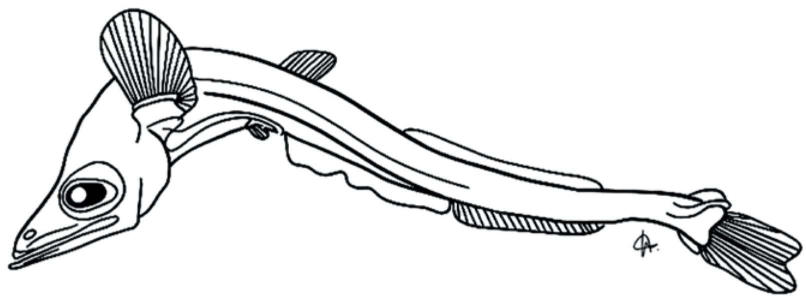


C. 14.5 mm SL

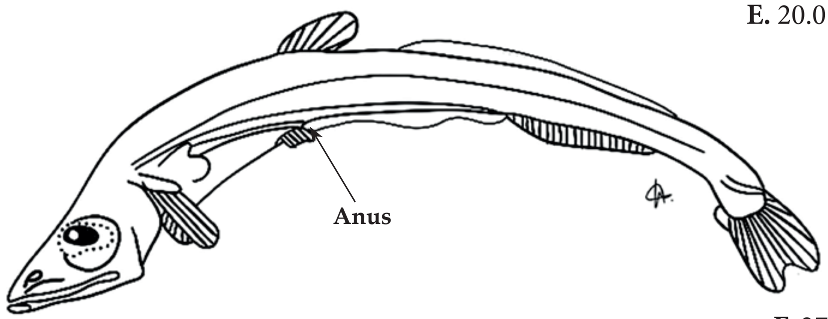


Body unpigmented until transformation

D. 15.5 mm SL



E. 20.0 mm SL



F. 27.0 mm SL

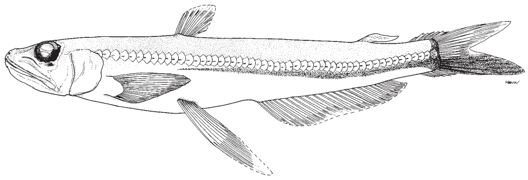
Literature: Ditty (2006a), Fahay (2007), Froese and Pauly (2022), Johnson (1984b), Merret *et al.* (1973)

Illustrations' sources: A-F: L. Rodriguez (**A, B:** original; **C-F:** redrawn from Merrett *et al.*, 1973)

Scopelarchoides danae Johnson, 1974 — Dana pearleye

Habitat: oceanic, mesopelagic, between 0 and 800 m depth
Distribution: worldwide in tropical and subtropical waters (absent from the Mediterranean Sea)
Spawning season: unknown

Meristic characters
Myomeres: 48-50
Vertebrae: 48-50
Dorsal fin: 7-8
Anal fin: 24-27
Adipose fin: present



EGGS

Undescribed

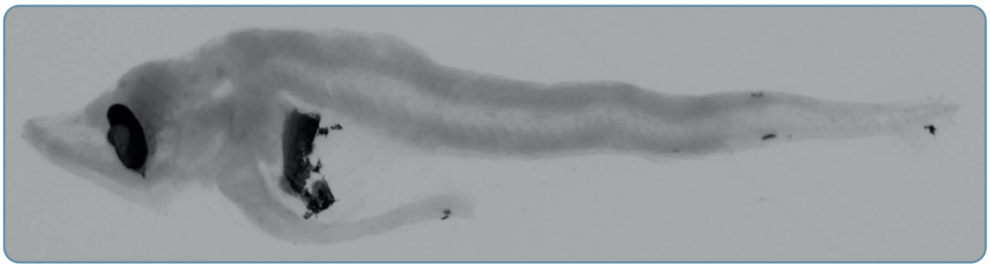
YOLK–SAC LARVAE

Undescribed

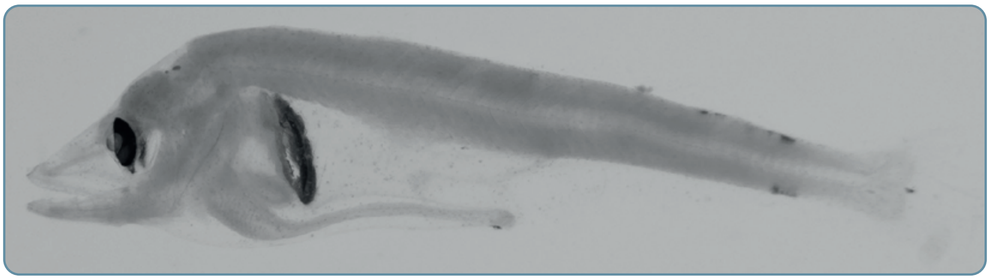
LARVAE — Figs. A-D

Body: elongate, deep anteriorly with expanded abdomen, tapers gradually to caudal peduncle; pelvic-fin origin under dorsal fin; dorsal-fin base short; preanal finfold persists in transformation stage; pelvic-fin buds inserted below gut in late larvae, at level of dorsal-fin base
Head: relatively small; snout pointed, elongate, with large, curved jaws; hooked teeth on tongue
Eye: slender with pigmented mass of choroid tissue (like a sliver) ventrally; lens migrates to dorsal margin of eye during transformation
Gut: tube-like, relatively elongate
Preanus length: about 52% SL
Air bladder: absent
Spination: none
Pigmentation: a single, large peritoneal patch; mid-ventral melanophore on terminal gut, just anterior to anus; one mid-dorsal (slightly in advance) and another mid-ventral (immediately behind anal fin) melanophore in caudal peduncle; a slash-like bar of pigment at middle of caudal fin
Length at flexion: about 8.0-10.0 mm SL
Length at transformation: gradual, begins at 16.0 mm, completed at 50.0 mm SL

PHOTOS — by S. Isari

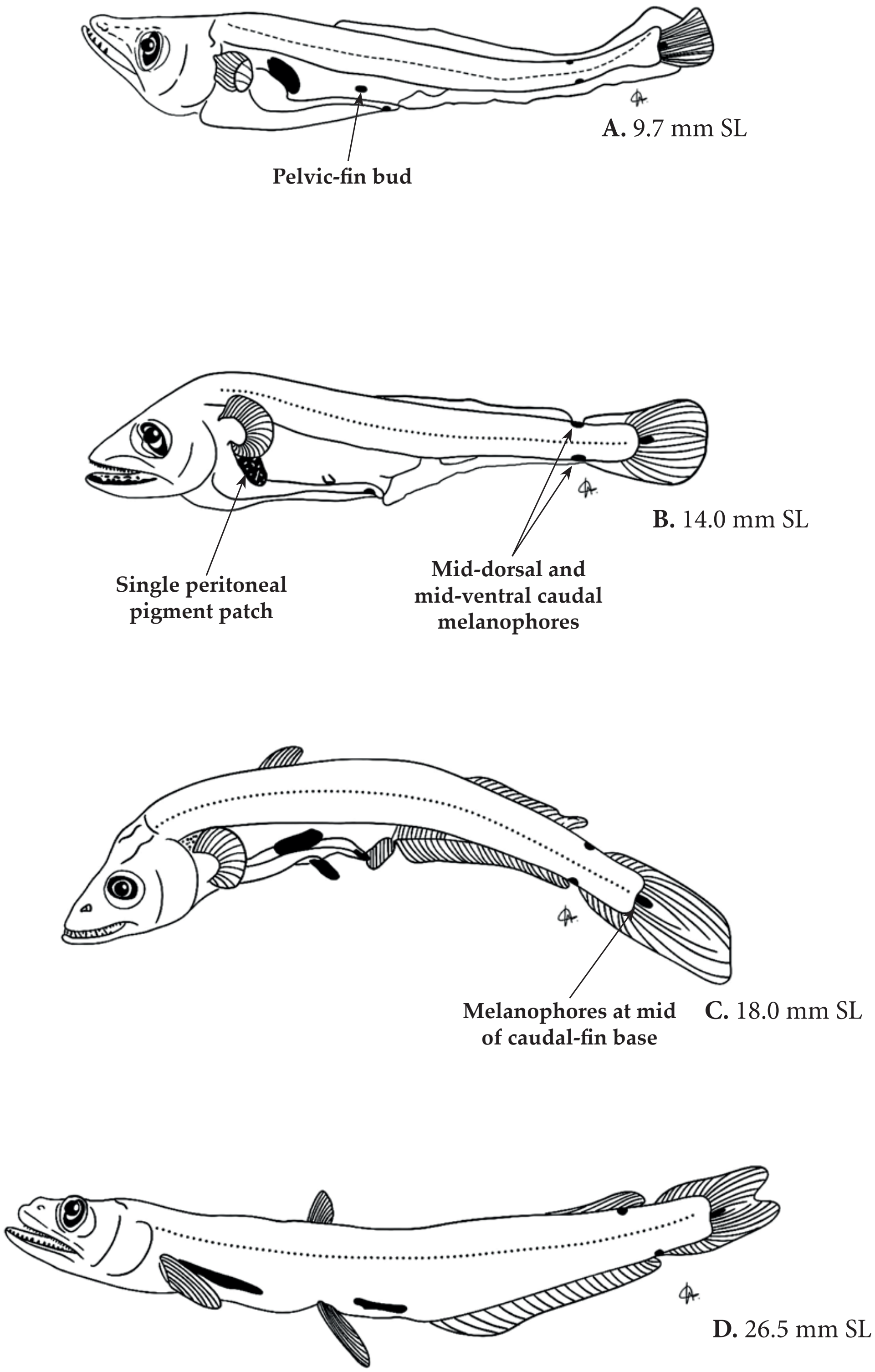


5.2 mm SL



11.8 mm SL

Scopelarchoides danae Johnson, 1974



Literature: Ditty (2006a), Fahay (2007), Johnson (1974, 1982, 1984b)

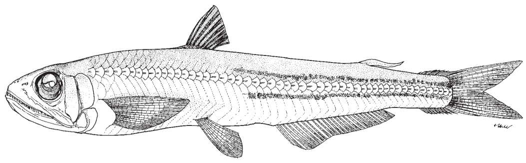
Illustrations' sources: A-D: L. Rodríguez (redrawn from Johnson, 1974)

SCOPELARCHIDAE

Scopelarchus guentheri Alcock 1896 — Staring pearleye

Habitat: oceanic, mesopelagic, between 0 and 400 m depth
Distribution: circumglobal warm-water species. Eastern Atlantic from 23°S to 7°N
Spawning season: throughout the year (western Atlantic Ocean)

Meristic characters
Myomeres: 46-51
Vertebrae: 46-51
Dorsal fin: 7-8
Anal fin: 24-29
Adipose fin: present



EGGS

Undescribed

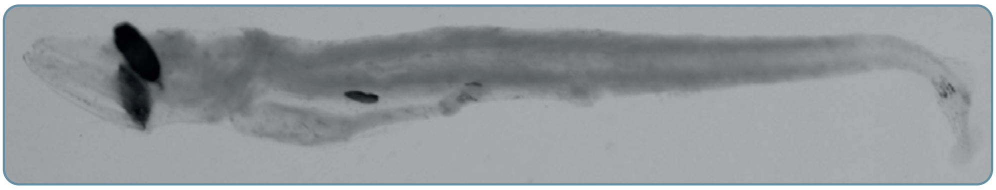
YOLK–SAC LARVAE

Undescribed

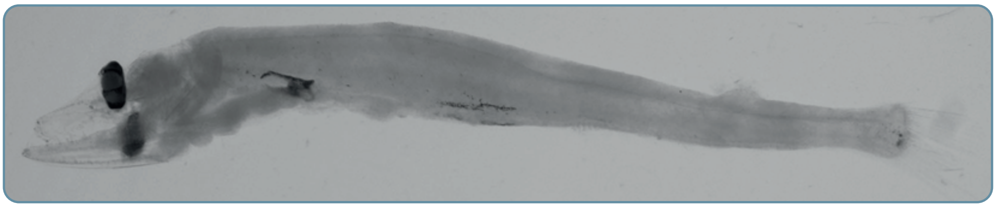
LARVAE — Figs. A-G

Body: elongate, with shallow caudal peduncle; pelvic-fin buds inserted below gut, a little behind dorsal-fin base
Head: relatively small; snout pointed, elongate, with large jaws; hooked teeth on tongue
Eye: oval, slender, directed forward; large, rounded lobe of pigment over lens in early larvae
Gut: tube-like
Preanus length: about 50% SL
Air bladder: absent
Spination: none
Pigmentation: early larvae, a single peritoneal patch in larvae of about 6.0 mm; a pair of dorso-lateral peritoneal patches by 8.4 mm; late larvae, some melanophores on lateral sides of caudal peduncle, increasing in number and spreading forward with development; no melanophores on caudal-fin
Length at flexion: about 9.0-12.0 mm SL
Length at transformation: about 30.0-55.0 mm SL

PHOTOS — by S. Isari



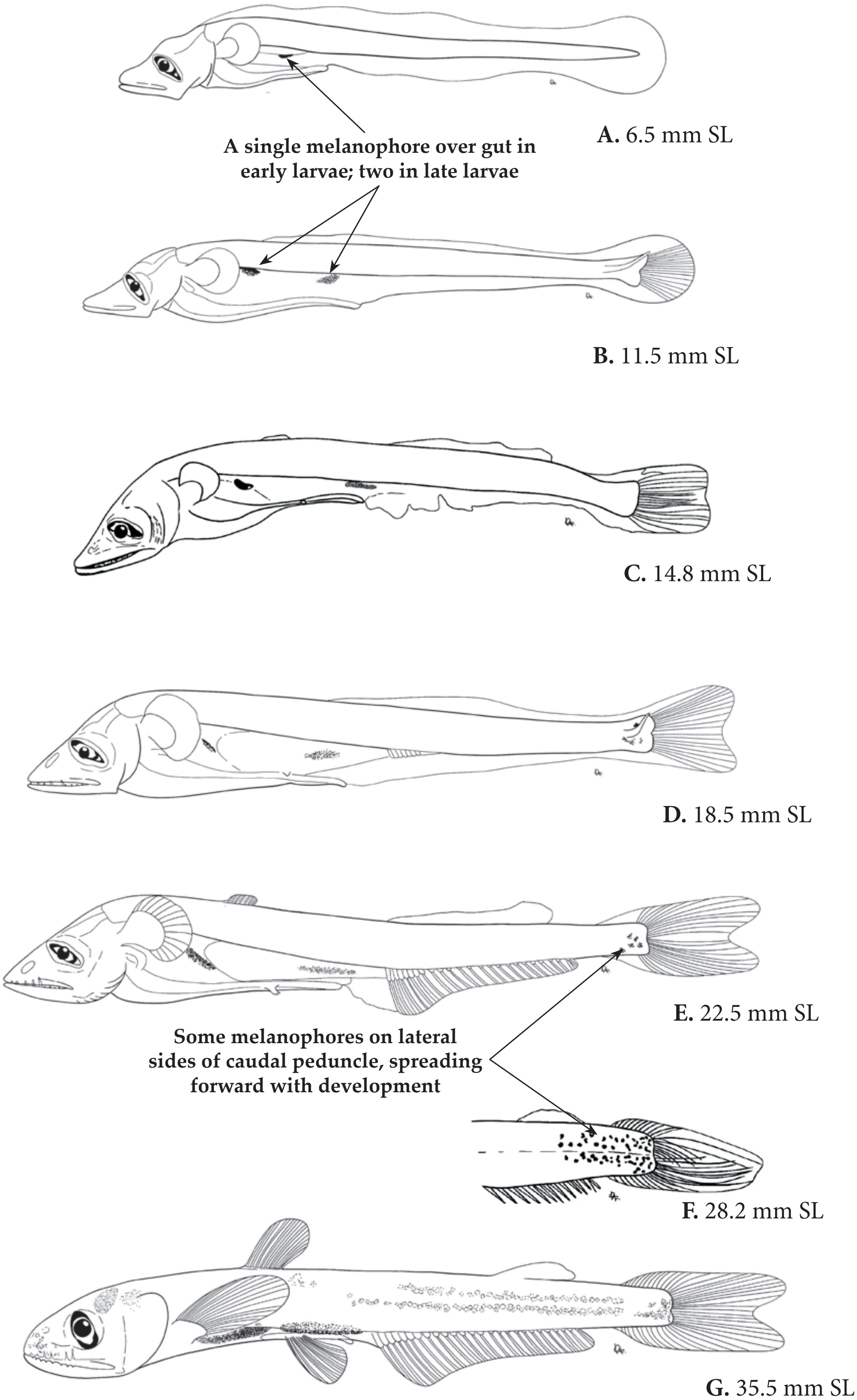
8.2 mm SL



16.7 mm SL

AULOPIFORMES

Scopelarchus guentheri Alcock 1896



Literature: Ditty (2006a), Johnson (1974, 1982, 1990), Watson and Sandknop (1996)

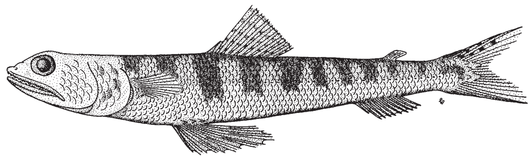
Illustrations' sources: A-G: L. Rodríguez (**A, B, D, E, G:** redrawn from Watson and Sandknop, 1996; **C, F:** redrawn from Johnson, 1974)

SYNODONTIDAE

Synodus saurus (Linnaeus, 1758) — Atlantic lizardfish

Habitat: neritic, demersal, between one and 400 m depth
Distribution: Atlantic Ocean and the Mediterranean Sea. Eastern Atlantic, from Cape Verde to Morocco
Spawning season: unknown

Meristic characters
Myomeres: 58-59
Vertebrae: 56-58
Dorsal fin: 12
Anal fin: 10



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: sculptured with hexagonal structures; diam. 1.10-1.35 mm
Perivitelline space: absent
Yolk: unsegmented; unpigmented
Oil globules: none
Colour: transparent

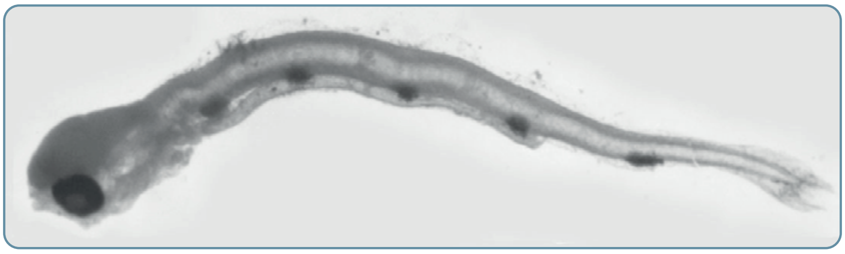
YOLK–SAC LARVAE

Hatch size: 4.0-4.5 mm SL
Body: elongate and slender
Yolk sac: elongated, swollen anteriorly, extends to third ventral melanophore
Anus: detached from yolk sac, reaches finfold border
Preanus length: about 80% SL
Pigmentation: 5 large ventral melanophores, 4 over gut and one in caudal region; melanophores arranged radially over caudal region of primordial fin

LARVAE — Figs. B-F

Body: elongate and slender (clupeid shaped)
Head: relatively small; relatively small mouth; snout pointed
Eye: oval and relatively large
Gut: tube-like, elongate and straight
Preanus length: about 80% SL
Air bladder: absent
Spination: none
Pigmentation: 5 (6 in late larvae) large melanophores along ventral side of trunk and tail, approximately equidistant, 4 (5 in late larvae) over gut and another in caudal region; melanophores arranged radially over caudal end of primordial fin in early larvae, and over caudal-fin rays in late larvae
Length at flexion: unknown
Length at transformation: unknown

PHOTOS — by J.M. Rodriguez

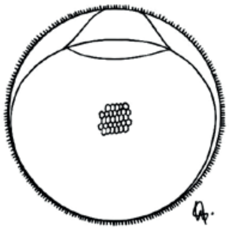


3.4 mm SL

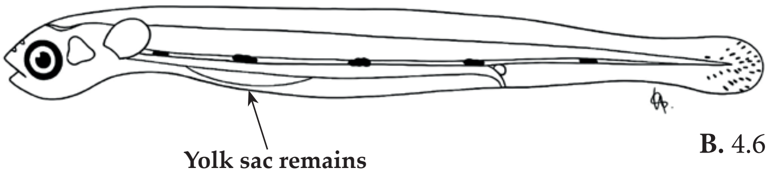
8.6 mm SL

AULOPIFORMES

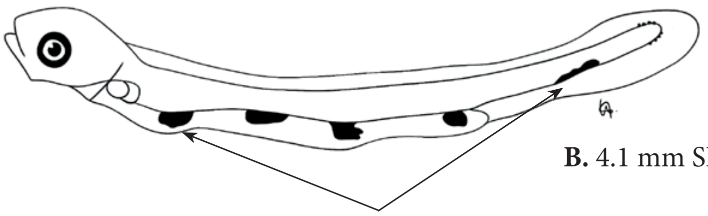
Synodus saurus (Linnaeus, 1758)



A.

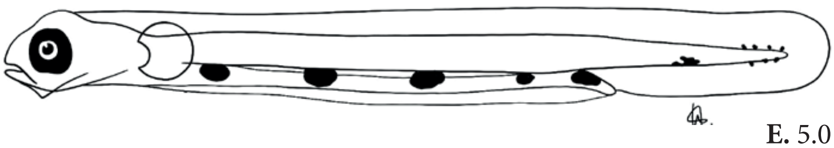


B. 4.6 mm

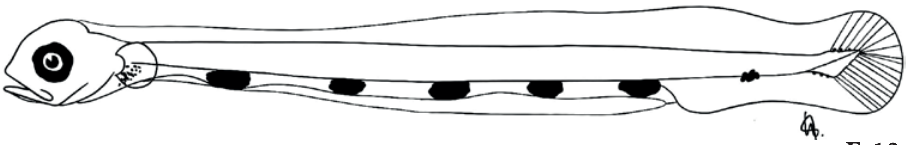


B. 4.1 mm SL

C. 4.5 mm SL



E. 5.0 mm TL



F. 12.0 mm TL

Literature: Froese and Pauly (2022), Sulak (1984), Tortonese (1956c)

Illustrations' sources: A-F: L. Rodríguez (**A, D:** redrawn from Tortonese, 1956c; **B, C:** redrawn from Alemany, 1997; **E, F:** redrawn from Tåning, 1918)

Arctozenus risso (Bonaparte, 1840)

Spotted barracudina

Habitat: oceanic, mesopelagic, mainly between 200 and 1 000 m depth

Distribution: worldwide, from the Artic to the Antarctic

Spawning season: throughout the year (California Current region)

Meristic characters

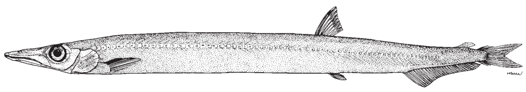
Myomeres: about 80-85

Vertebrae: 80-85

Dorsal fin: 8-11

Anal fin: 31-34

Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

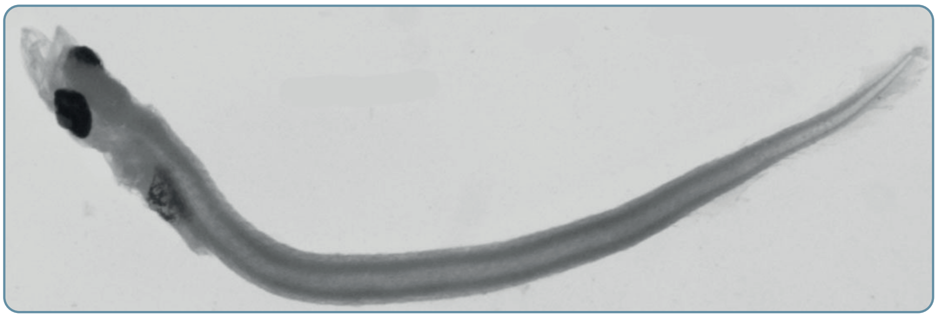
Figs. A-E

Body: elongate and relatively slender
Head: small; snout relatively short (duck-billed shaped) in early larvae, becomes elongate and pointed with development; mouth large
Eye: may be slightly oval, horizontally elongated
Gut: very short in early larvae, increases in length with development
Preanus length: increases with development from around 32% SL to 41% SL
Air bladder: absent
Spination: none

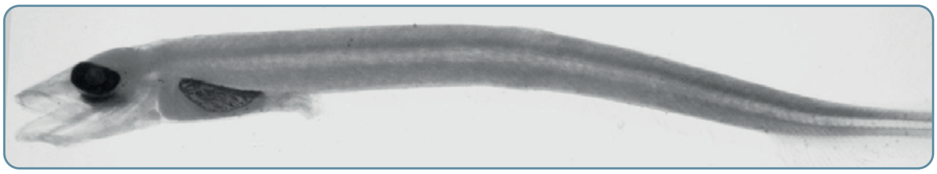
Pigmentation: reduced to a single peritoneal patch in preflexion larvae, 1-3 in flexion larvae, and 3-9 in postflexion larvae, smaller towards end of gut; postflexion larvae show two lines of spots, one dorsal, one ventral to posterior end of notochord; melanophores on top of head behind eyes, and on tips of snout and lower jaw
Length at flexion: at about 12.0-24.0 mm SL
Length at transformation: at about 34.0-46.0 mm SL, gradual

PHOTOS

by J.M. Rodriguez

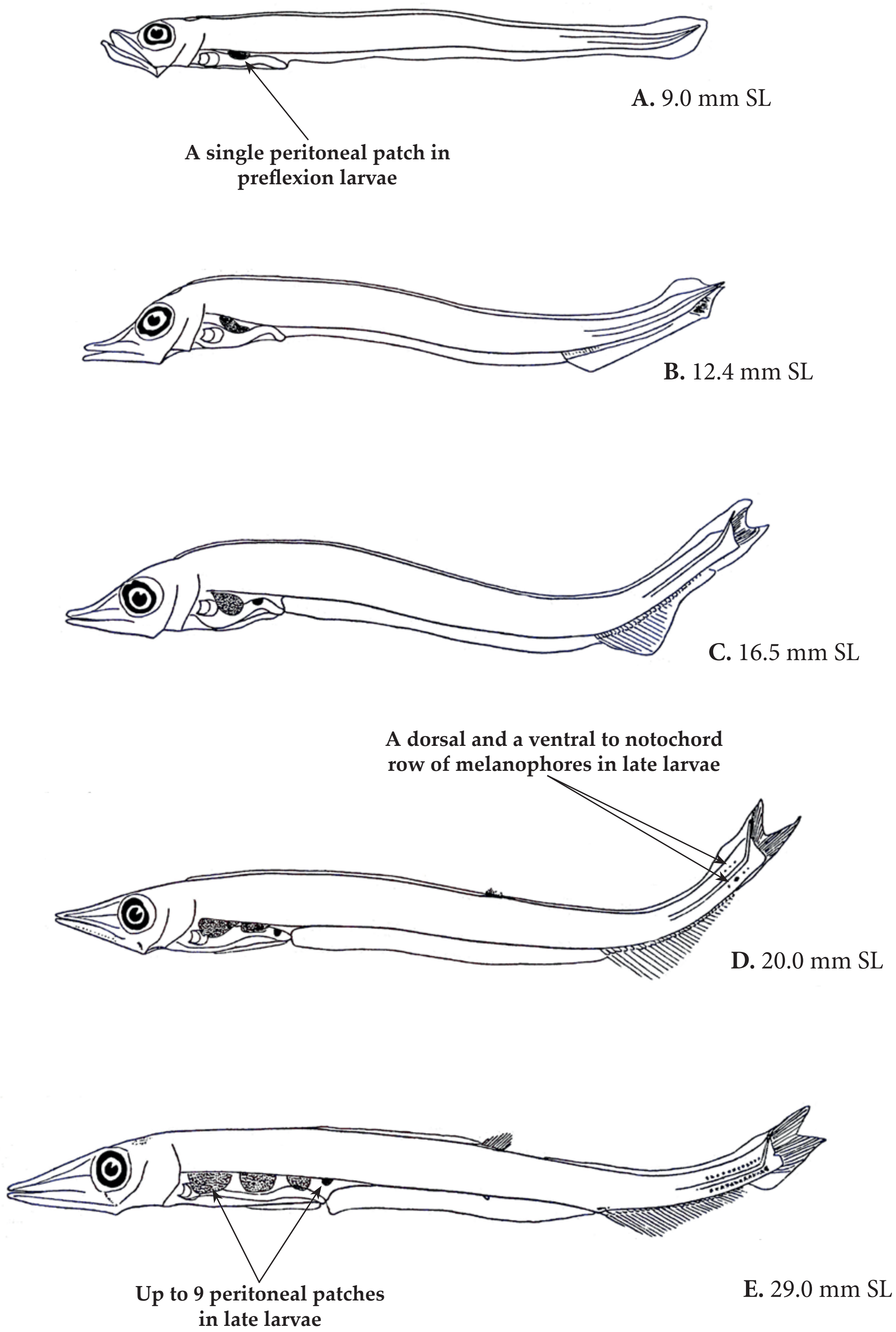


8.0 mm SL



18.0 mm SL

Arctozenus risso (Bonaparte, 1840)



Literature: Ambrose (1996b), Ditty (2006d), Ege (1930), Fahay (2007), Post (1984, 1990)

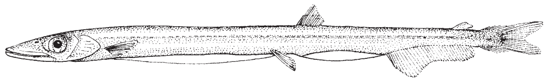
Illustrations' sources: A-E: Ege (1930)

PARALEPIDIDAE

Lestidiops jayakari (Boulenger, 1889)

Habitat: oceanic, meso- to bathypelagic, between 50 and 2 000 m depth
Distribution: worldwide, in tropical to temperate waters (except the southeastern Pacific)
Spawning season: throughout the year

Meristic characters
Myomeres: about 76-85
Vertebrae: 76-85
Dorsal fin: 9-10
Anal fin: 28-33
Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

Figs. A-G

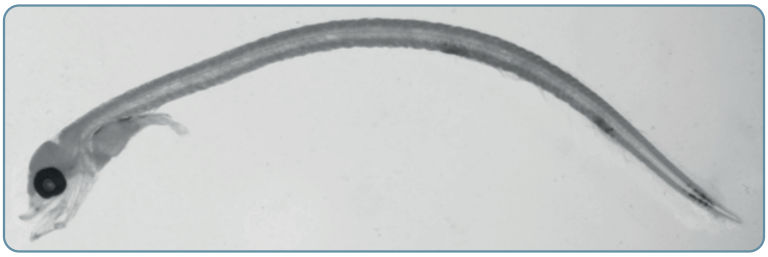
Body: elongate and slender, pelvic fins located well anterior to dorsal fin
Head: short and deep (duck-billed shape) in early larvae, becomes longer and pointed during development
Eye: round and large
Gut: triangular and short in early larvae, becomes longer and tube-like throughout development
Preanus length: increases during development from about 25% SL to about 60% SL
Air bladder: absent
Spination: none
Pigmentation: two short rows of small melanophores (congener species, *L. sphyrenoides*, has 3) in postanal, ventral region; two rows of small melanophores in caudal region, one above and the other below urostyle since early larvae; up to 12 peritoneal patches of pigment form during development (absent in early larvae)
Length at flexion: about 12.0-16.0 mm
Length at transformation: > 40.0-45.0 mm

PHOTOS

by J.M. Rodriguez

4.5 mm SL

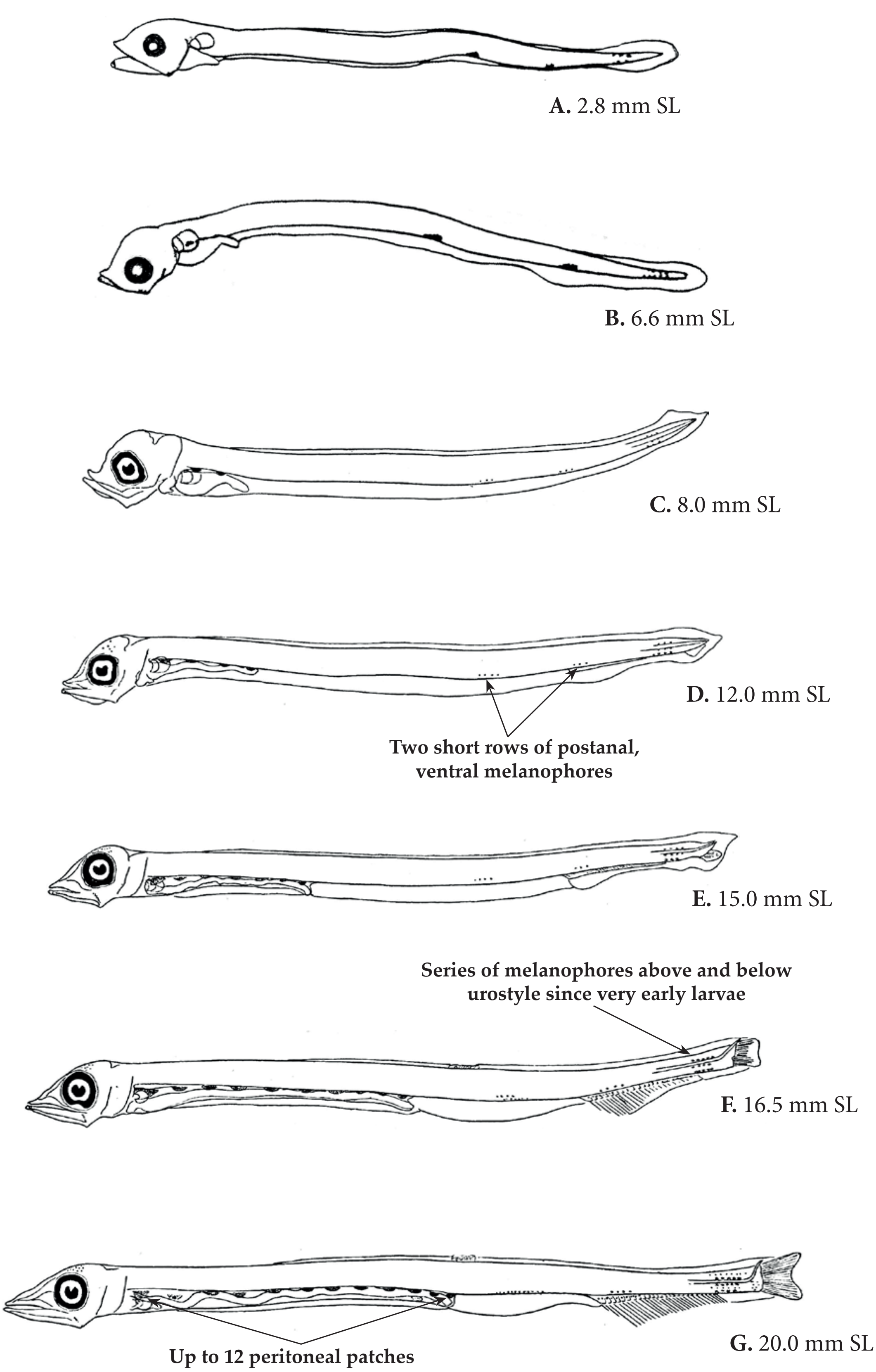
9.1 mm SL



11.5 mm SL

AULOPIFORMES

Lestidiops jayakari (Boulenger, 1889)



Literature: Ditty (2006d), Ege (1930), Fahay (2007), Froese and Pauly (2022), Olivar and Fortuño (1991), Post (1984)

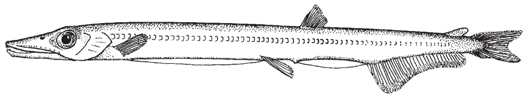
Illustrations' sources: A, B: Alemany (1997); **C-G:** Ege (1930)

PARALEPIDIDAE

Lestidiops sphyrenoides (Risso, 1820)

Habitat: oceanic, epi- to mesopelagic, to 400 m depth
Distribution: eastern Atlantic Ocean, from Mauritania to France, and the Mediterranean Sea
Spawning season: throughout the year

Meristic characters
Myomeres: 84-94
Vertebrae: 84-94
Dorsal fin: 9-11
Anal fin: 28-31
Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

Figs. A-G

Body: elongate and slender; dorsal fin located at level of anus; anal fin located at end of tail; pelvic fins slightly ahead of anus; remains of primordial fin in very late larvae
Head: short and deep (duck-billed shape) in early larvae, becomes longer and pointed during development
Eye: round and large
Gut: triangular and short in early larvae, becomes longer and tube-like during development
Preanus length: increases during development from about 23% SL to about 59% SL
Air bladder: absent
Spination: none
Pigmentation: three short rows of small melanophores (congener species, *L. jayakari*, has two) in postanal, ventral region; two rows of small melanophores in caudal region, one above and other below urostyle since early larvae; up to 12 peritoneal patches of pigment form during development (2 in larvae of 7.5 mm); melanophores close to nostril; lower jaw pigmented; melanophores on top of head in late larvae
Length at flexion: unknown
Length at transformation: unknown

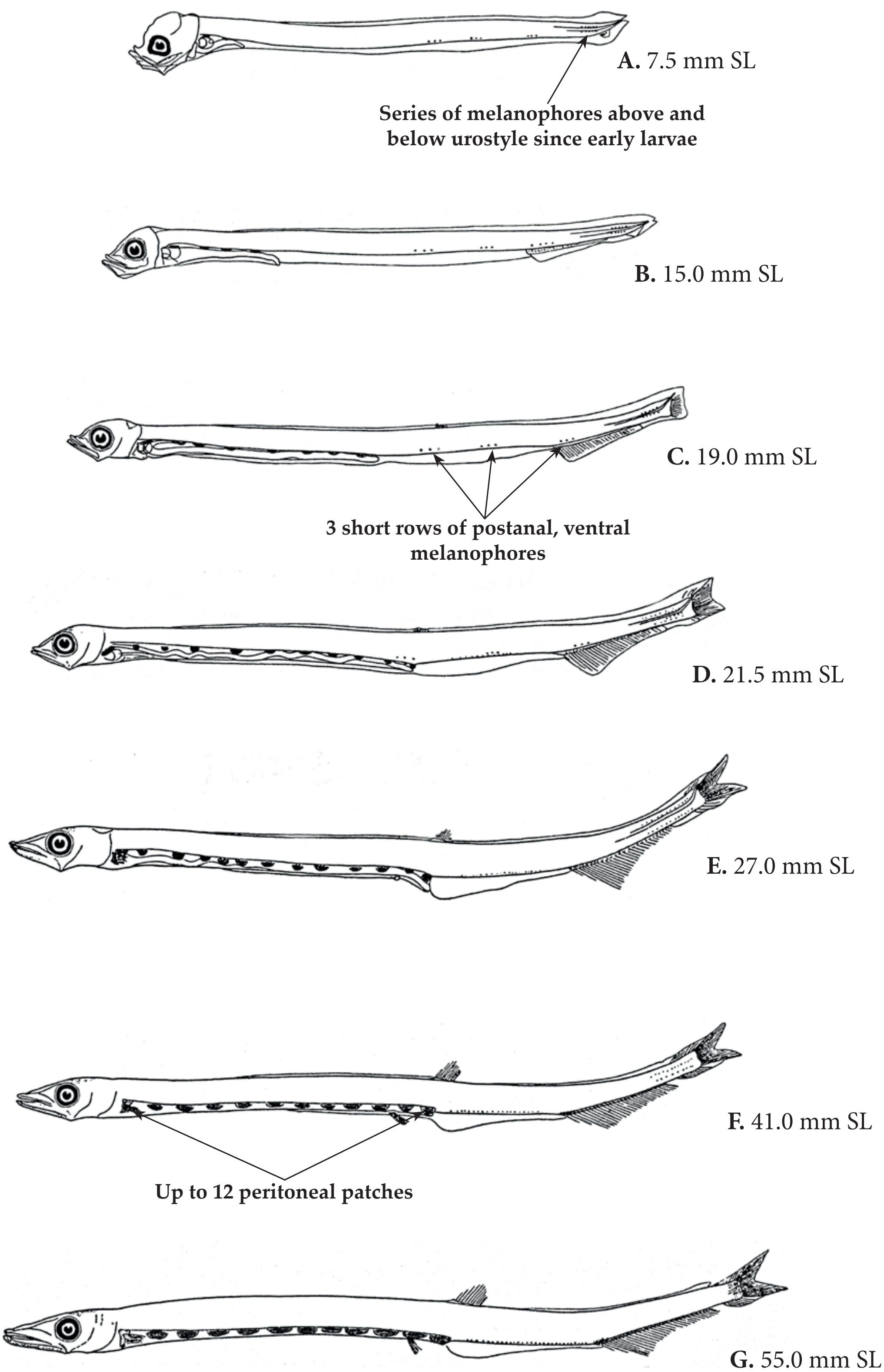
PHOTOS

by J.M. Rodriguez

17.0 mm SL

AULOPIFORMES

Lestidiops sphyrenoides (Risso, 1820)



Literature: Ege (1930), Post (1984), Tortonese (1956b)

Illustrations' sources: A-G: Ege (1930)

PARALEPIDIDAE

AULOPIFORMES

Lestrolepis intermedia (Poey, 1868)

Habitat: oceanic, mesopelagic, between 10 and 800 m depth

Distribution: circumtropical in all oceans

Spawning season: mainly from December to April (Caribbean Sea)

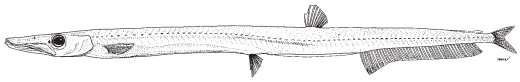
Meristic characters

Myomeres: 91-98

Vertebrae: 91-93

Dorsal fin: 9

Anal fin: 40-44



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

Figs. A-G

Body: elongate and slender; pelvic fins form well anterior to dorsal fin

Head: fairly large and deep (duck-billed shaped) in small larvae, becomes longer, with pointed snout, throughout development

Eye: round and large

Gut: triangular and short in early larvae, becomes longer and tube-like throughout development

Preanus length: increases during development, anus reaches its final position in larvae of about 20.0 mm SL

Air bladder: absent

Spination: none

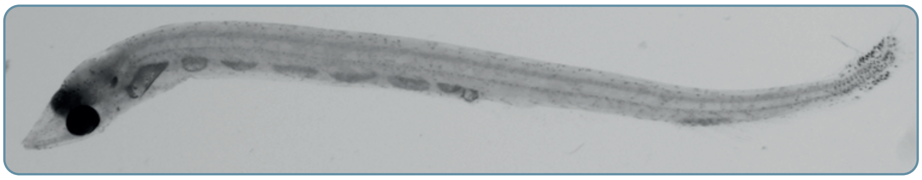
Pigmentation: numerous melanophores on caudal finfold, from early larvae on; in addition, late larvae have two parallel rows of melanophores in caudal region, one above and the other below urostyle; up to 8 peritoneal patches of pigment form during development (one in early larvae)

Length at flexion: about 13.0-17.0 mm SL

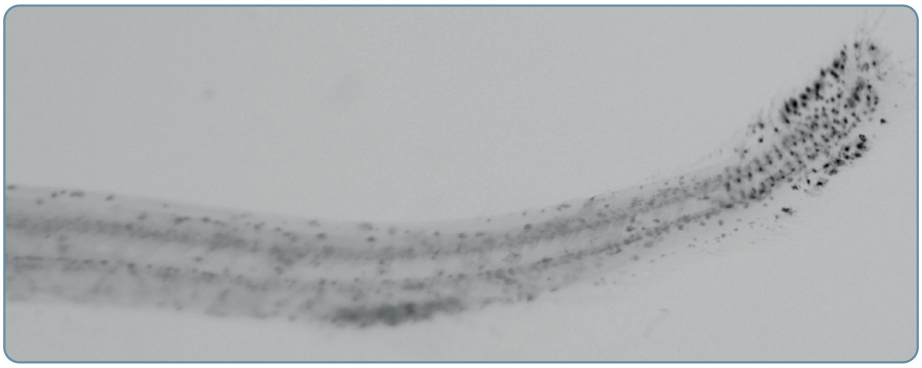
Length at transformation: from about 40.0 mm SL

PHOTOS

by S. Isari

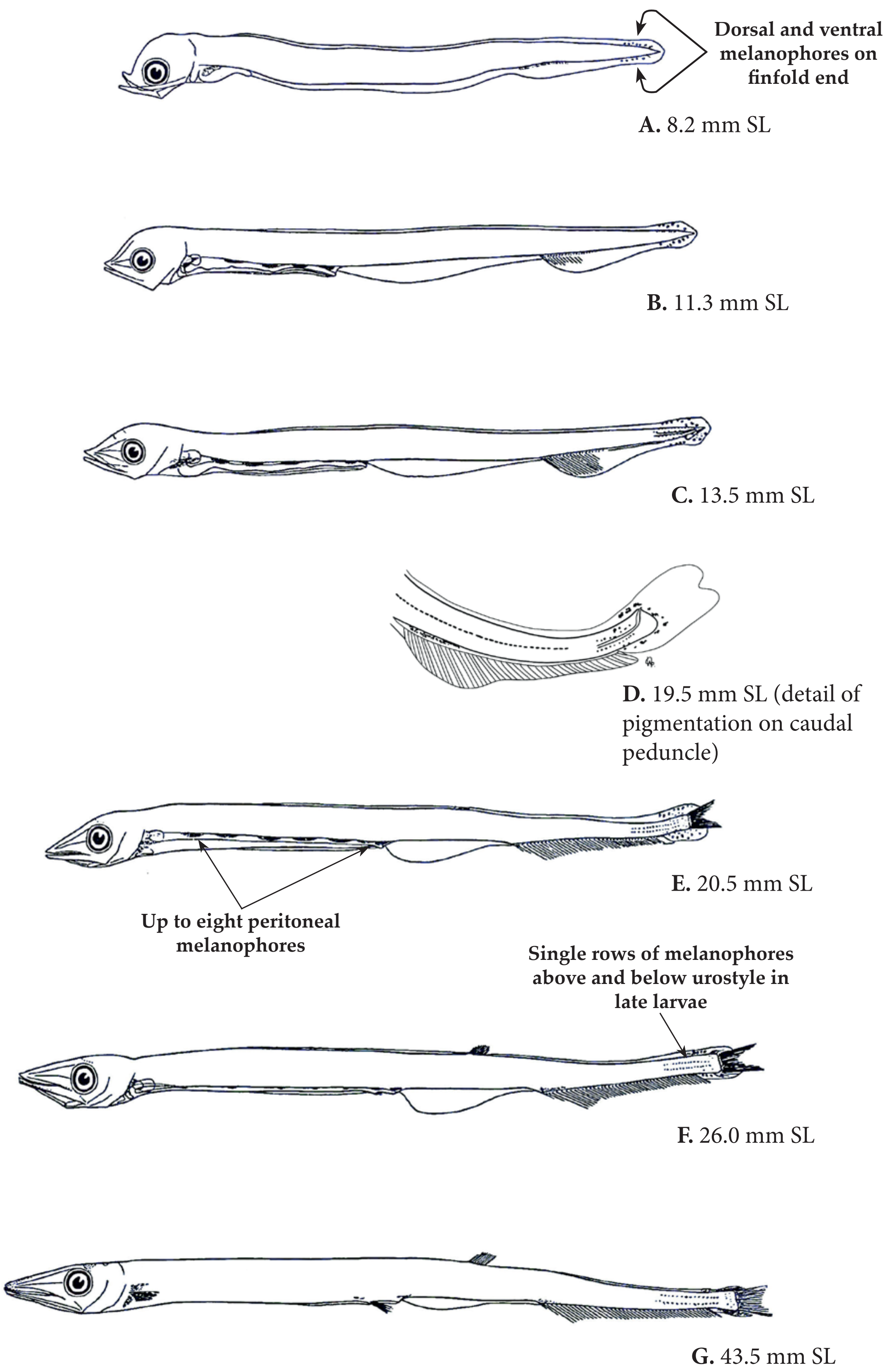


17.3 mm SL



Detail of caudal region

Lestrolepis intermedia (Poey, 1868)



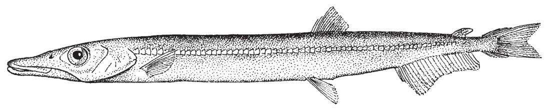
Literature: Ditty (2006d), Ege (1930), Fahay (2007), Post (1990)

Illustrations' sources: A-C, E-G: Ege (1930); **D:** L. Rodríguez (redrawn from Ozawa, 1986c)

Paralepis coregonoides Risso, 1820

Habitat: oceanic, mesopelagic, between 50 and 1 000 m depth
Distribution: North Atlantic Ocean, and the Mediterranean Sea; eastern Atlantic Ocean, from Morocco to 65° N
Spawning season: March to September

Meristic characters
Myomeres: 70-74
Vertebrae: 70
Dorsal fin: 9-11
Anal fin: 22-26
Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

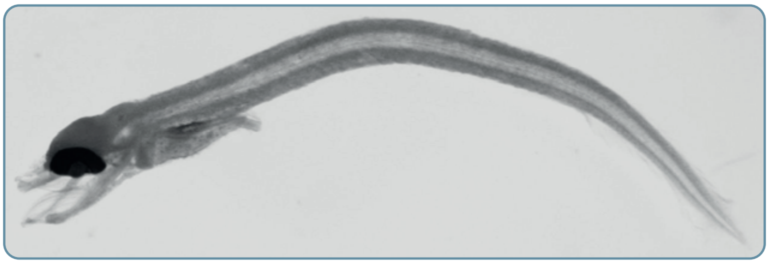
LARVAE

Figs. A-G

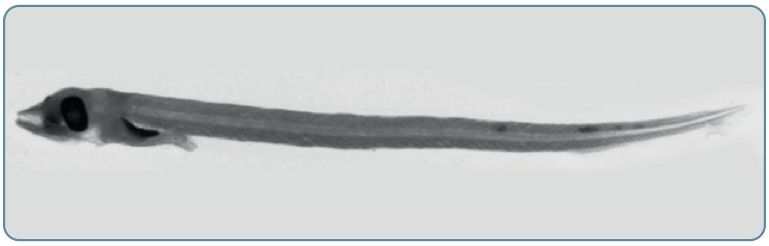
Body: elongate and slender; pectoral fins present from early larvae on; pelvic fins form under dorsal fin at about midbody
Head: small and deep; snout relatively short (duck-billed shaped) in early larvae, becomes longer and pointed during development
Eye: large and oval in early larvae, becomes round in late larvae
Gut: very short
Preanus length: increases with development from about 30% TL to about 36% TL
Air bladder: absent
Spination: none
Pigmentation: postanal region unpigmented in larvae up to about 5.0 mm; larvae > 5.0 mm show a deep internal melanophore above notochord, close to its end and a peritoneal patch; a long internal series of melanophores above and a short one below notochord in late larvae; up to 3 peritoneal patches appear during development (before transformation)
Length at flexion: about 10.0-15.0 mm (no SL)
Length at transformation: >20.0-25.0 mm (no SL)

PHOTOS

by J.M. Rodriguez



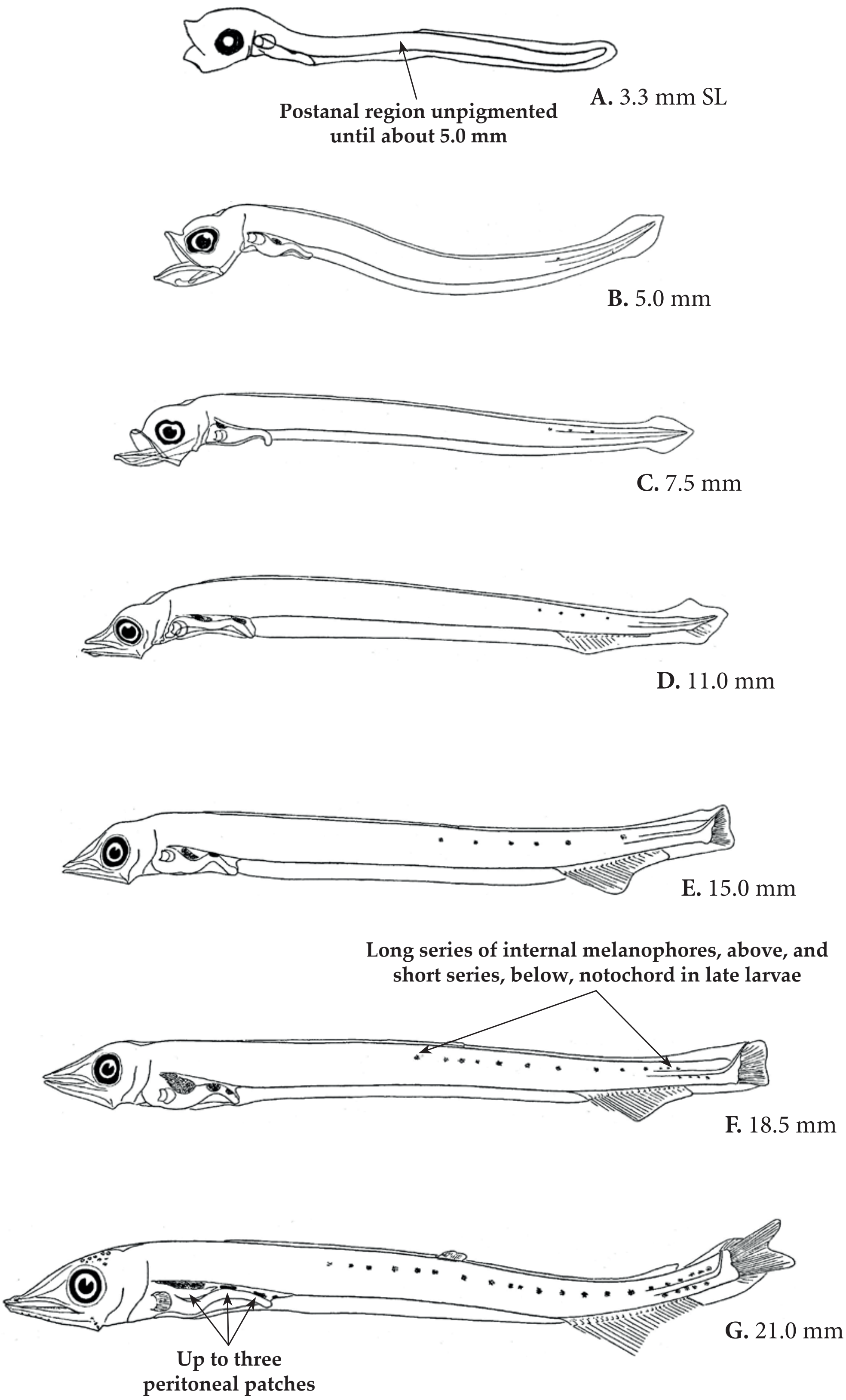
8.8 mm SL



10.8 mm SL

15.0 mm SL

Paralepis coregonoides Risso, 1820



Literature: Ege (1930), Fahay (2007), Froese and Pauly (2022), Post (1984)

Illustrations' sources: A: Alemany (1997); **B-G:** Ege (1930)

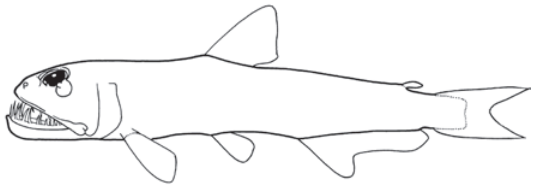
EVERMANNELLIDAE

Evermannella balbo (Risso, 1820)

Balbo sabretooth

Habitat: oceanic, mesopelagic, between 100 and 1 000 m depth
Distribution: Atlantic Ocean and the Mediterranean Sea; eastern Atlantic Ocean from Namibia to Portugal.
Spawning season: March to November

Meristic characters
Myomeres: 52-54
Vertebrae: 52-54
Dorsal fin: 12-13
Anal fin: 33-36



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

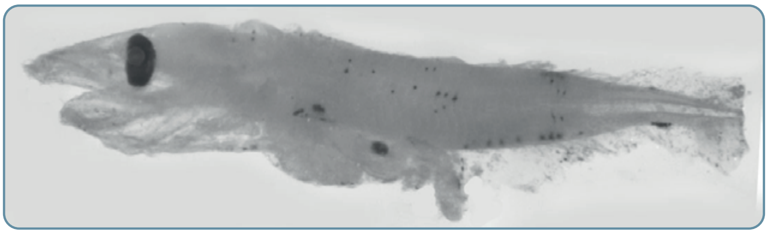
Figs. A-E

Body: moderately elongate
Head: relatively large; mouth relatively large and ventral; snout long and pointed; large teeth in both jaws
Eye: vertically elliptical with rounded pupil
Gut: swollen anteriorly (sac-shaped)
Preanus length: < 50% SL
Air bladder: absent
Spination: none

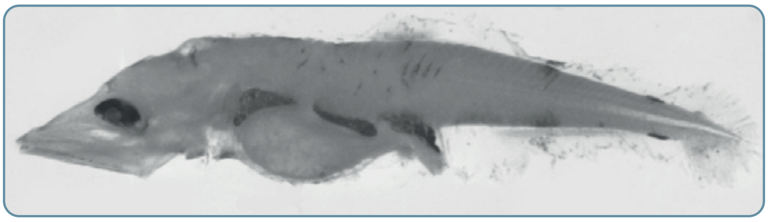
Pigmentation: 3 large peritoneal pigment patches; melanophores scattered on lateral preanal region and some melanophores on caudal–fin base in early larvae; melanophores arranged in transversal bars (up to 4-5 above and 7-8 below lateral midline of body), following myosepta in late larvae; melanophores on head, snout and neck; caudal–fin base pigmented
Length at flexion: about 5.5-7.0 mm
Length at transformation: < 14.0-25.0 mm

PHOTOS

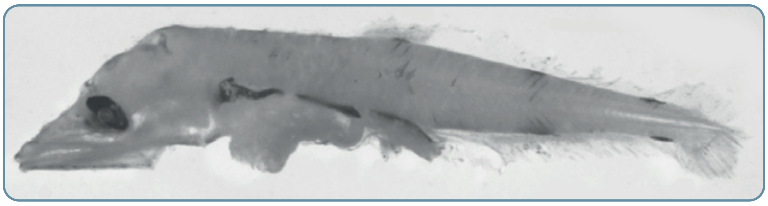
by J.M. Rodriguez



5.7 mm SL



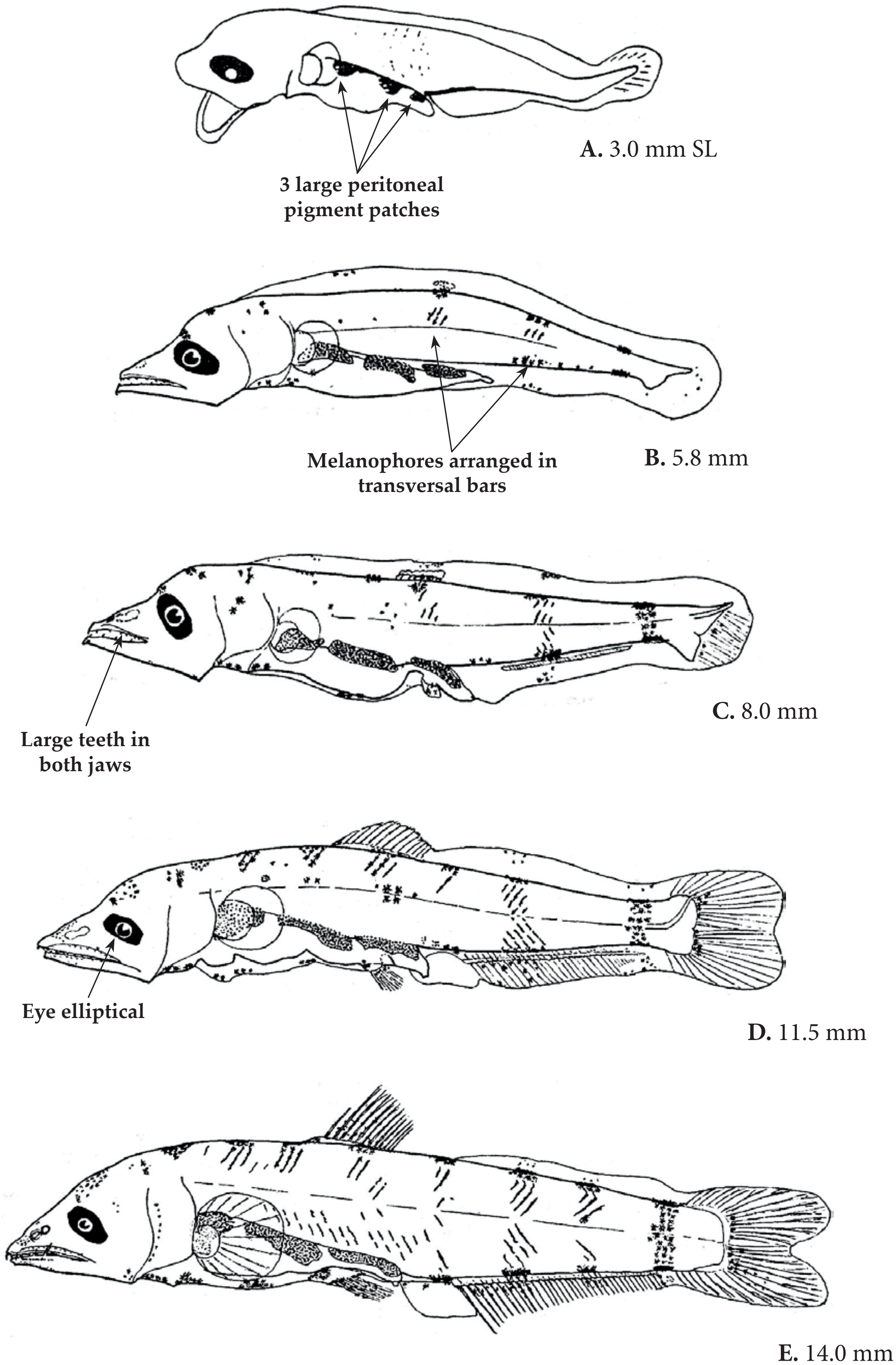
6.5 mm SL



7.4 mm SL

AULOPIFORMES

Evermannella balbo (Risso, 1820)



Literature: Ditty (2006c), Fahay (2007), Froese and Pauly (2022), Johnson (1984a), Schmidt (1918); Tortonese (1956a)

Illustrations' sources: A: Alemany (1997); **B-E:** Schmidt (1918)

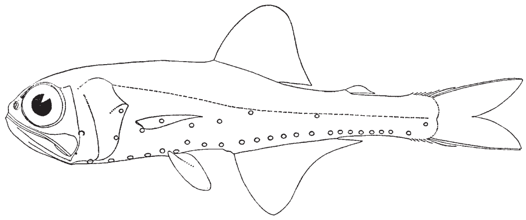
MYCTOPHIDAE

Benthosema glaciale (Reinhardt, 1837)

Glacier lantern fish - Lanterne glaciaire

Habitat: mesopelagic, between 0 and 1 400 m depth
Distribution: eastern Atlantic Ocean from Guinea (Mauritanian Upwelling Region) to Norway, and the Mediterranean Sea.
Spawning season: spring and summer

Meristic characters
Myomeres: 34-36
Vertebrae: 34-36
Dorsal fin: 12-14
Anal fin: 17-19
Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

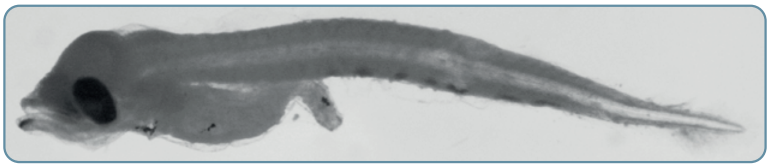
Figs. A-E

Body: moderately elongate; a gap between anus and anal fin in early larvae, closes in larvae of about 8.0 mm
Head: moderate, with a pointy snout
Eye: oval, with a mass of choroid tissue ventrally
Gut: curved downward in early larvae
Preanus length: about 50% SL
Air bladder: absent
Spination: none

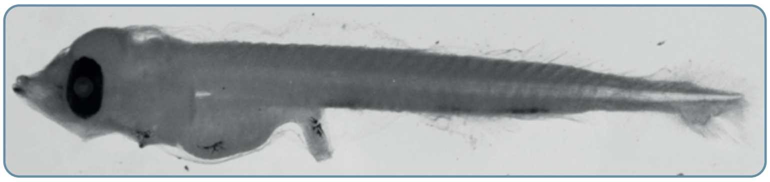
Pigmentation: melanophores at posterior edge of opercle, at tip of snout and lower jaw; 3 ventral melanophores: on cleithral symphysis, lateral side of gut, and on terminal gut, respectively; several melanophores on postanal, ventral region, decreasing in number to a single one over mid anal fin in late larvae; abdominal region and pectoral–fin rays pigmented; premature preopercular photophore
Length at flexion: 5.0-7.0 mm
Length at transformation: about 11.0 mm

PHOTOS

by J.M. Rodriguez

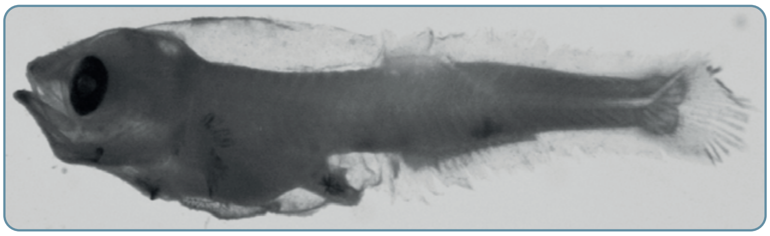


4.4 mm SL



5.8 mm SL

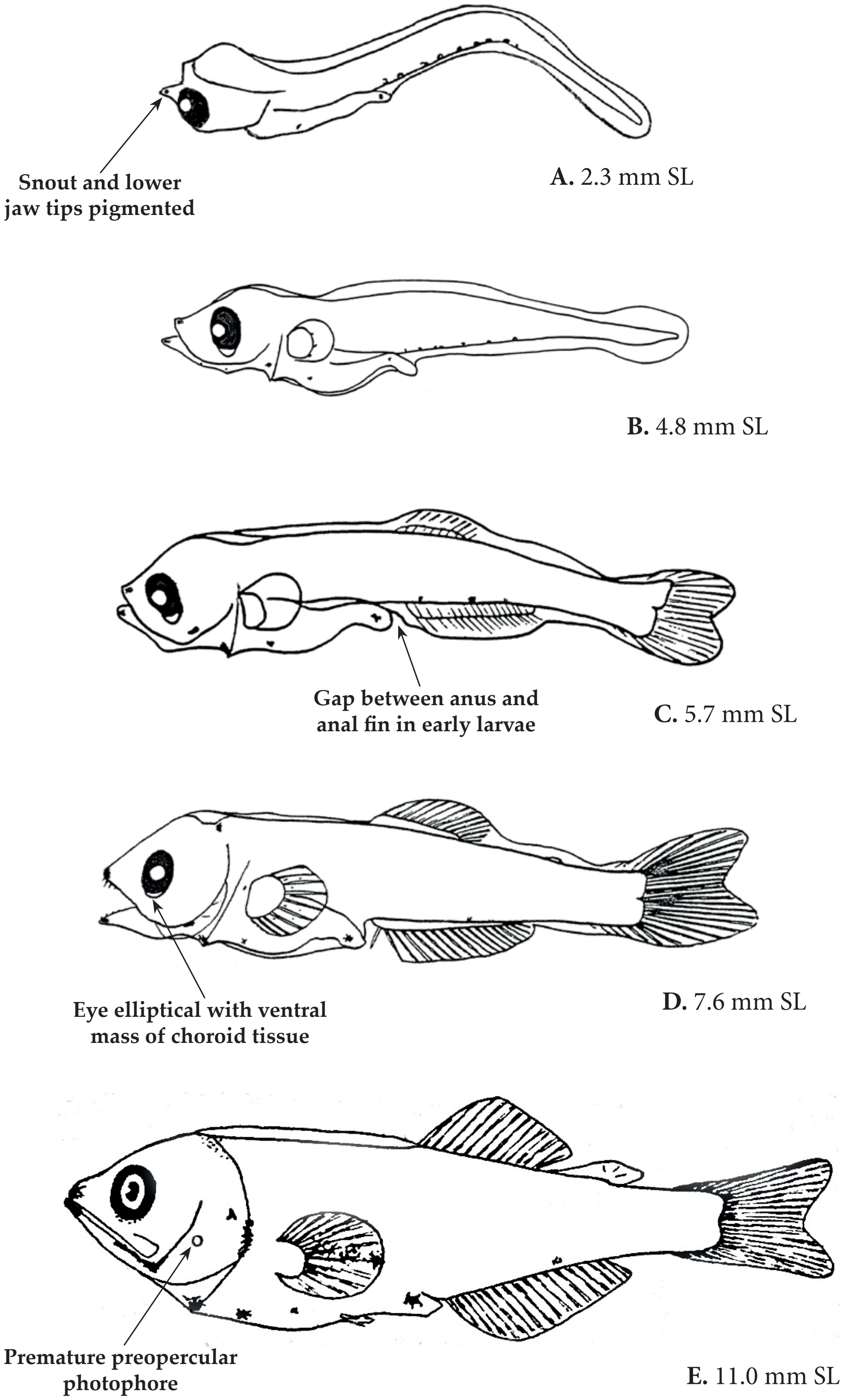
7.2 mm SL



Not sized

MYCTOPHIFORMES

Benthosema glaciale (Reinhardt, 1837)



Literature: Alemany (1997), Fahay (2007), Froese and Pauly (2022), Hulley (1984), Tåning (1918)

Illustrations' sources: A-D: Alemany (1997); **E:** Tåning (1918)

MYCTOPHIDAE

Benthosema suborbitale (Gilbert, 1913) — Smallfin lanternfish

Habitat: oceanic, mesopelagic, between 10 and 750 m depth

Distribution: Atlantic Ocean. Eastern Atlantic, from Morocco to South Africa. Absent from the Mediterranean Sea

Spawning season: peaks in spring and summer (off Hawaii, USA)

Meristic characters

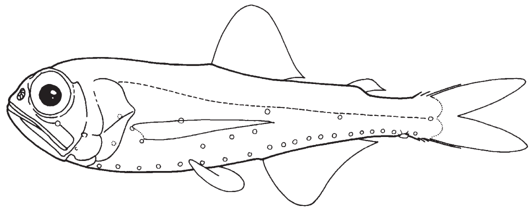
Myomeres: 33-35

Vertebrae: 33-35

Dorsal fin: 11-14

Anal fin: 16-19

Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE — Figs. A-E

Body: initially elongate, becomes short and deep; gap between anus and anal-fin origin closes between 9.0 and 10.0 mm SL

Head: moderate with slightly pointed snout

Eye: elliptical with a lunate mass of choroid tissue ventrally

Gut: short, bulbous anteriorly with narrow posterior section; large terminal gut, acutely deflected ventrally

Preanus length: less than 50% SL

Air bladder: absent

Spination: none

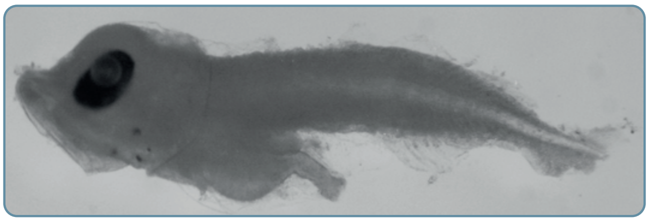
Pigmentation: most of body unpigmented; several melanophores on ventral surface of head; 2 melanophores anterior to lower and upper portion of pectoral-fin base

Length at flexion: 5.2-6.5 mm

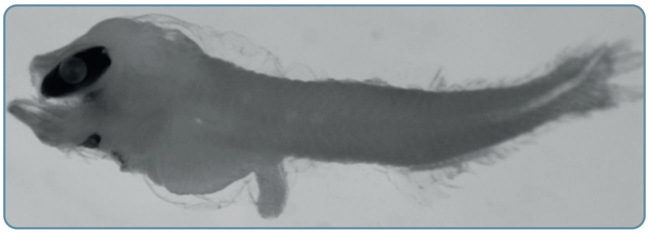
Length at transformation: about 10.0 mm SL

Note: larvae similar to those of *Electrona risso*, which have a longer preanus length, pigment on pectoral-fin rays, and lack blotches at pectoral-fin base

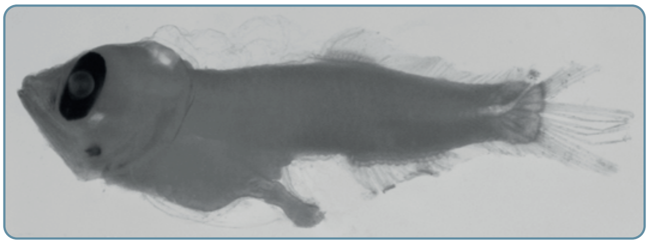
PHOTOS — by J.M. Rodriguez



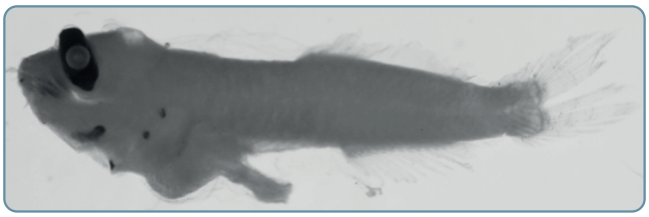
3.5 mm SL



4.6 mm SL



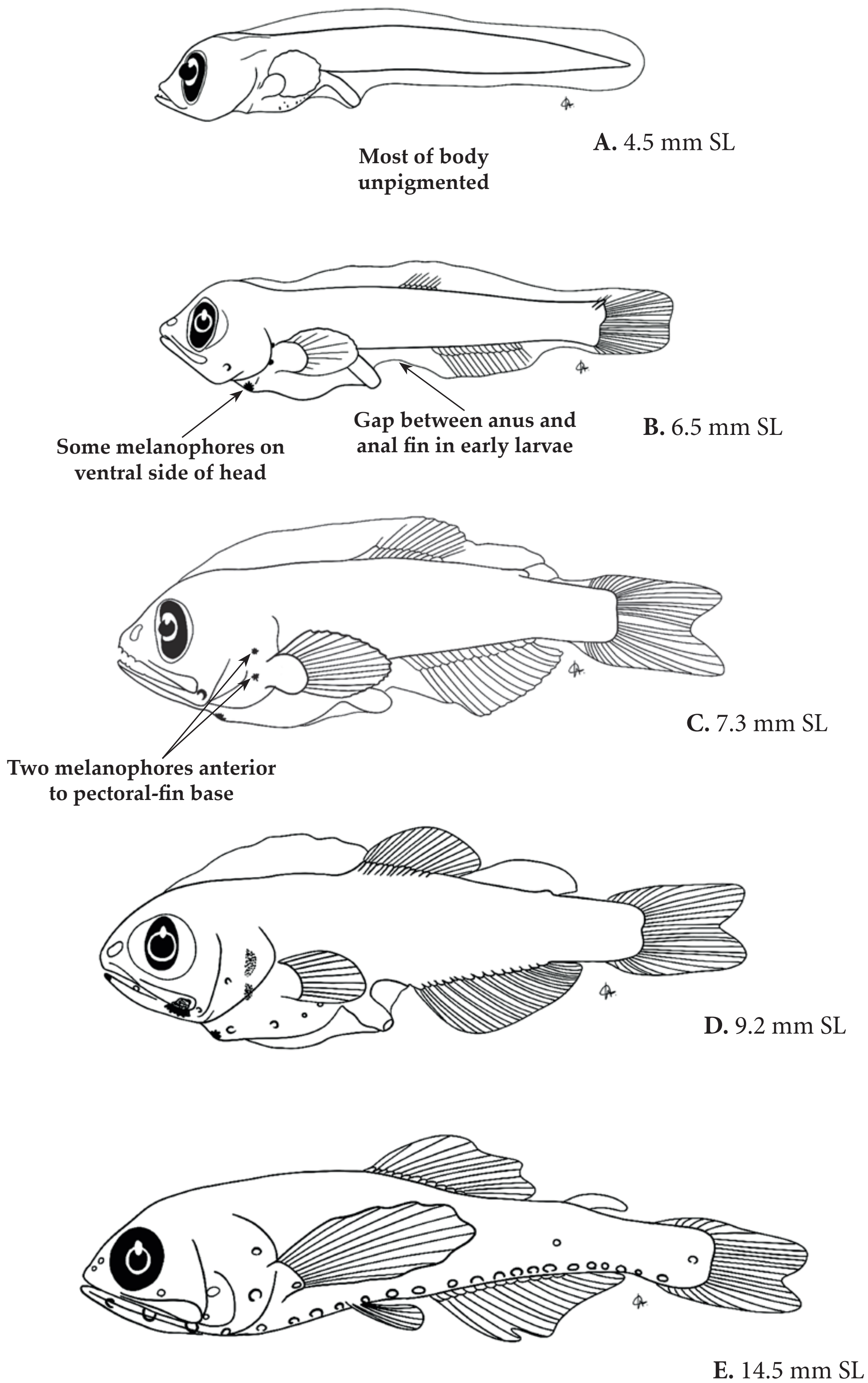
5.0 mm SL



7.0 mm SL

MYCTOPHIFORMES

Benthosema suborbitale (Gilbert, 1913)



Literature: Fahay (2007), Froese and Pauly (2022), Hulley (1984), Moser and Ahlstrom (1974, 1996b), Moser and Watson (2001, 2006)

Illustrations' sources: A-E: L. Rodríguez (redrawn from Moser and Ahlstrom, 1996b)

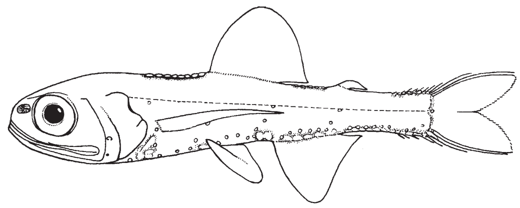
MYCTOPHIDAE

MYCTOPHIFORMES

Ceratoscopelus maderensis (Lowe, 1839) Madeira lantern fish – Lanterne de Madère

Habitat: oceanic, mesopelagic, between 100 and 1 000 m depth
Distribution: North Atlantic Ocean and the Mediterranean Sea. Eastern Atlantic, from 20°N to 50°N
Spawning season: spring and summer

Meristic characters
Myomeres: 37
Vertebrae: 37
Dorsal fin: 13-15
Anal fin: 13-15



EGGS

Undescribed

YOLK–SAC LARVAE

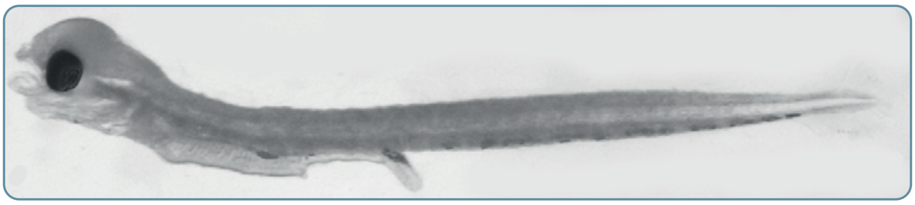
Undescribed

LARVAE Figs. A-F

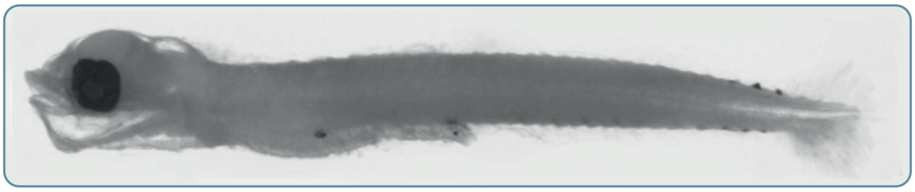
Body: elongate, moderately slender
Head: relatively small; snout pointed, short in early larvae, lengthens during development; mouth large reaches posterior border of eye in late larvae
Eye: round and large
Gut: tube-like, moderately slender and gently curved downward at about its midway
Preanus length: increases from > 50% SL in early larvae to > 60% SL in late larvae
Air bladder: absent
Spination: no spination

Pigmentation: single melanophores on lateral side of gut and on terminal gut; a continuous line of melanophores between anus and caudal fin decreasing in number during development (3 in late larvae); 3-4 melanophores on dorsal side of caudal peduncle (not present in early larvae); no melanophores at cleithral symphysis
Length at flexion: about 6.0 mm
Length at transformation: about 16.0 mm

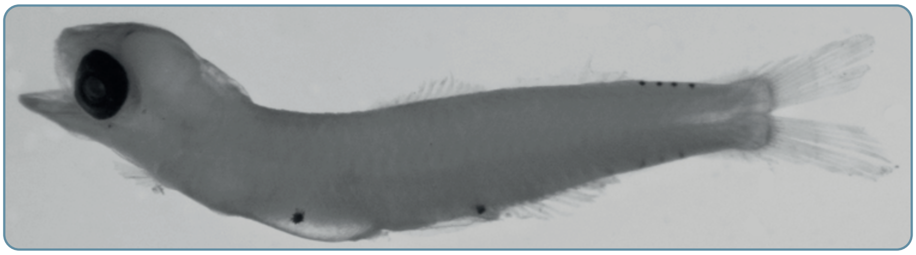
PHOTOS by J.M. Rodriguez



4.3 mm SL

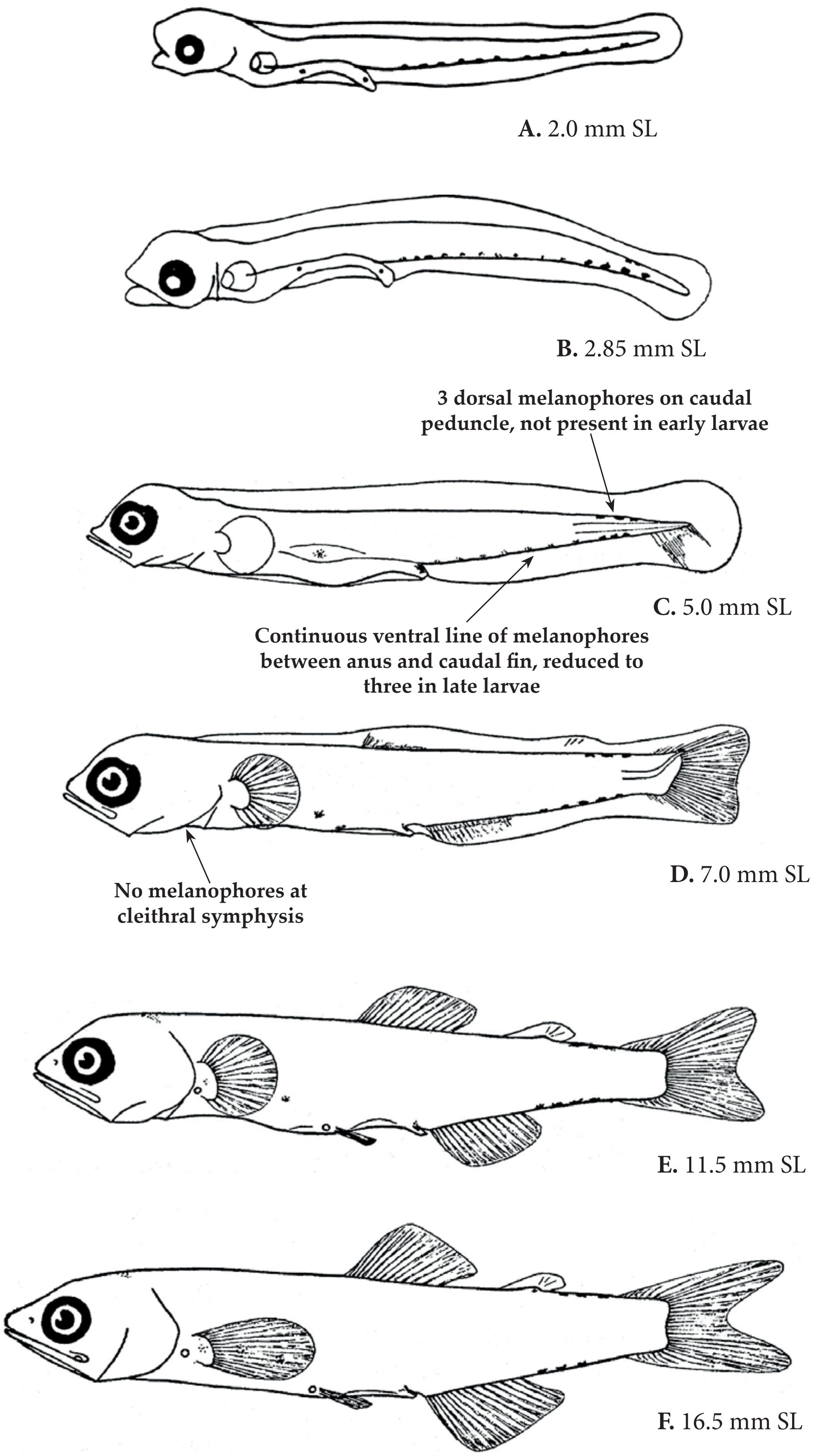


6.0 mm SL



7.9 mm SL

Ceratoscopelus maderensis (Lowe, 1839)



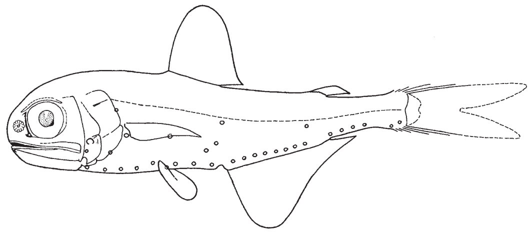
Literature: Fahay (2007), Froese and Pauly (2022), Hulley (1984), Tåning (1918)

Illustrations' sources: A, B: Alemany (1997); **C-F:** Tåning (1918)

Dasyscopelus asper (Richardson, 1845) — Prickly lanternfish

Habitat: oceanic, mesopelagic, between 0 and 750 m depth
Distribution: Atlantic, Pacific and Indian oceans. Eastern Atlantic, from South Africa to Mauritania
Spawning season: unknown

Meristic characters
Myomeres: 35-38
Vertebrae: 35-38
Dorsal fin: 12-14
Anal fin: 17-19
Adipose fin: present



EGGS

Undescribed

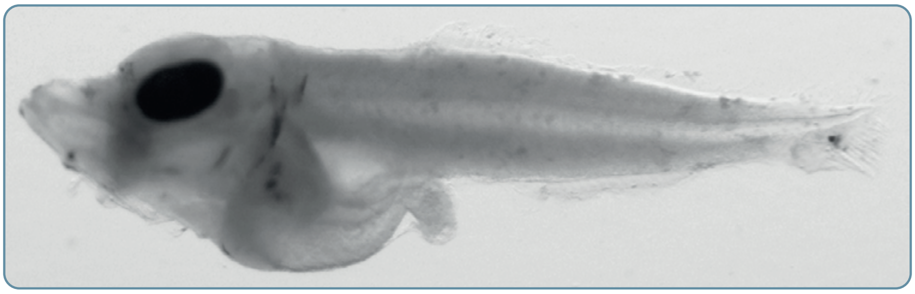
YOLK–SAC LARVAE

Undescribed

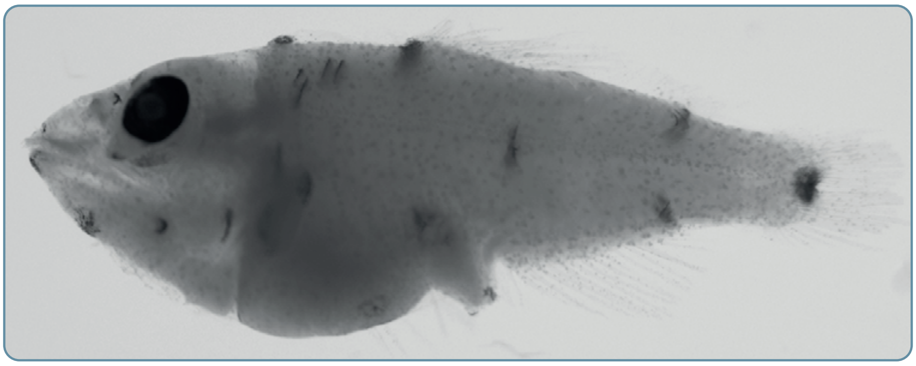
LARVAE — Figs. A-E

Body: elongate in early larvae, becomes deeper and stout with development
Head: large and broad; snout pointed in early larvae, rounded in late larvae; snout and forehead concave (duck-billed shaped) in early larvae, becomes convex with development; mouth large and oblique; jaws with prominent teeth since early larvae
Eye: oval, with a ventral, unpigmented mass of choroid tissue
Gut: bulky anteriorly, with thinner terminal section; anus protruding
Preanus length: increases from about 40-48% SL in early larvae, to 56-64% SL in late larvae
Air bladder: absent
Spination: none
Pigmentation: early larvae, one melanophore at tip of upper and lower jaws, on forehead (between eyes), at base of pectoral fin, and over terminal gut; pigmentation increases with development, adding a melanophore at dorsal-fin origin and another at end of adipose fin; a few internal melanophores on epaxial myosepta; a large melanophore at base of caudal fin
Length at flexion: 4.5-6.0 mm SL
Length at transformation: 11.0-13.0 mm SL

PHOTOS — by S. Isari

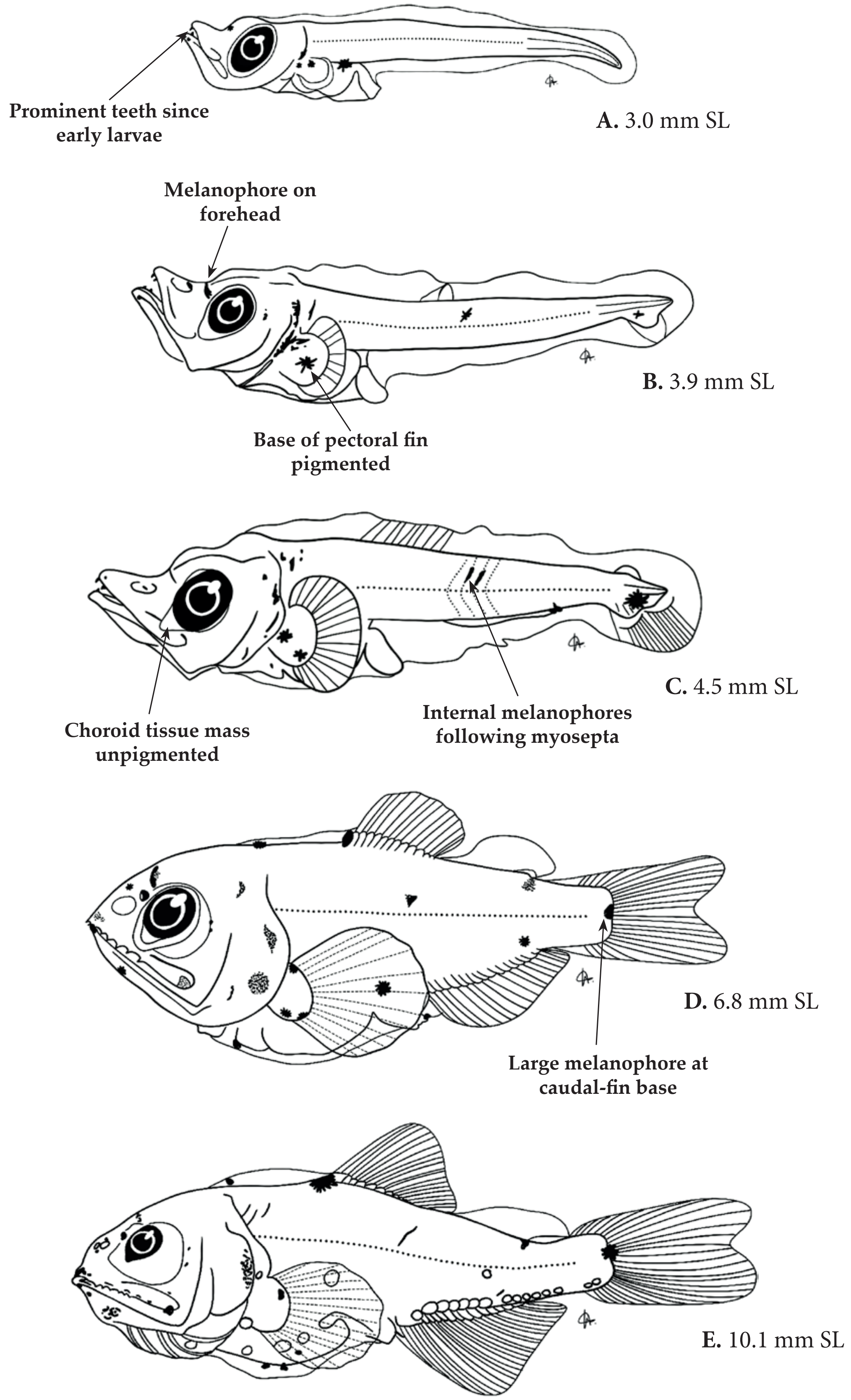


4.2 mm SL



7.0 mm SL

Dasyscopelus asper (Richardson, 1845)



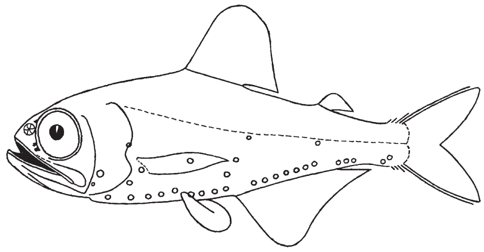
Literature: Fahay (2007), Froese and Pauly (2022), Hulley (1990), Moser and Ahlstrom (1974, 1996b), Moser and Watson (2001, 2006)

Illustrations' sources: A-E: L. Rodríguez (**A, B, D, E:** redrawn from Ozawa, 1986; **C:** redrawn from Moser and Ahlstrom, 1974)

Dasyscopelus selenops (Tåning, 1928) — Wisner's lantern fish

Habitat: oceanic, mesopelagic, between 40 and 450 m depth
Distribution: Atlantic, Pacific and Indian oceans. Eastern Atlantic, from South Africa to Morocco (absent from the Mauritanian upwelling region)
Spawning season: spring (off Hawaii, USA)

Meristic characters
Myomeres: 34-35
Vertebrae: 34-35
Dorsal fin: 12-14
Anal fin: 17-19
Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

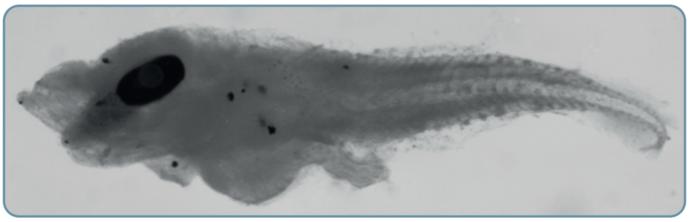
LARVAE — Figs. A-D

Body: relatively slender in early larvae, soon becomes stout and deep, especially through head and trunk
Head: relatively large, broad and deep; snout pointed; mouth large and moderately oblique
Eye: elliptical, with a large mass of choroid tissue ventrally
Gut: triangular, narrow in terminal section; anus protruding
Preanus length: 50-53% SL in early larvae, increases to 61-64% SL in postflexion stage
Air bladder: absent
Spination: none

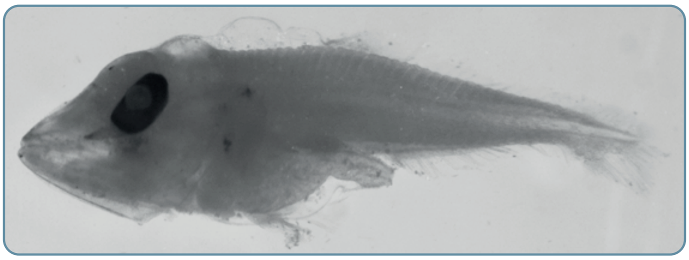
Pigmentation: tail unpigmented; upper and lower jaw-tips pigmented; midline of pigment anterior to forebrain in early larvae, becomes a pair of spots lateral to mid-brain with development; a single group of melanophores over opercular margin; few spots over mid-gut and on pectoral-fin base; scattered melanophores on nostril; a stellate melanophore ventrally on trunk; pectoral-fin rays with scattered pigment; choroid tissue mass pigmented
Length at flexion: 4.5-6.0 mm SL
Length at transformation: 10.0-13.0 mm SL

PHOTOS

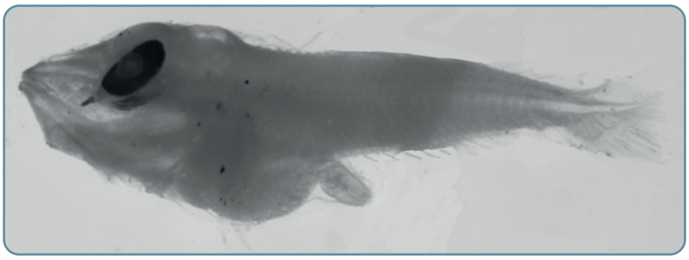
by J.M. Rodriguez



3.9 mm SL

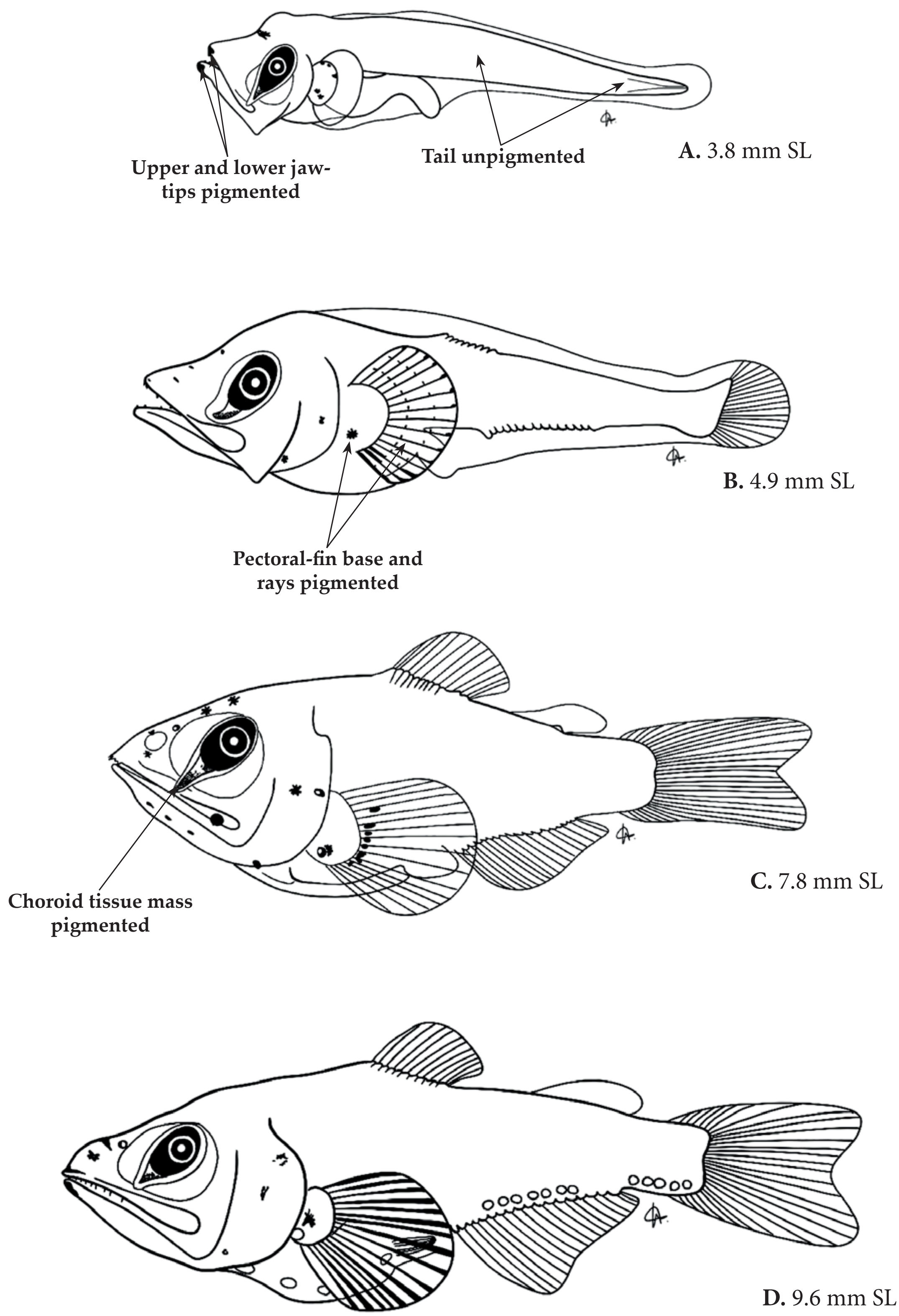


4.5 mm SL



4.7 mm SL

Dasyscopelus selenops (Tåning, 1928)



Literature: Fahay (2007), Hulley (1984), Hulley *et al.* (1990), Moser and Ahlstrom (1974), Moser and Watson (2001, 2006), Olivar *et al.* (1999)

Illustrations' sources: A-D: L. Rodríguez (**A, B, D:** redrawn from Moser and Watson, 2001; **C:** redrawn from Moser and Ahlstrom, 1974)

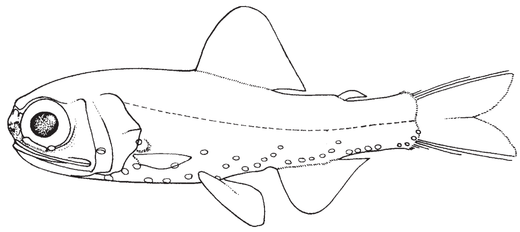
MYCTOPHIDAE

Diaphus holti Tåning, 1918

Small lantern fish - Lanterne courte

Habitat: oceanic, mesopelagic, between 40 and 777 m depth
Distribution: eastern Atlantic Ocean, from Liberia to the Bay of Biscay, and the Mediterranean Sea
Spawning season: spring and summer (Mediterranean Sea)

Meristic characters
Myomeres: 32-34
Vertebrae: 32-34
Dorsal fin: 13-14
Anal fin: 12-14



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

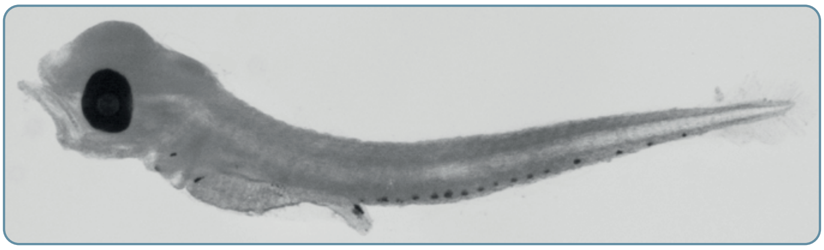
Figs. A-E

Body: relatively elongate and moderately slender
Head: relatively large; snout pointed in early larvae becomes rounded with development
Eye: round and relatively large
Gut: moderately slender and moderately curved
Preanus length: < 50% SL
Air bladder: absent
Spination: none

Pigmentation: single melanophores on ventral, lateral-anterior sides of gut, on mid-gut (in early larvae) and on terminal gut; regular row of ventral melanophores between anus and caudal region; single, large melanophore on lower half of caudal–fin base; no melanophores on head
Length at flexion: < 6.0 mm
Length at transformation: 10.0-11.0 mm

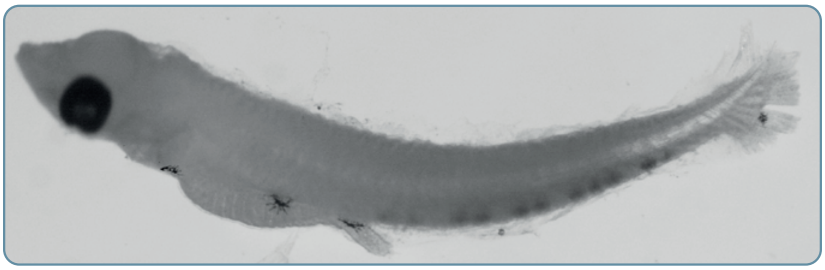
PHOTOS

by J.M. Rodriguez



3.3 mm SL

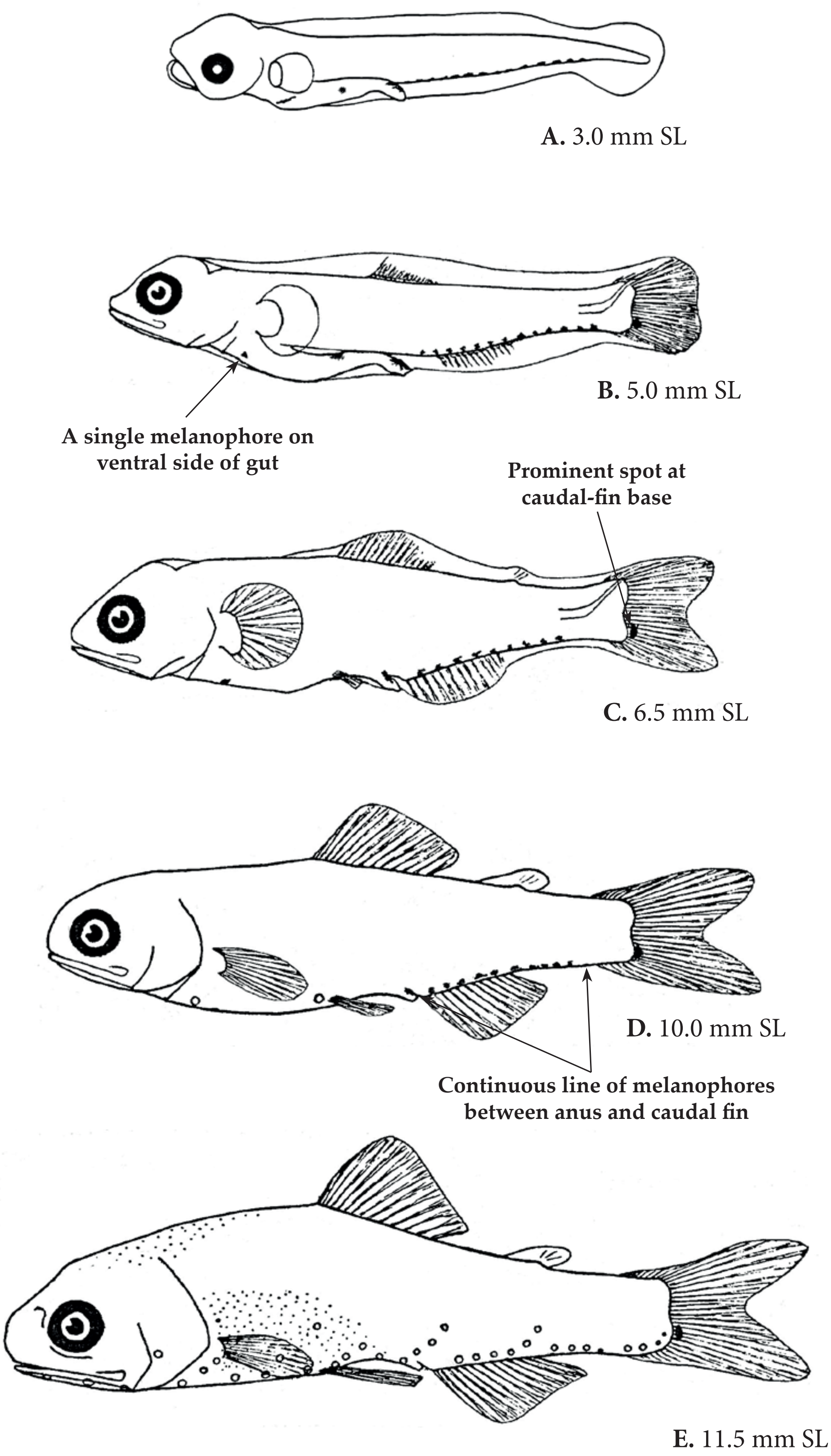
3.9 mm SL



4.6 mm SL

MYCTOPHIFORMES

Diaphus holti Tåning, 1918



Literature: Fahay (1983), Froese and Pauly (2022), Hulley (1984), Tåning (1918)

Illustrations' sources: A: Alemany (1997); **B-E:** Tåning (1918)

Diaphus metopoclampus (Cocco, 1829)

Bluntnose lanternfish

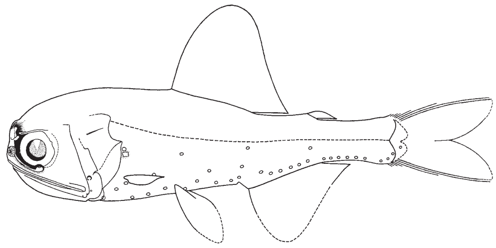
Habitat: oceanic, mesopelagic, between 90 and 800 m depth

Distribution: Atlantic, western Pacific and western Indian oceans, and the western Mediterranean Sea. Eastern Atlantic, from South Africa to the British Isles

Spawning season: unknown

Meristic characters

Myomeres: 35
Vertebrae: 35
Dorsal fin: 14-16
Anal fin: 14-16
Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

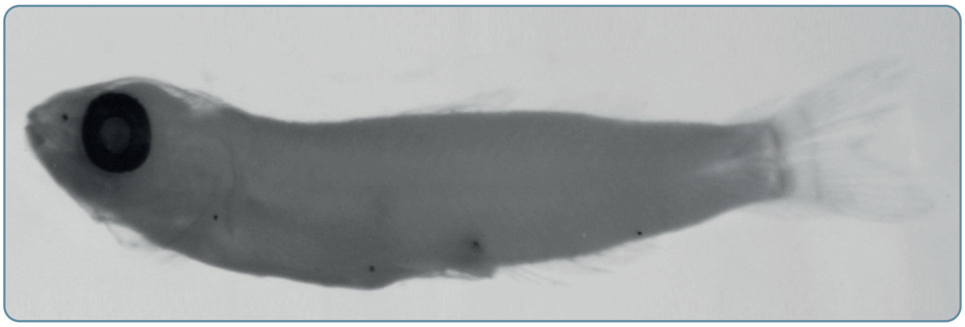
Figs. A-E

Body: relatively deep, similar to *D. rafinesquii*
Head: large and somewhat bulbous; snout short
Eye: round and moderately large
Gut: thicker anteriorly, more narrow posteriorly; anus slightly protruding
Preanus length: increases from about 50% SL, in early larvae, to about 60% SL, in late larvae
Air bladder: absent
Spination: none

Pigmentation: a single, large ventral melanophore, at posterior margin of anal fin (at about mid-tail); a pair of melanophores over anus in early larvae; melanophores over lateral sides of gut and snout (see photo) appear in late larvae; rest of body unpigmented; no melanophore on ventral side of gut, posterior to cleithral symphysis, in early larvae
Length at flexion: about 5.0 mm SL
Length at transformation: about 11.0 mm SL

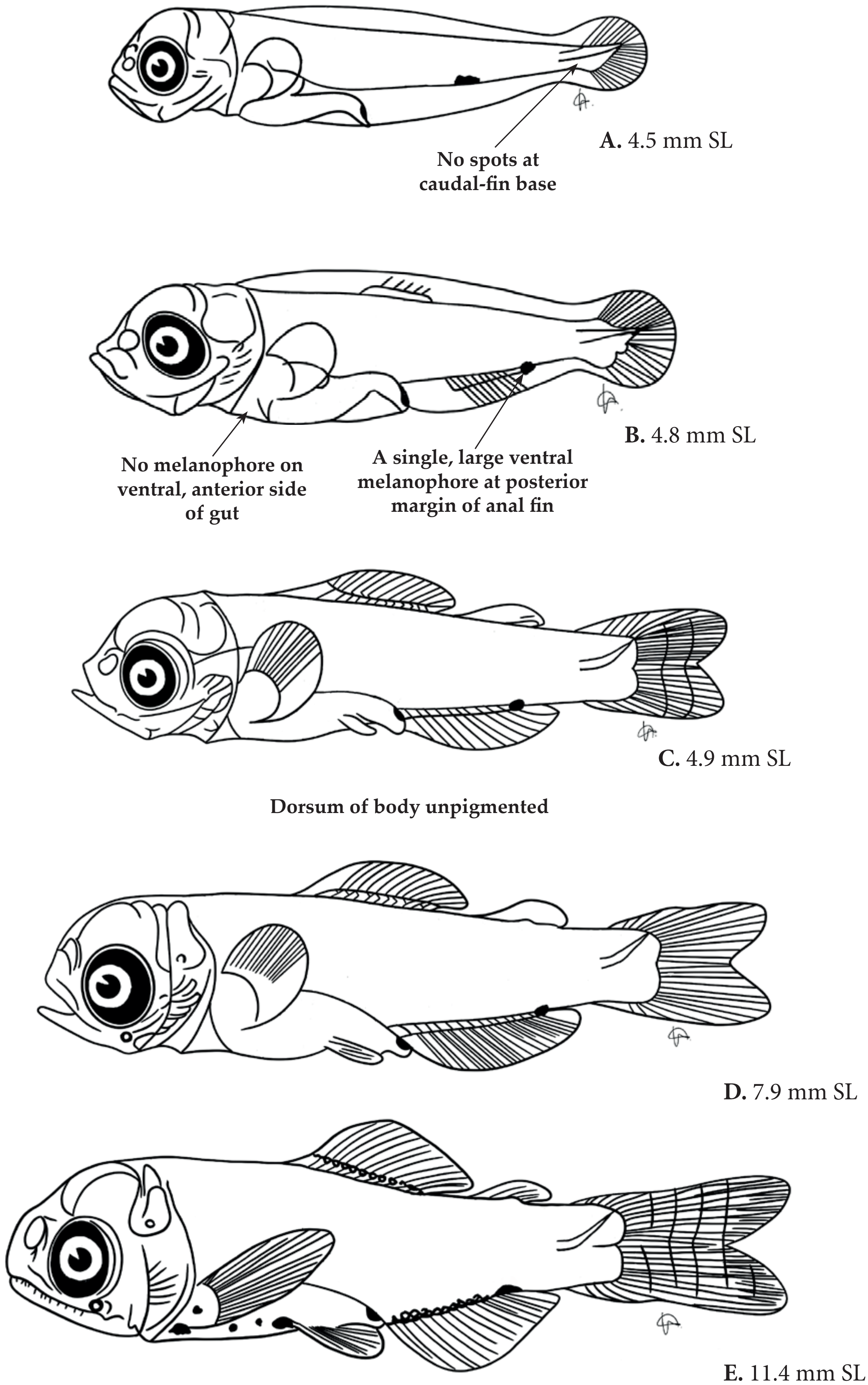
PHOTOS

by J.M. Rodriguez



8.1 mm SL

Diaphus metopoclampus (Cocco, 1829)



Literature: Fahay (2007), Froese and Pauly (2022), Hulley (1984), Moser and Ahlstrom (1974, 1996b), Moser and Watson (2001, 2006), Sparta (1952)

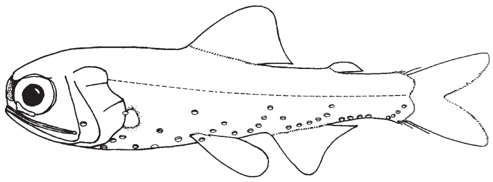
Illustrations' sources: A-E: L. Rodríguez (redrawn from Sparta, 1952)

MYCTOPHIDAE

Diaphus rafinesquii (Cocco, 1838) — Rafinesque's lanternfish

Habitat: oceanic, mesopelagic, between 40 and 700 m depth
Distribution: Atlantic Ocean (also reported from the Indian and Pacific oceans), and the Mediterranean Sea. Eastern Atlantic, from 20°N to 56°N
Spawning season: peaks in autumn and winter (Mediterranean Sea)

Meristic characters
Myomeres: 33-34
Vertebrae: 33-34
Dorsal fin: 12-14
Anal fin: 9-11
Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

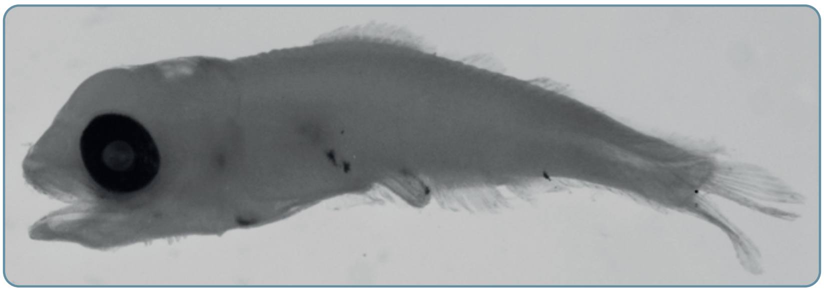
Undescribed

LARVAE — Figs. A-D

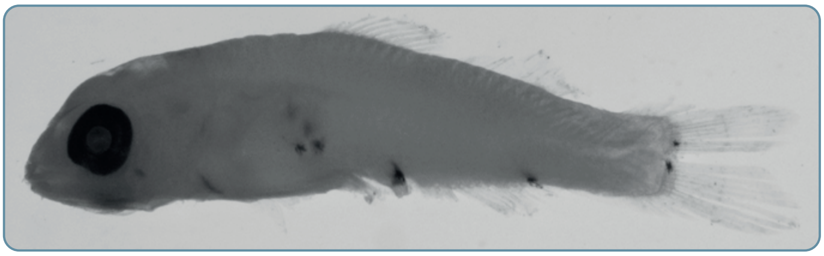
Body: relatively deep, deeper than that of *D. holti*
Head: relatively large and bulbous; snout pointed in early larvae, becomes rounded with development
Eye: round and large
Gut: thicker anteriorly, more narrow posteriorly; anus slightly protruding in early larvae
Preanus length: about 60% SL
Air bladder: absent
Spination: none

Pigmentation: a single melanophore on anterior, ventral side of gut, posterior to cleithral symphysis; single melanophores on lateral sides of gut and over anus; a single large, ventral mid-tail melanophore, at posterior margin of anal fin; 2 large melanophores (may be one in young larvae) at caudal-fin base, one on upper and one on lower half; no melanophores on head
Length at flexion: 4.5-5.0 mm SL
Length at transformation: about 10.0 mm SL

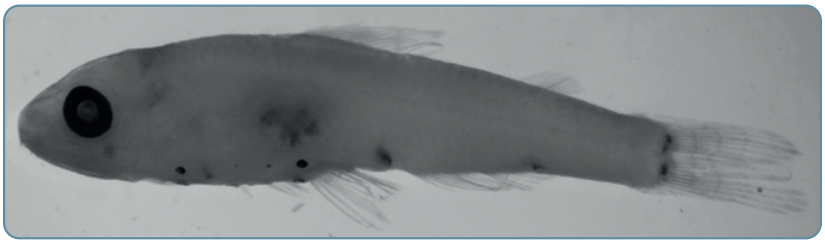
PHOTOS — by J.M. Rodriguez



4.8 mm SL



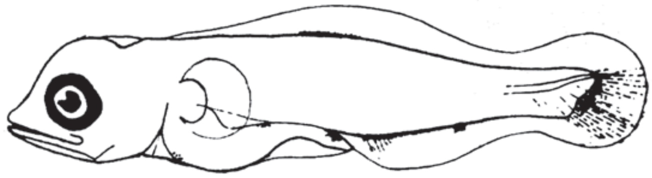
5.9 mm SL



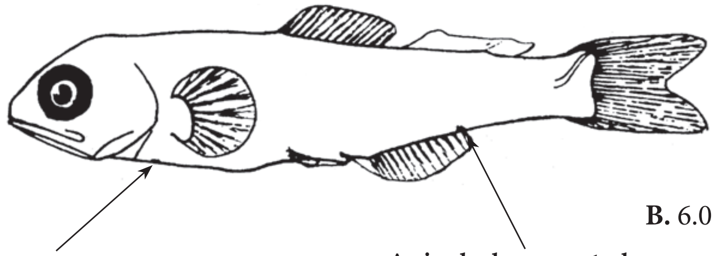
9.5 mm SL

MYCTOPHIFORMES

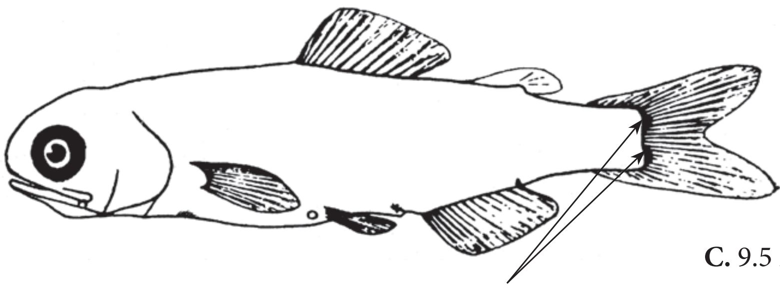
Diaphus rafinesquii (Cocco, 1838)



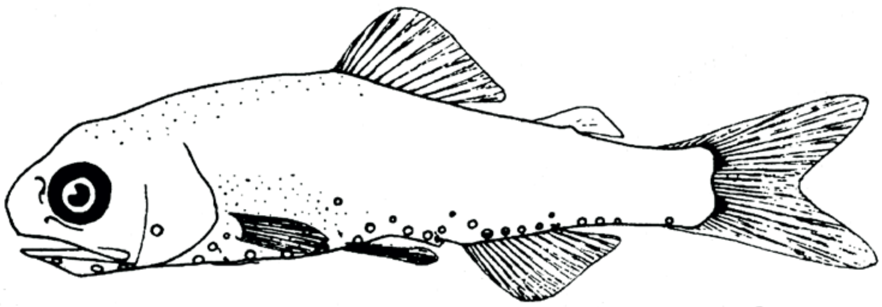
A. 4.5 mm SL



B. 6.0 mm SL



C. 9.5 mm SL



D. 10.0 mm SL

Literature: Alemany (1997), Fahay (2007), Hulley (1984), Moser and Watson (2001, 2006), Tåning (1918)

Illustrations' sources: A-D: Tåning (1918)

Diogenichthys atlanticus (Tåning, 1928) — Atlantic lanternfish

Habitat: oceanic, mesopelagic, between 18 and 1 250 m depth

Distribution: Atlantic, Pacific and Indian oceans and the western Mediterranean Sea. Eastern Atlantic Ocean, from 48°S to 50°N

Spawning season: unknown

Meristic characters

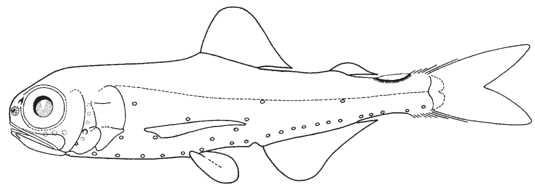
Myomeres: 31-35

Vertebrae: 31-35

Dorsal fin: 10-12

Anal fin: 14-18

Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

Figs. A-E

Body: elongate and slender, becoming somewhat compressed with development

Head: large, rounded in early and late stages of development, slightly concave at middle stages; snout pointed, becoming round and shorter in late larvae; a symphyseal barbel forms at about 5.0 mm, and disappears before transformation

Eye: elliptical, becoming rounded in late larvae; choroid tissue absent

Gut: slightly sigmoid, thicker anteriorly; terminal gut makes almost a right angle with body in early larvae; anus moderately protruding

Preanus length: about 50-60% SL

Air bladder: absent

Spination: none

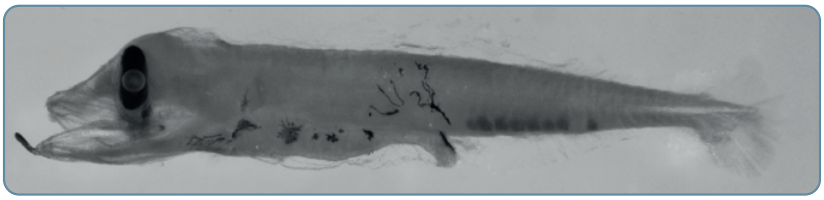
Pigmentation: in early larvae, a ventro-lateral pair of melanophores just posterior to cleitrhum; dorso-lateral pairs of melanophores on terminal gut; two lateral pairs on mid-gut; about 3 melanophores in ventral series, posterior to anus; in late larvae, number of melanophores on lateral side of gut and ventral series, posterior to anus, increases; melanophores on jaw barbel appear; a large spot develops at base of caudal fin

Length at flexion: 6.0-9.0 mm SL

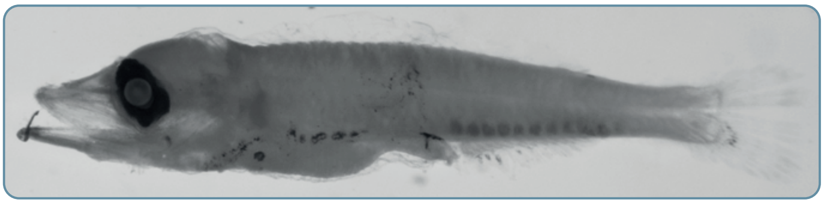
Length at transformation: 13.5-15.5 mm SL

PHOTOS

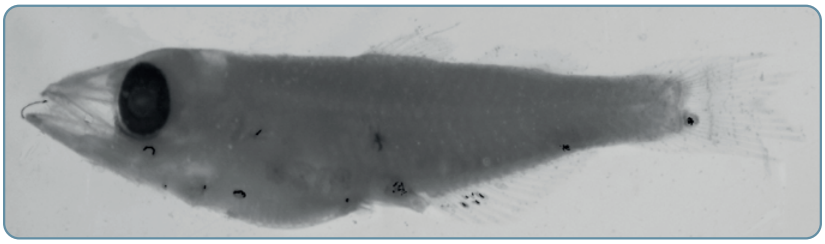
by J.M. Rodriguez



5.4 mm SL



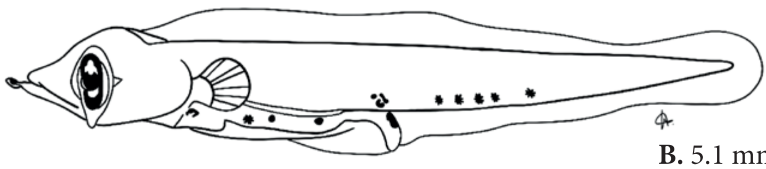
9.2 mm SL



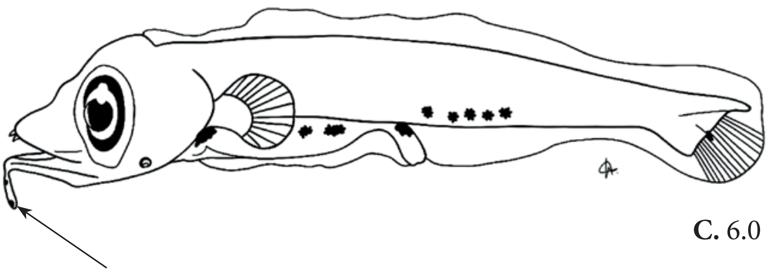
Not sized

Diogenichthys atlanticus (Tåning, 1928)

A. 3.6 mm SL

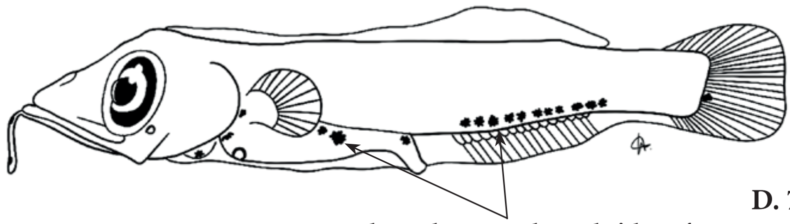


B. 5.1 mm SL



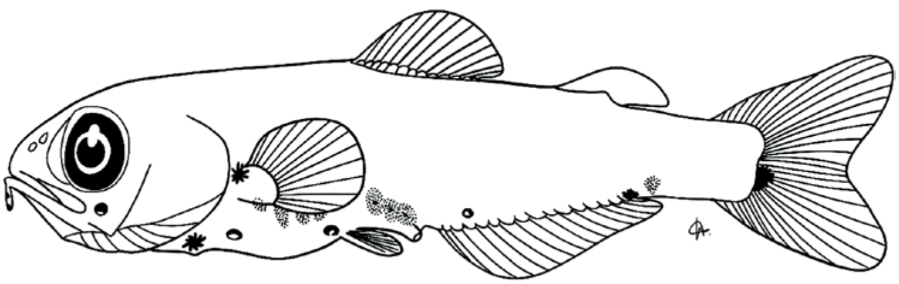
C. 6.0 mm SL

Jaw barbel, pigmented, present at middle stages of development



D. 7.2 mm SL

Melanophores on lateral sides of gut and posterior to anus increase in number with development



E. 12.8 mm SL

Literature: Fahay (2007), Froese and Pauly (2022), Hulley (1984), Moser and Ahlstrom (1970), Moser and Watson (2001, 2006), Olivar and Fortuño (1991)

Illustrations' sources: A-E: L. Rodríguez (redrawn from Moser and Ahlstrom, 1970)

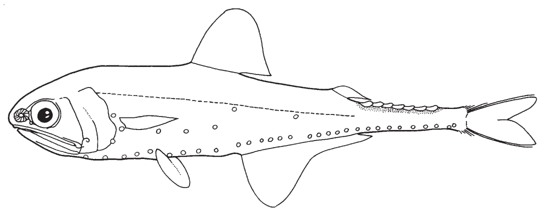
MYCTOPHIDAE

MYCTOPHIFORMES

Gonichthys cocco Cocco, 1829 — Cocco's lanternfish

Habitat: oceanic, mesopelagic, between 0 and 1 000 m depth
Distribution: Atlantic Ocean and the Mediterranean Sea. Eastern Atlantic, from South Africa to Morocco
Spawning season: May to June (Mediterranean Sea)

Meristic characters
Myomeres: 40-41
Vertebrae: 40-41
Dorsal fin: 20-23
Anal fin: 13-16
Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

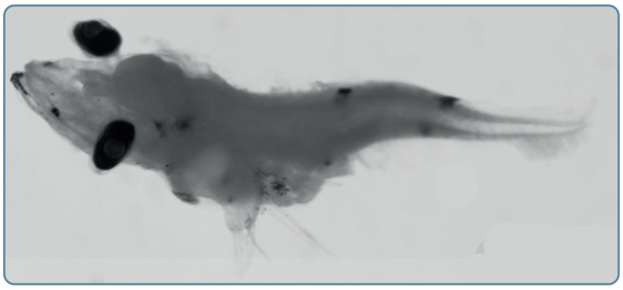
LARVAE

Figs. A-C

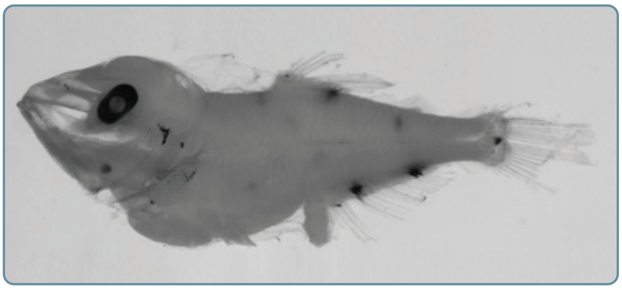
Body: deep, highly laterally compressed; large anterior finfold present until transformation
Head: large; snout large and pointed in early larvae, becoming blunt in later larvae; jaws large, slightly oblique
Eye: oblique, with a large conical mass of choroid tissue ventrally, finely striped
Gut: strongly sigmoid; anus protruding
Preanus length: increases from 50 to 60% SL throughout development
Air bladder: absent
Spination: none
Pigmentation: 2 large dorsal and 2 opposing, large ventral melanophores behind anus; an additional melanophore on dorsum of body, anterior to dorsal fin, appearing after flexion; a series of melanophores along margins of upper and lower jaw; a large spot at caudal-fin base; later larvae with melanophores above and on ventral surface of gut, on lateral sides of head, and on snout; pectoral-fin rays pigmented
Length at flexion: 5.0-7.5 mm SL
Length at transformation: > 12.0 mm SL

PHOTOS

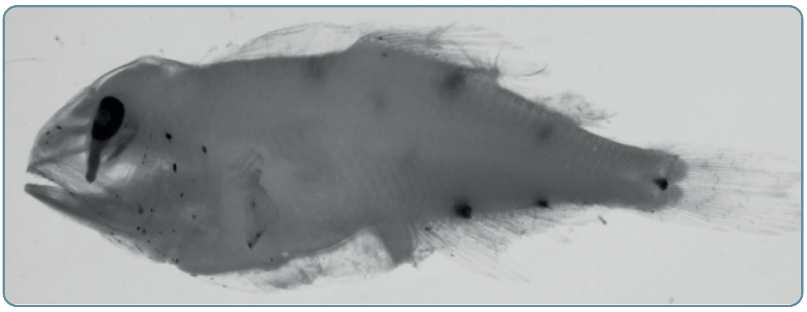
by J.M. Rodriguez



4.5 mm SL

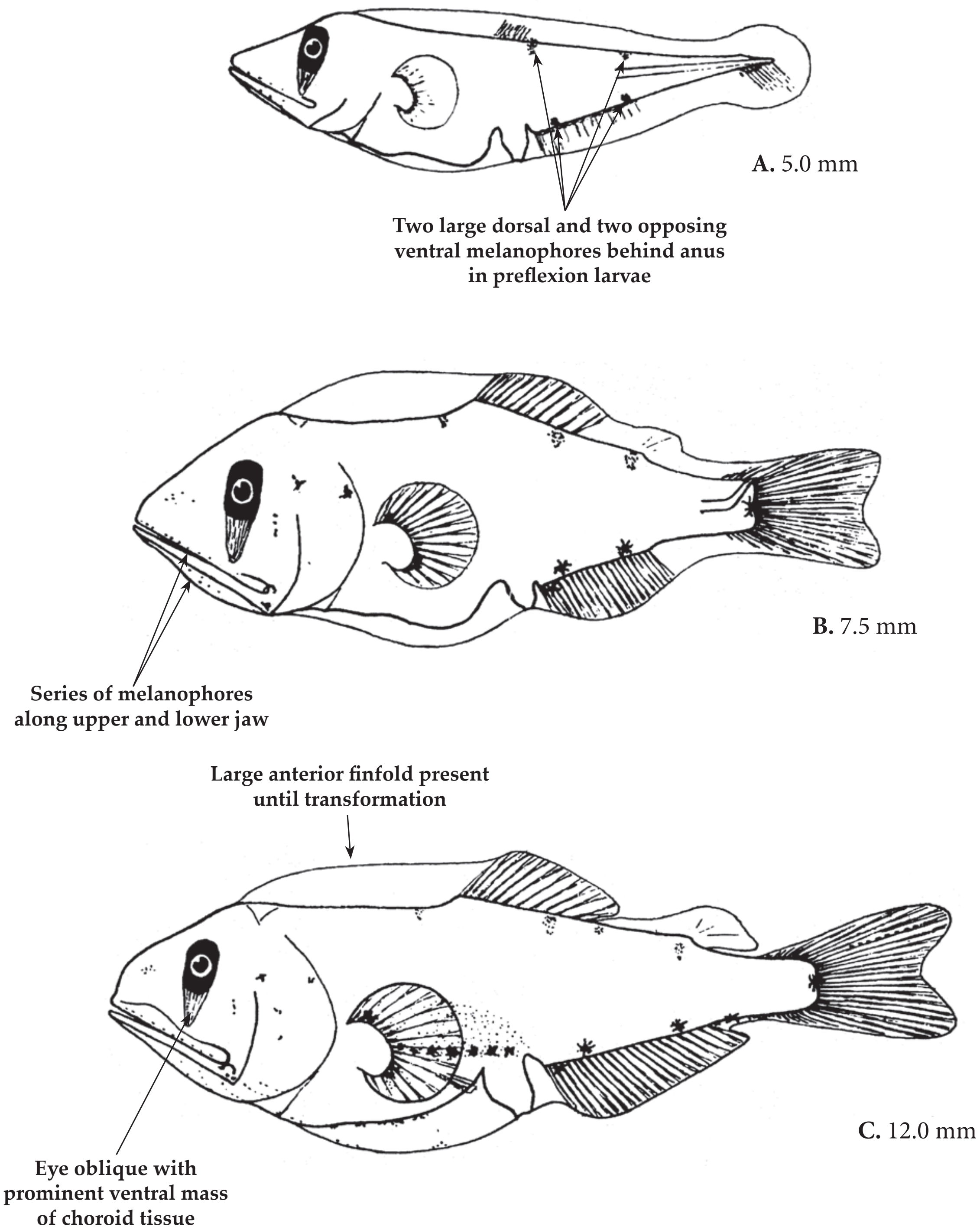


6.1 mm SL



9.3 mm SL

Gonichthys cocco Cocco, 1829



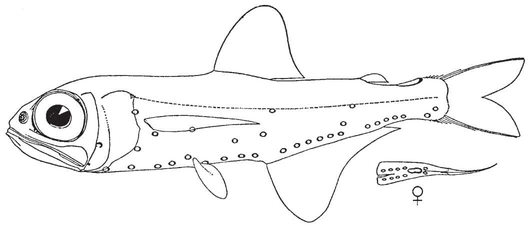
Literature: Fahay (2007), Froese and Pauly (2022), Hulley (1984), Moser and Ahlstrom (1970), Moser and Watson (2001, 2006), Tåning (1918)

Illustrations' sources: A-C: Tåning (1918)

Hygophum benoiti (Cocco, 1838) — Benoit's lanternfish - Lanterne benoite

Habitat: oceanic, mesopelagic, between 50 and 700 m depth
Distribution: eastern Atlantic Ocean, from Mauritania to Portugal, and the Mediterranean Sea
Spawning season: peaks in spring and summer (Mediterranean Sea)

Meristic characters
Myomeres: 34-37
Vertebrae: 34-37
Dorsal fin: 12-14
Anal fin: 19-21



EGGS

Undescribed

YOLK–SAC LARVAE

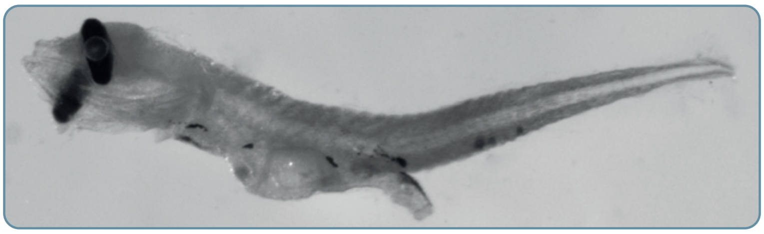
Undescribed

LARVAE — Figs. A-E

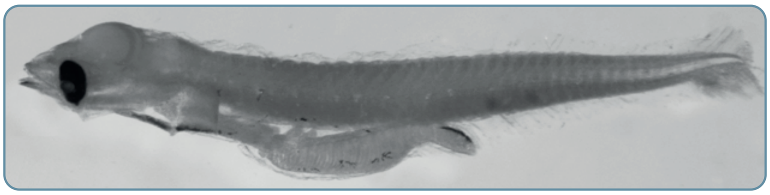
Body: relatively elongate and moderately slender, increasing in depth with development; remains of prominent finfold between head and dorsal fin, present up to pre-transformation stage
Head: relatively large; snout pointed in early larvae, becomes rounded with development
Eye: moderately elliptical with a prominent conical mass of choroid tissue ventrally
Gut: thick, slightly curved, with visible transverse folds; protruding anus, situated at anterior margin of anal fin
Preanus length: about 55% SL in early larvae, increases with development to > 60% SL
Air bladder: absent
Spination: none
Pigmentation: paired, ventral series of melanophores on isthmus and just posterior to cleithral symphysis; a series of usually 3 melanophores on lateral sides of gut; a large melanophore over anus; melanophores on caudal–fin base in some individuals; melanophores on finfold in larvae < 3.0 mm
Length at flexion: 5.0-5.5 mm SL
Length at transformation: 10.0-12.5 mm SL

Larvae of the two species of the *Hygophum* genus, *H. benoiti* and *H. hygomii*, are very similar and their differentiation, based mainly on their pigmentation patterns, is problematic.

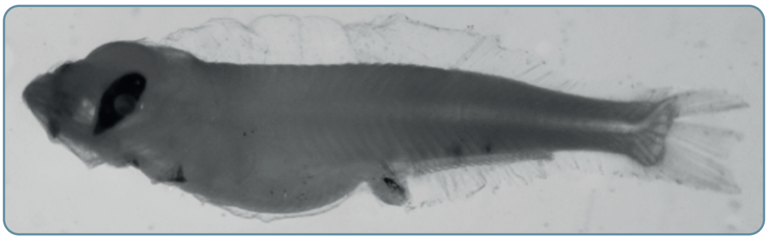
PHOTOS — by J.M. Rodriguez



3.0 mm SL

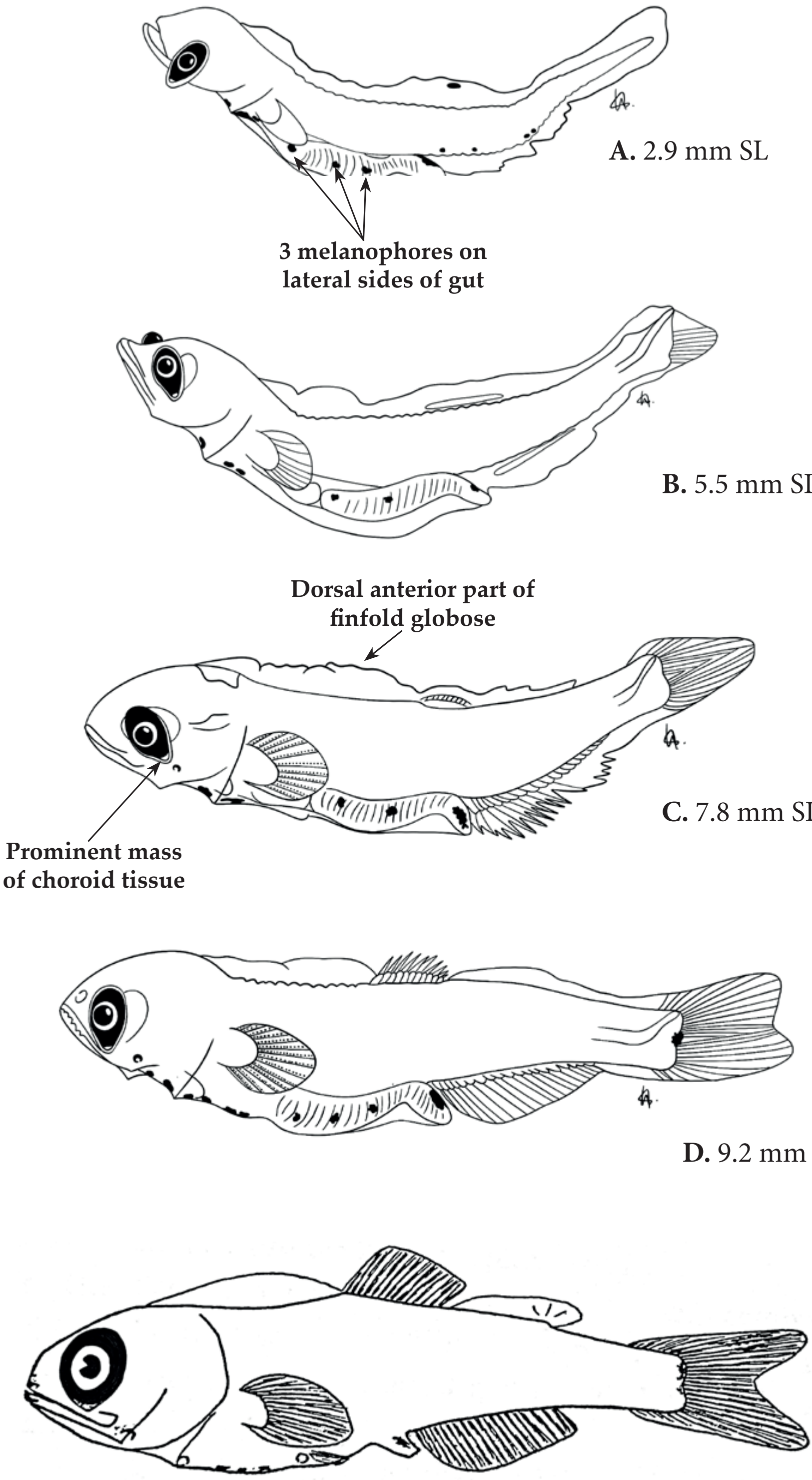


5.8 mm SL



6.9 mm SL

Hygophum benoiti (Cocco, 1838)



A. 2.9 mm SL

B. 5.5 mm SL

C. 7.8 mm SL

D. 9.2 mm SL

E. 10.5 mm SL

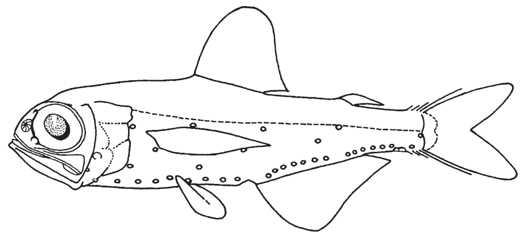
Literature: Badcock and Merrett (1976), Fahay (2007), Froese and Pauly (2022), Hulley (1984), Olivar and Palomera (1994), Tåning (1918)

Illustrations' sources: A-D: L. Rodríguez (redrawn from Olivar and Palomera, 1994); **E:** Tåning (1918)

Hygophum hygomii (Lütken, 1892) — Bermuda lanternfish - Lanterne des Bermudes

Habitat: oceanic, mesopelagic, between 0 and 700 m depth
Distribution: Atlantic Ocean, and the Mediterranean Sea. Eastern Atlantic, from South Africa to Portugal
Spawning season: peaks in summer and autumn (Mediterranean Sea)

Meristic characters
Myomeres: 36-38
Vertebrae: 36-38
Dorsal fin: 12-14
Anal fin: 19-21
Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

Figs. A-E

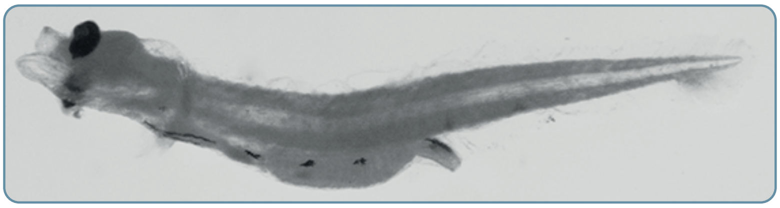
Body: moderately slender, slightly increasing in depth with development; remains of prominent finfold, between head and dorsal fin, up to pre-transformation stage
Head: relatively large; snout pointed in early larvae, becoming rounded with development
Eye: moderately elliptical with a prominent conical mass of choroid tissue ventrally
Gut: thick, slightly curved, with visible transverse folds; anus situated at anterior margin of anal fin, protruding
Preanus length: < 60% SL
Air bladder: absent

Spination: none
Pigmentation: a ventral series of melanophores at cleithral symphysis and on isthmus; melanophores rarely found at tip of snout, lower jaw, and on caudal-fin rays; 1-2 melanophores on lateral sides of gut; a prominent melanophore over anus; postanal ventral melanophores reduced to one (or none) over middle of anal-fin base; finfold borders unpigmented; no melanophores over ventral rays of caudal fin; pectoral-fin rays pigmented
Length at flexion: 6.0-7.0 mm SL
Length at transformation: 13.0-14.5 mm SL

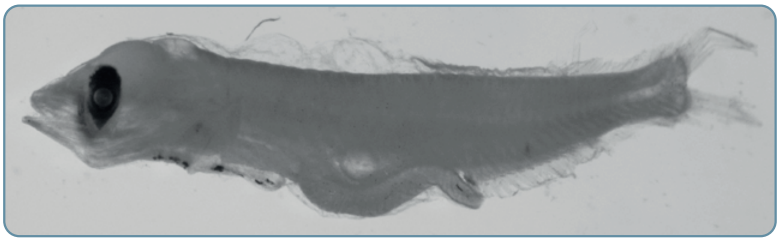
Larvae of the two species of the *Hygophum* genus, *H. benoiti* and *H. hygomii*, are very similar and their differentiation, based mainly on their pigmentation patterns, is problematic.

PHOTOS

by J.M. Rodriguez



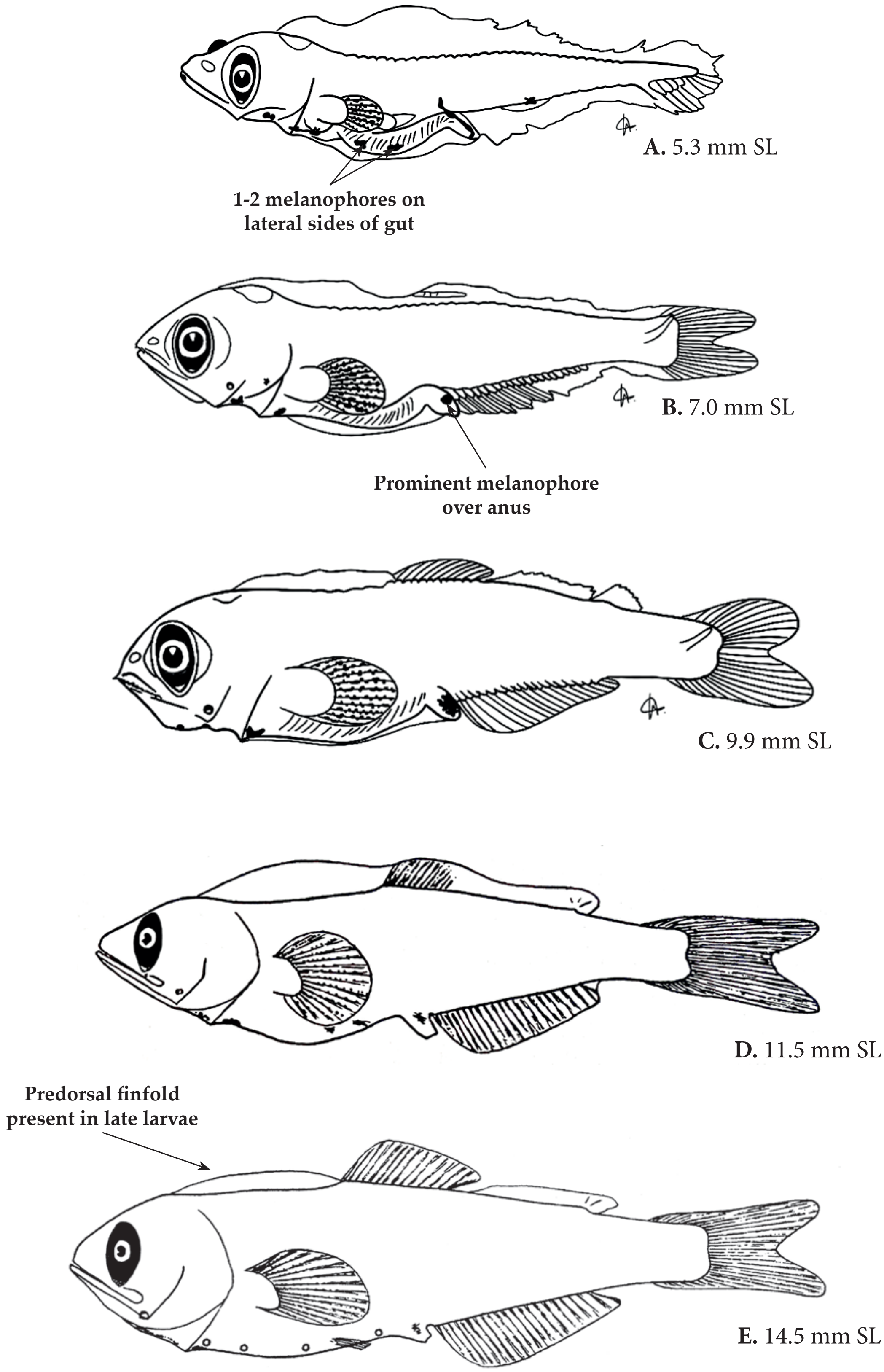
4.9 mm SL



6.6 mm SL

9.3 mm SL

Hygophum hygomii (Lütken, 1892)



Literature: Fahay (2007), Hulley (1984, 1990), Moser and Watson (2001, 2006), Olivar and Palomera (1994), Olivar *et al.* (1999), Tåning (1918)

Illustrations' sources: A-C: L. Rodríguez (redrawn from Olivar and Palomera, 1994); **D, E:** Tåning (1918)

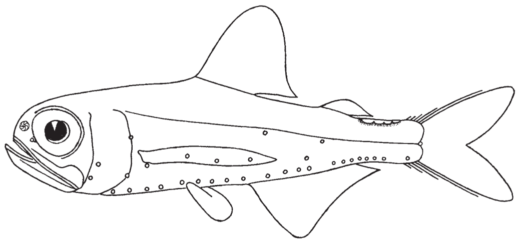
MYCTOPHIDAE

Hygophum macrochir (Günther, 1864)

Large-finned lanternfish

Habitat: oceanic, mesopelagic, between 0 and 750 m depth
Distribution: Atlantic Ocean. Eastern Atlantic, between about 3°S and 18°N
Spawning season: unknown

Meristic characters
Myomeres: 35
Vertebrae: 35
Dorsal fin: 12-14
Anal fin: 17-21
Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

Figs. A-E

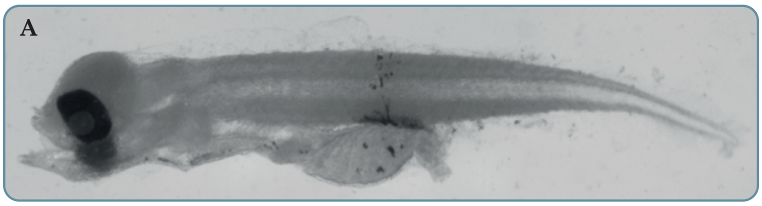
Body: relatively deep and laterally compressed, except in early larvae; body depth at anus ranges from about 15% SL in flexion stage to 29% SL in late larvae
Head: moderately large; snout slightly pointed
Eye: slightly oblique and wider than in other *Hygophum* species (similar to *H. taaningi*) with no choroid tissue
Gut: narrow anteriorly and thick posteriorly, with prominent terminal gut; anus slightly protruding
Preanus length: between 59 and 61% SL
Air bladder: absent
Spination: none

Pigmentation: ventral series of melanophores on isthmus and cleithrum (genus-specific); very small melanophores on ventral edge of tail in early larvae; some ventral melanophores between cleithrum and anus; a cluster of melanophores over terminal section of gut; upper and lower jaw-tips pigmented in late larvae; some postflexion larvae have a single melanophore on caudal-fin base
Length at flexion: 5.5-6.0 mm SL
Length at transformation: 10.0-11.0 mm SL

PHOTOS

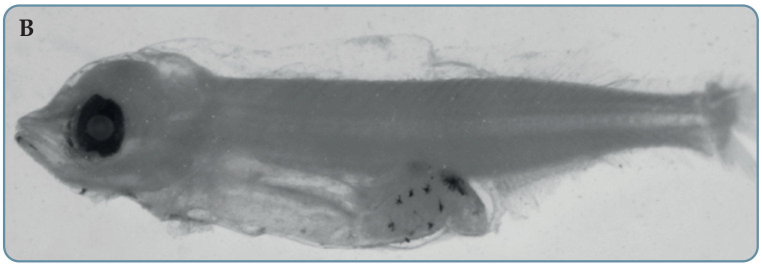
A, B: J.M. Rodriguez; **C:** S. Isari

A



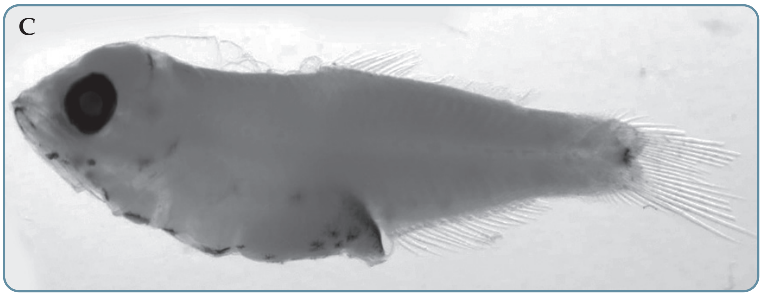
3.4 mm SL

B



5.4 mm SL

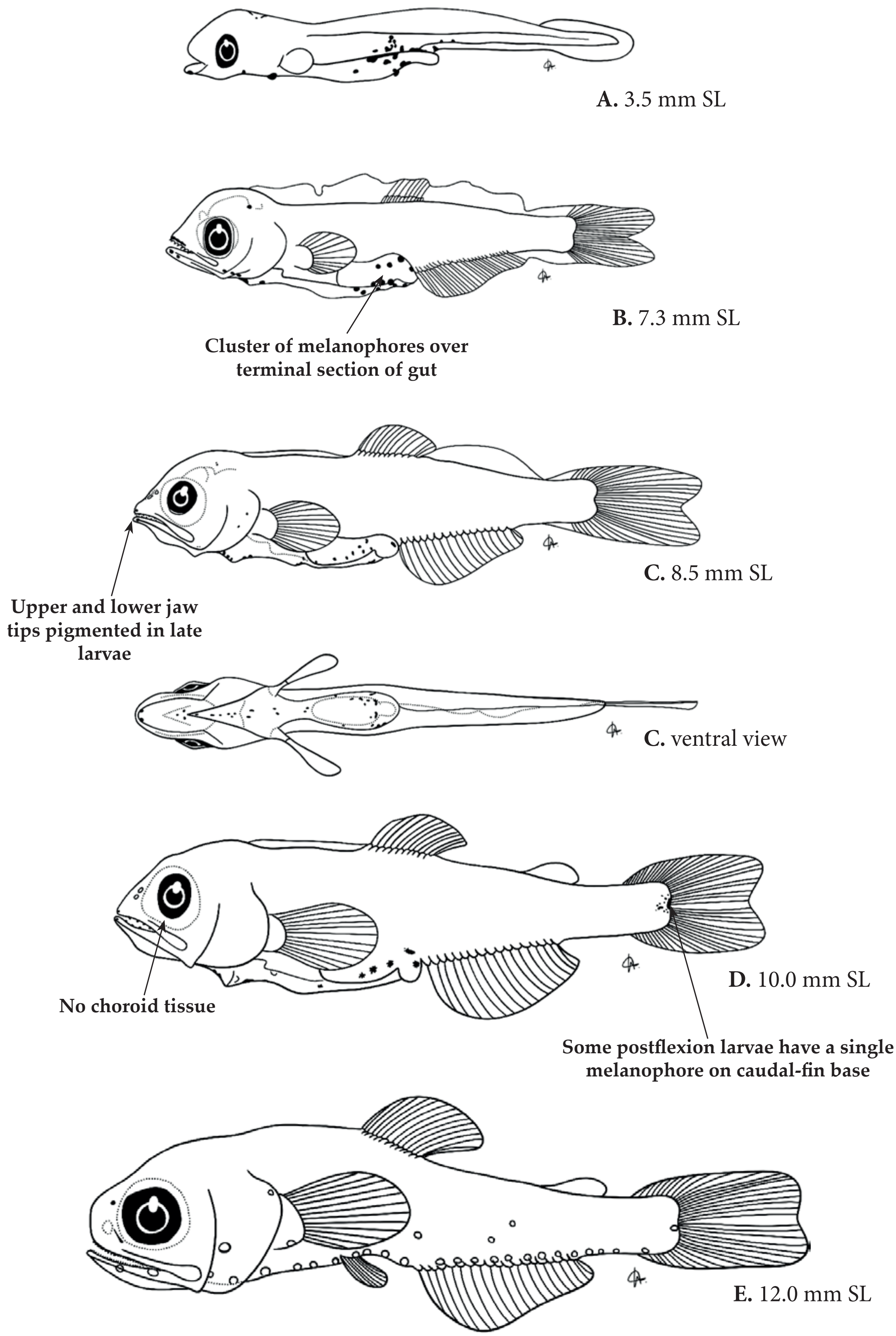
C



8.9 mm SL

MYCTOPHIFORMES

Hygophum macrochir (Günther, 1864)

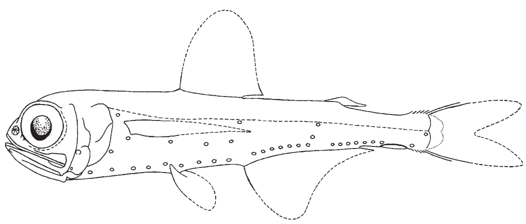


Literature: Fahay (2007), Hulley (1990), Moser and Ahlstrom (1974); Moser and Watson (2001, 2006), Olivar (1988), Olivar and Fortuño (1991)
Illustrations' sources: A-E: L. Rodríguez (**A:** redrawn from Olivar, 1988; **B:** redrawn from Moser and Ahlstrom, 1974; **C-E:** redrawn from Moser and Watson, 2001)

Hygophum reinhardtii (Lütken, 1892) Reinhardt's lanternfish

Habitat: oceanic, mesopelagic, between 10 and 900 m depth
Distribution: Atlantic, Pacific and southern Indian oceans. Eastern Atlantic from Namibia to Morocco (absent from the Mediterranean Sea)
Spawning season: unknown

Meristic characters
Myomeres: 38-40
Vertebrae: 38-40
Dorsal fin: 13-15
Anal fin: 21-25
Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

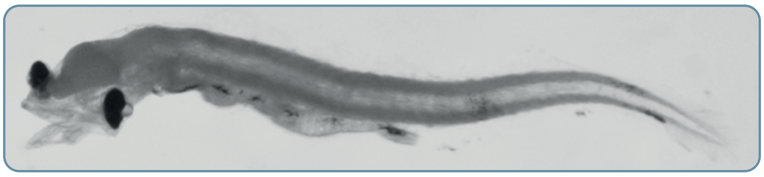
Undescribed

LARVAE Figs. A-G

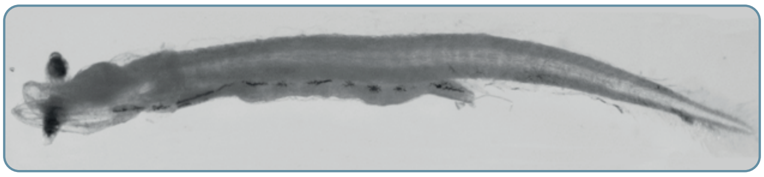
Body: elongate and thin, more elongate than larvae of congener species; body depth 10% SL, deepens before transformation
Head: flattened in early larvae; snout pointed in early larvae, becomes rounded before transformation
Eye: strongly elliptical on short stalks; prominent mass of ventral choroid tissue present
Gut: elongate and thin, nearly straight
Preanus length: increases from 55% to 65% throughout development
Air bladder: absent
Spination: none

Pigmentation: 2 ventral melanophores on isthmus; ventral melanophores just posterior to cleitrhum, along mid-section of gut and on anus; 2 postanal melanophores at ventral mid-tail; 1-2 melanophores on dorsum of tail end (disappear in late larvae); a melanophore at base of caudal fin; in late larvae, melanophores increase in number along lateral sides of gut and ventral tail, and these latter migrate onto miosepta
Length at flexion: 8.8-10.3 mm SL
Length at transformation: 14.9-16.4 mm SL

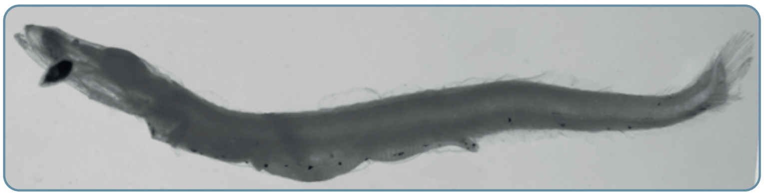
PHOTOS by J.M. Rodriguez



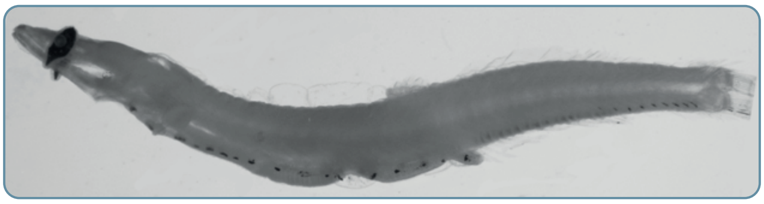
4.8 mm SL



6.0 mm SL

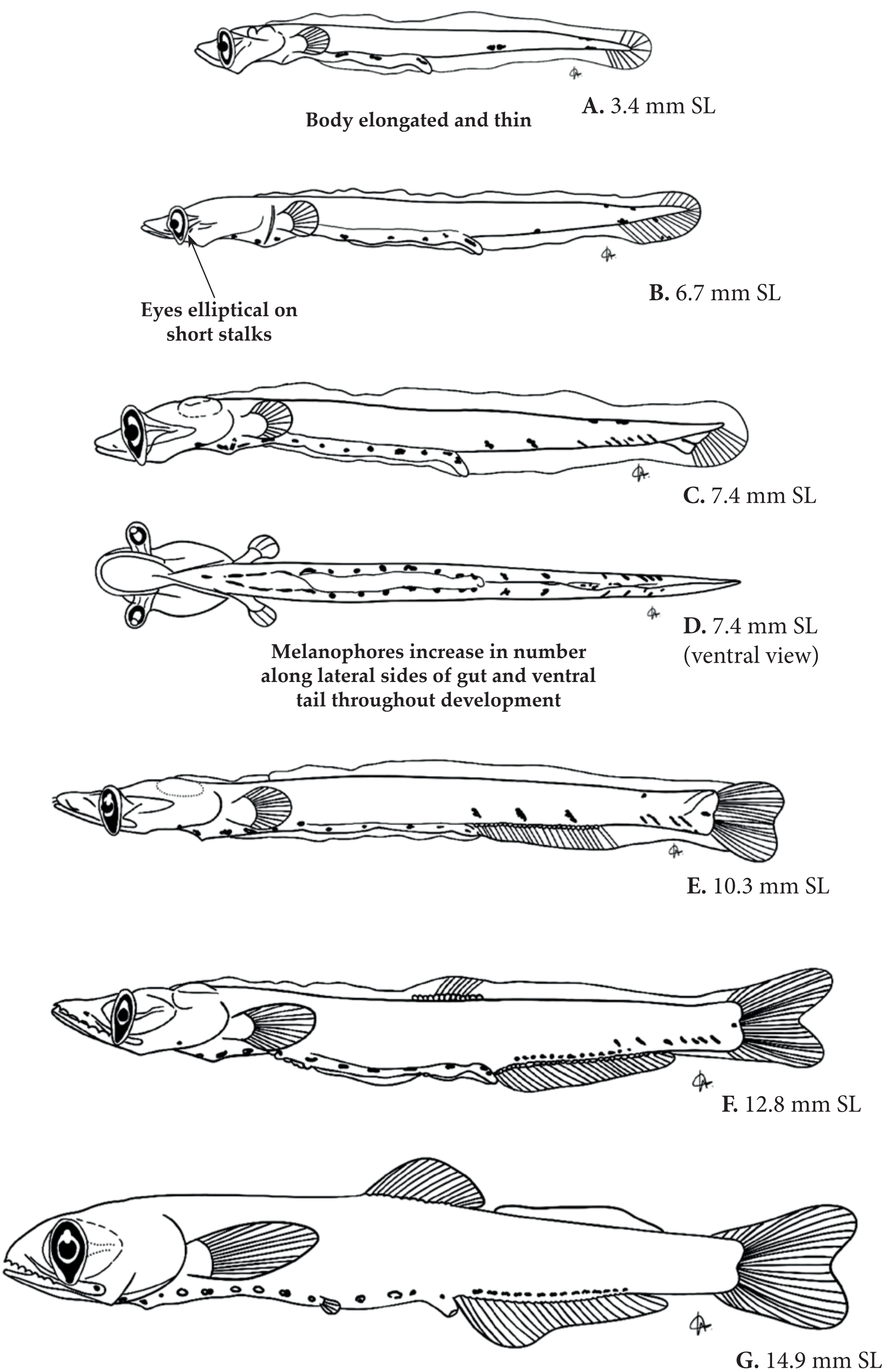


10.1 mm SL



12.4 mm SL

Hygophum reinhardtii (Lütken, 1892)



Literature: Fahay (2007), Froese and Pauly (2022), Hulley (1984), Moser and Ahlstrom (1970, 1974), Moser and Watson (2001, 2006)

Illustrations' sources: A-G: L. Rodrìguez (redrawn from Moser and Ahlstrom, 1970)

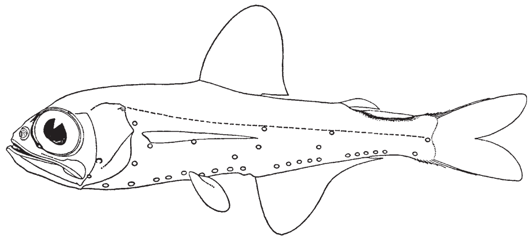
MYCTOPHIDAE

Hygophum taaningi Becker, 1965

Tåning's lanternfish

Habitat: oceanic, mesopelagic, between 0 and 1 000 m depth
Distribution: Atlantic Ocean. Eastern Atlantic, between 22°S and 40°N (absent from the Mediterranean Sea)
Spawning season: unknown

Meristic characters
Myomeres: 35-36
Vertebrae: 35-36
Dorsal fin: 12-14
Anal fin: 17-23
Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

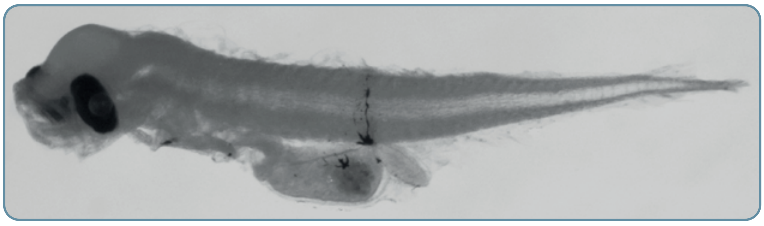
Figs. A-D

Body: relatively deep and laterally compressed; body depth 27–28% SL in flexion stage, 25–31% SL in postflexion stage
Head: moderately large; snout slightly pointed
Eye: slightly oblique with little or no choroid tissue
Gut: thick (narrower anteriorly) with prominent terminal gut; anus slightly protruding
Preanus length: 60% SL
Air bladder: present
Spination: none

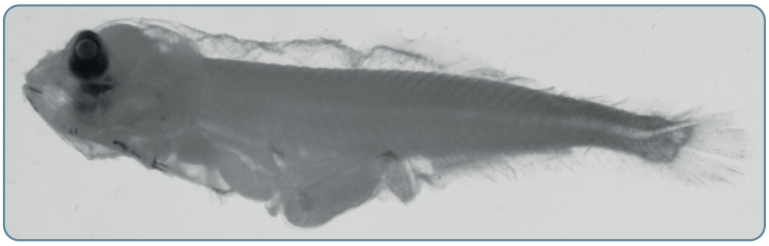
Pigmentation: a pair of melanophores on isthmus and another pair posterior to cleitrhum; a spot under midgut; a prominent melanophore (with fewer minor ones) that in early larvae extends to body at end of gut; 1-2 embedded melanophores anterior to pectoral-fin base; a pair of melanophores on antero-lateral margin of lower jaw in late larvae; dorsum of body unpigmented
Length at flexion: 4.2-6.0 mm SL
Length at transformation: 10.0-12.0 mm SL

PHOTOS

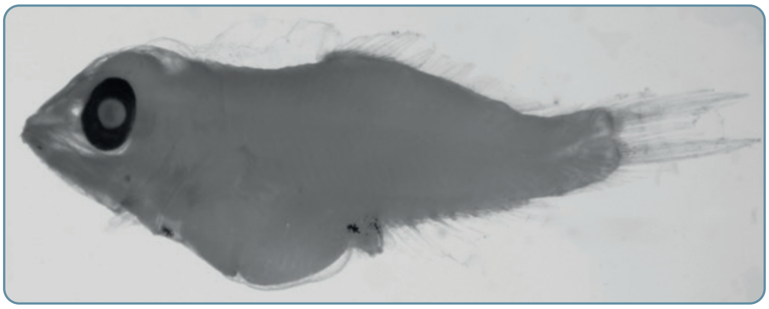
by J.M. Rodriguez



3.5 mm SL



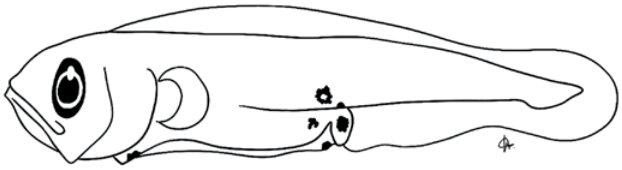
6.3 mm SL



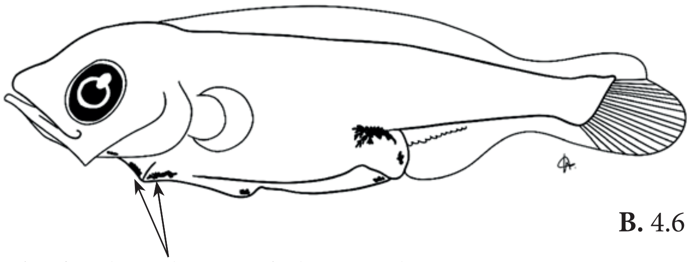
7.3 mm SL

MYCTOPHIFORMES

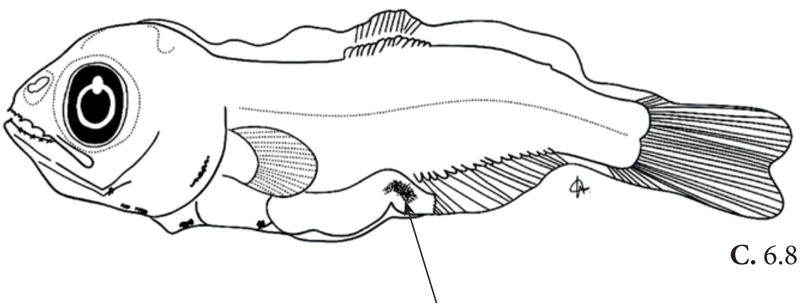
Hygophum taaningi Becker, 1965



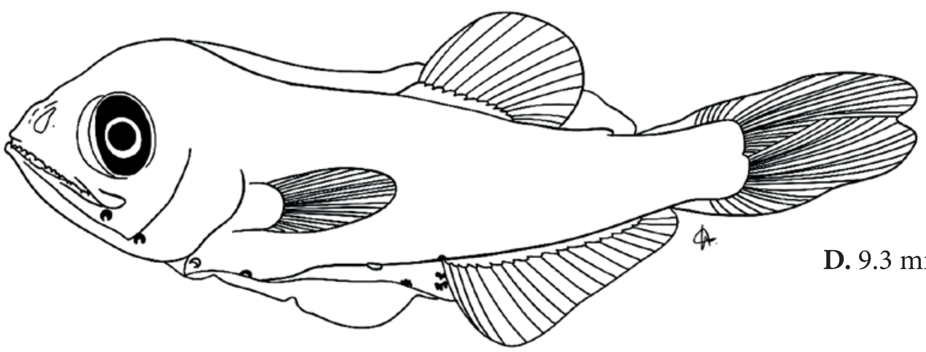
A. 4.1 mm SL



B. 4.6 mm SL



C. 6.8 mm SL



D. 9.3 mm SL

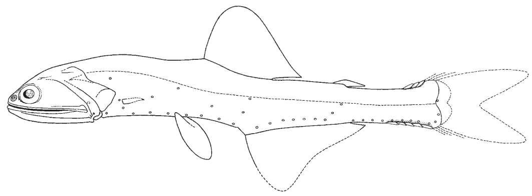
Literature: Fahay (2007), Froese and Pauly (2022), Hulley (1984), Moser and Ahlstrom (1974), Moser and Watson (2001, 2006)

Illustrations' sources: A-D: L. Rodrìguez (**A, B, D:** redrawn from Moser and Watson, 2001; **C:** redrawn from Moser and Ahlstrom, 1974)

Lampanyctus ater Tåning, 1928 — Dusky lanternfish

Habitat: oceanic, mesopelagic, between 40 and 750 m depth
Distribution: North and South Atlantic, South Pacific and Indian oceans. Eastern Atlantic, between 15°S-40°S and 17°N-58°N
Spawning season: unknown

Meristic characters
Myomeres: 36-39
Vertebrae: 36-39
Dorsal fin: 12-16
Anal fin: 17-21
Adipose fin: present



EGGS

Undescribed

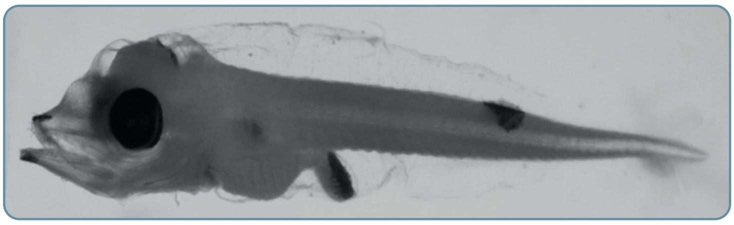
YOLK–SAC LARVAE

Undescribed

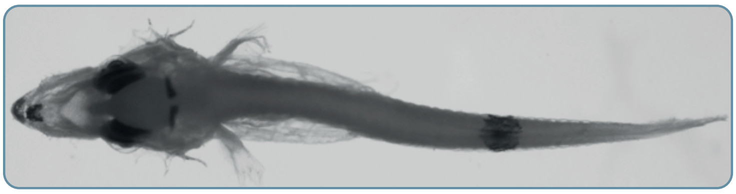
LARVAE — Figs. A-E

Body: deep anteriorly, tapers to a narrow caudal peduncle; body becomes shallower throughout development
Head: large; snout pointed; jaws large; teeth protruding in upper jaw from early larvae on
Eye: slightly elliptical
Gut: triangular and thick; anus protruding
Preanus length: increases from about 60% SL, in early larvae, to about 70% SL, in later larvae
Air bladder: present
Spination: two series of large preopercular spines, one on edge and one on lateral ridge
Pigmentation: a pair of melanophores on head and another pair over anus; upper and lower jaw tips pigmented; a large melanophore at dorsal-fin end; air bladder pigmented
Length at flexion: 5.0-6.0 mm SL
Length at transformation: > 15.0 mm SL

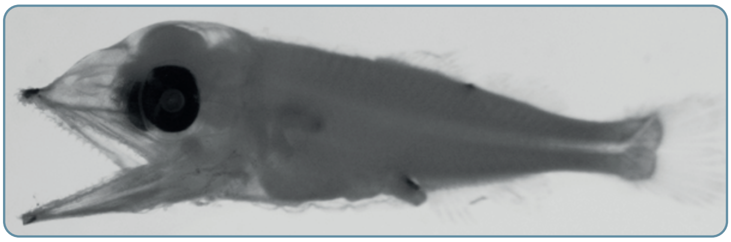
PHOTOS — by J.M. Rodriguez



Not sized

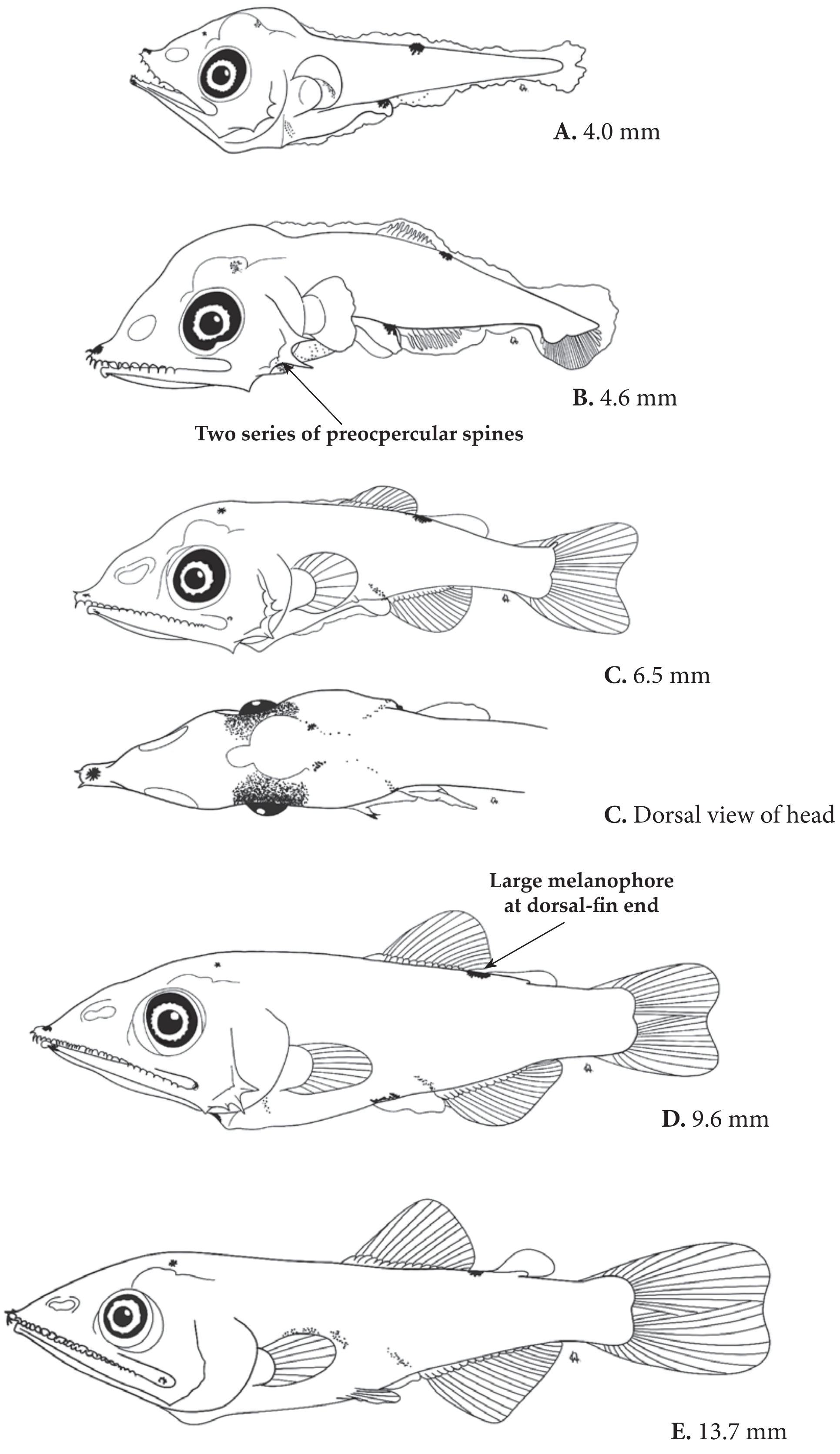


Not sized (dorsal view)



7.3 mm SL

Lampanyctus ater Tåning, 1928



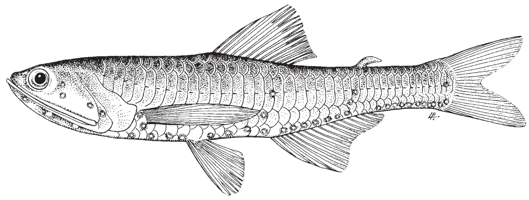
Literature: Fahay (2007), Froese and Pauly (2022), Moser and Watson (2001, 2006)

Illustrations' sources: A-E: L. Rodríguez (redrawn from Moser and Watson, 2001)

Lampanyctus crocodilus (Risso, 1810) — Jewel lanternfish – Lanterne crocodile

Habitat: oceanic, mesopelagic, between 0 and 1 000 m depth
Distribution: North Atlantic Ocean and the Mediterranean Sea. Eastern Atlantic, from the Mauritanian upwelling region to 65°N
Spawning season: March to August

Meristic characters
Myomeres: 35-36
Vertebrae: 35-36
Dorsal fin: 13-15
Anal fin: 16-18
Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

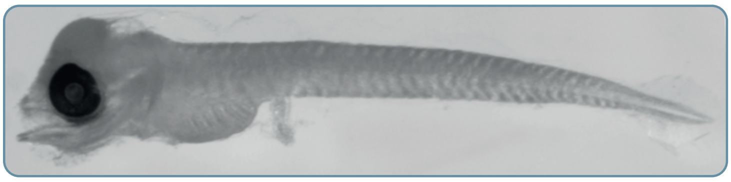
Undescribed

LARVAE — Figs. A-F

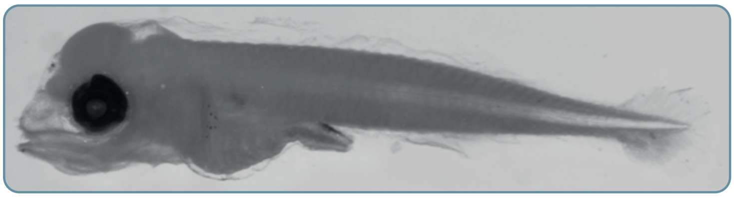
Body: initially elongate, soon deepens, especially at level of pectoral region
Head: large with pointed snout; well–developed protruding teeth in upper jaw from early larvae on
Eye: round and moderately large
Gut: thicker anteriorly; anus makes almost a right angle with body in early larvae; anus slightly protruding
Preanus length: increases from about 25% SL in early larvae, to about 60% SL in late larvae
Air bladder: present in late larvae
Spination: none

Pigmentation: single large melanophore on top of head (absent in early larvae); a single melanophore on body dorsum, between dorsal and adipose fins, from flexion stage on; single melanophores at tip of lower jaw and over anus; peritoneal pigment develops in late larvae; pectoral–fin base and rays pigmented; melanophores embedded in myosepta anteriorly on trunk in late larvae
Length at flexion: about 6.0-7.0 mm SL
Length at transformation: about 20.0 mm SL

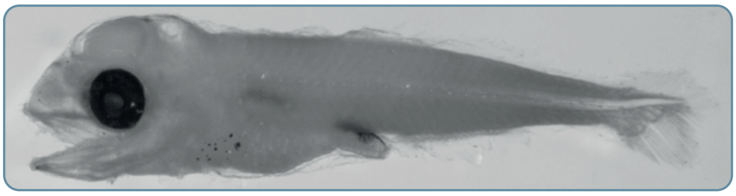
PHOTOS — by J.M. Rodriguez



4.5 mm SL



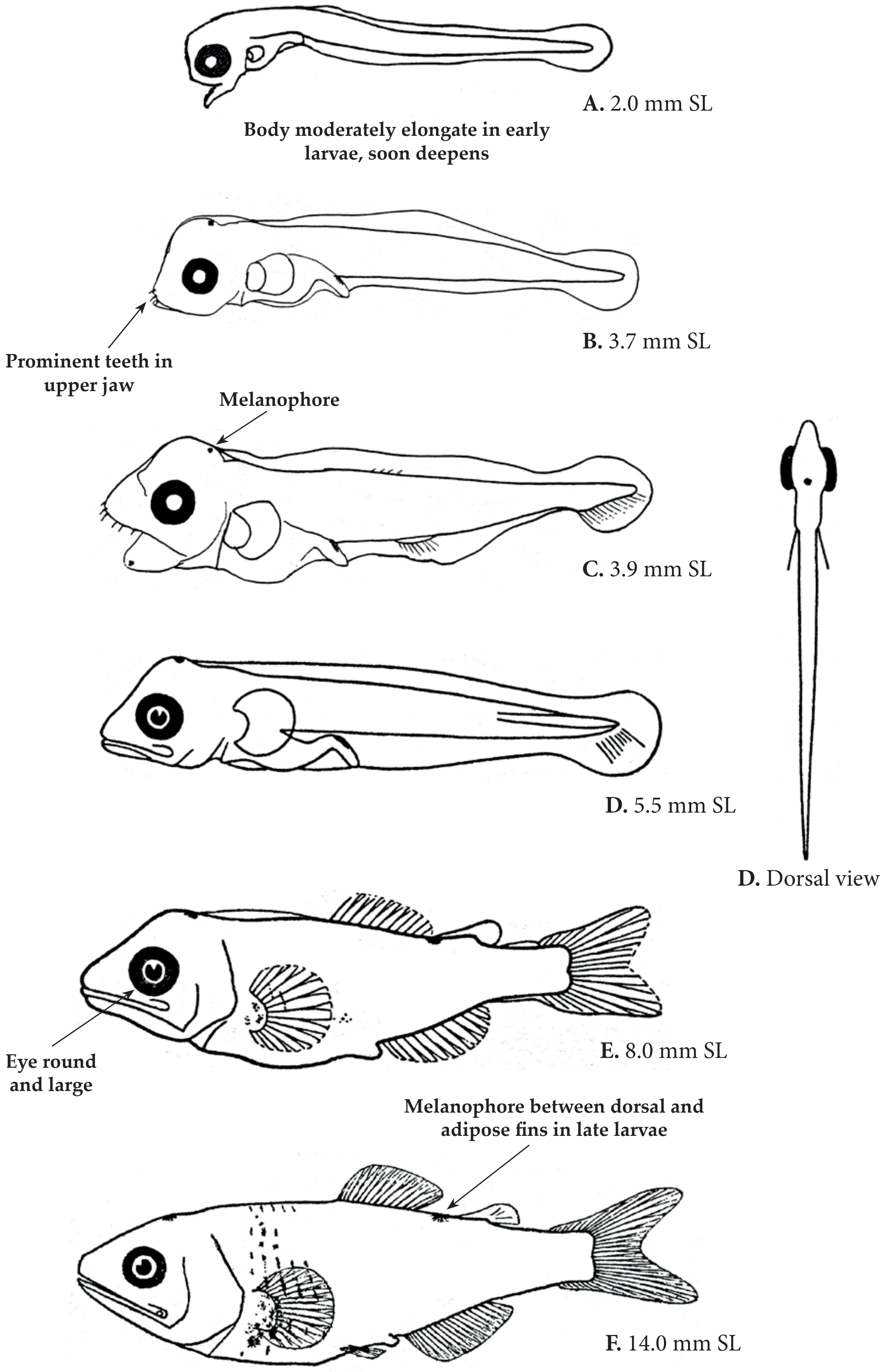
5.5 mm SL



6.0 mm SL

6.5 mm SL
(dorsal view)

Lampanyctus crocodilus (Risso, 1810)



Literature: Alemany (1997), Fahay (2007), Froese and Pauly (2022), Hulley (1984), Tåning (1918)

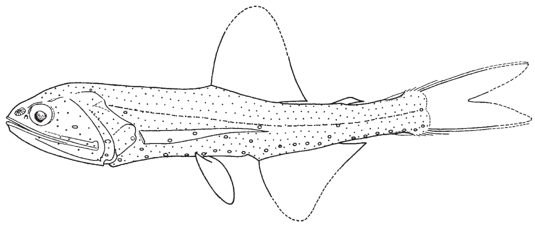
Illustrations' sources: A-C: Alemany (1997); **D-F:** Tåning (1918)

MYCTOPHIDAE

Lampanyctus pusillus (Risso, 1810) — Pigmy lanternfish

Habitat: oceanic, mesopelagic, between 25 and 1 000 m depth
Distribution: Atlantic Ocean and the Mediterranean Sea. Eastern Atlantic, from the Mauritanian upwelling region to 65°N
Spawning season: summer and autumn (Mediterranean Sea)

Meristic characters
Myomeres: 30-32
Vertebrae: 30-32
Dorsal fin: 11-13
Anal fin: 13-16
Adipose fin: present



EGGS

Undescribed

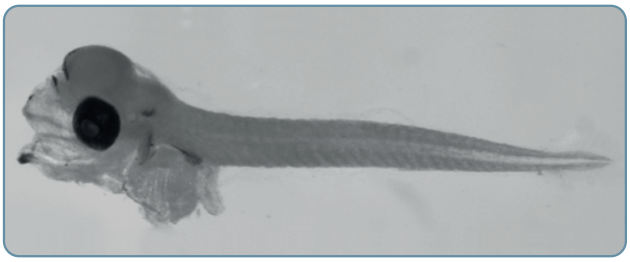
YOLK–SAC LARVAE

Undescribed

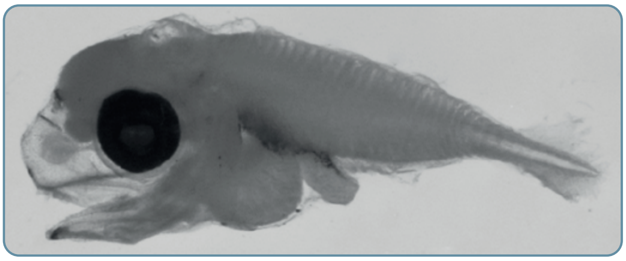
LARVAE — Figs. A-F

Body: elongate in early larvae, becomes short and plump throughout development
Head: large; mouth large, reaches posterior edge of eye in late larvae; snout blunt and rounded; well–developed teeth in upper jaw from early larvae on
Eye: round and large
Gut: thick and bulbous; terminal section of gut protruding, forms almost a right angle with body
Preanus length: increases from about 30% SL, in early larvae, to about 65% SL, in late larvae
Air bladder: present
Spination: none
Pigmentation: 1-3 melanophores from snout to top of head; melanophores at tip of lower jaw, over opercle, pectoral-fin base, anterior of gut, and over terminal gut; internal pigment on air bladder; ventral melanophores on abdominal region; late larvae, add paired series of melanophores along dorsum and a row of melanophores along lateral midline
Length at flexion: about 4.0-6.0 mm SL
Length at transformation: about 12.0 mm SL

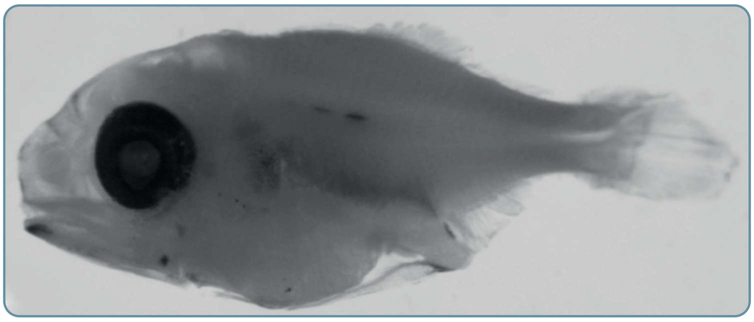
PHOTOS — by J.M. Rodriguez



3.0 mm SL



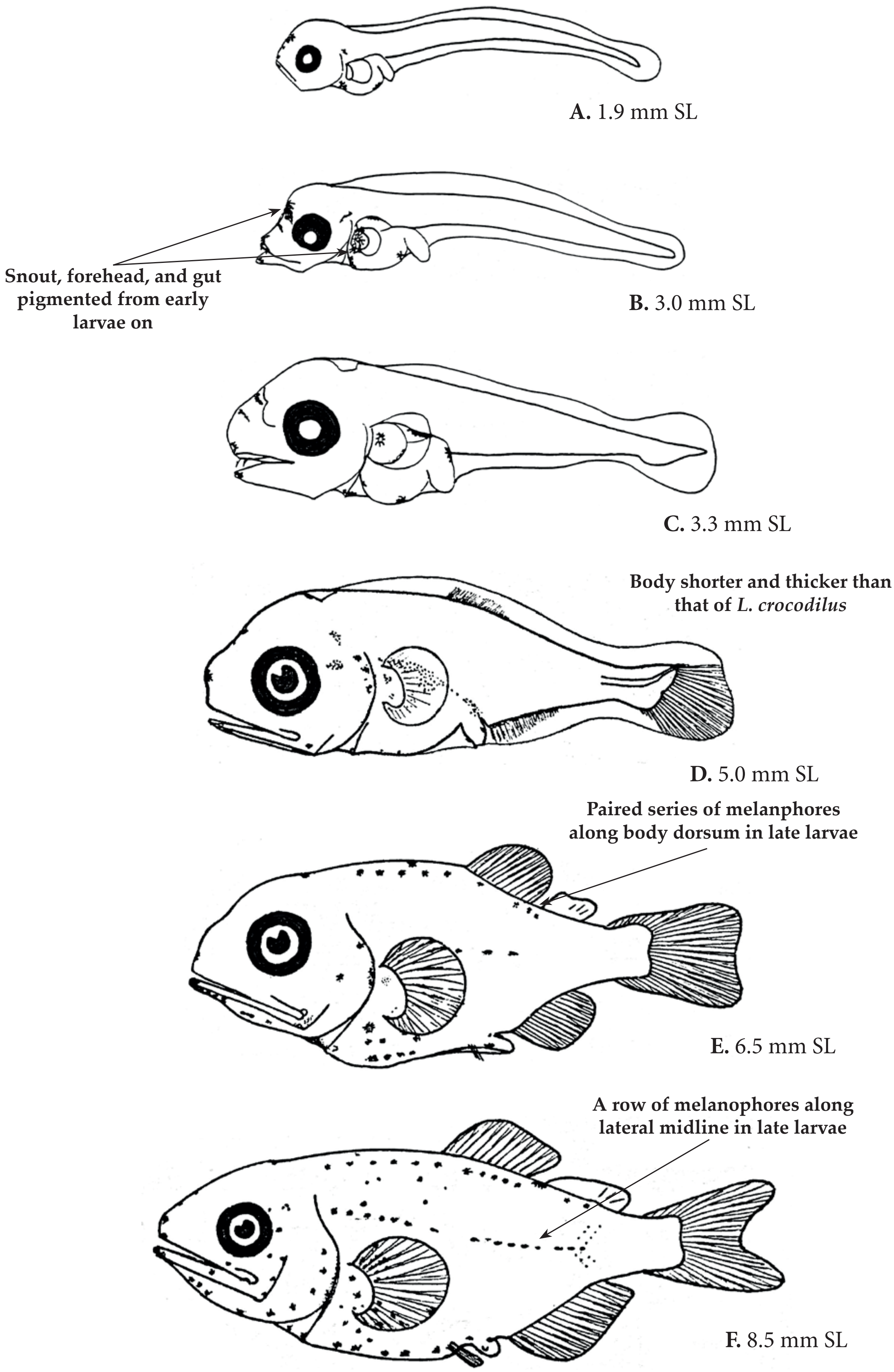
3.4 mm SL



4.3 mm SL

MYCTOPHIFORMES

Lampanyctus pusillus (Risso, 1810)



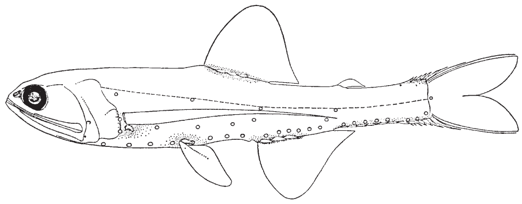
Literature: Fahay (2007), Froese and Pauly (2022), Hulley (1984), Moser and Watson (2006), Tåning (1918)

Illustrations' sources: **A-C:** Alemany (1997); **D-F:** Tåning (1918)

Lepidophanes gaussi (Brauer, 1906) — Gauss' lanternfish

Habitat: oceanic, mesopelagic, between 100 and 1 000 m depth
Distribution: Atlantic Ocean (absent from the Mediterranean Sea). Eastern Atlantic, between 13°S and 27°S and between 18°N and 42°N
Spawning season: year-round (western Atlantic Ocean)

Meristic characters
Myomeres: 35-36
Vertebrae: 35-36
Dorsal fin: 12-15
Anal fin: 13-15
Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

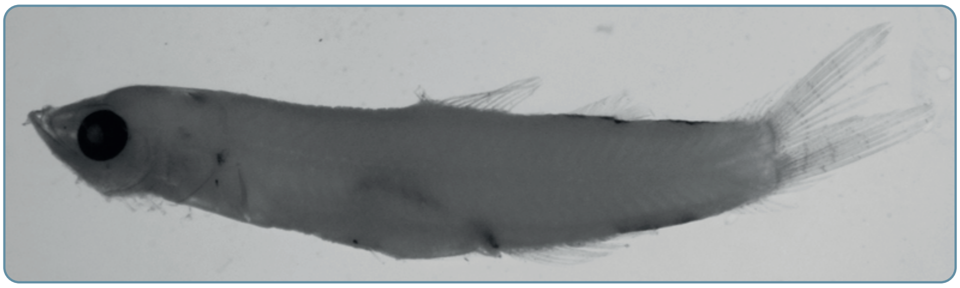
Undescribed

LARVAE — Figs. A-D

Body: elongate and slender; dorsal and ventral margins of body almost parallel
Head: moderately small; snout moderately pointed, concave in early larvae
Eye: round and large
Gut: tube-like, moderately slender and almost of constant diameter along all its length
Preanus length: increases from > 59% SL in early larvae to 64% SL in postflexion stage
Air bladder: prominent
Spination: none

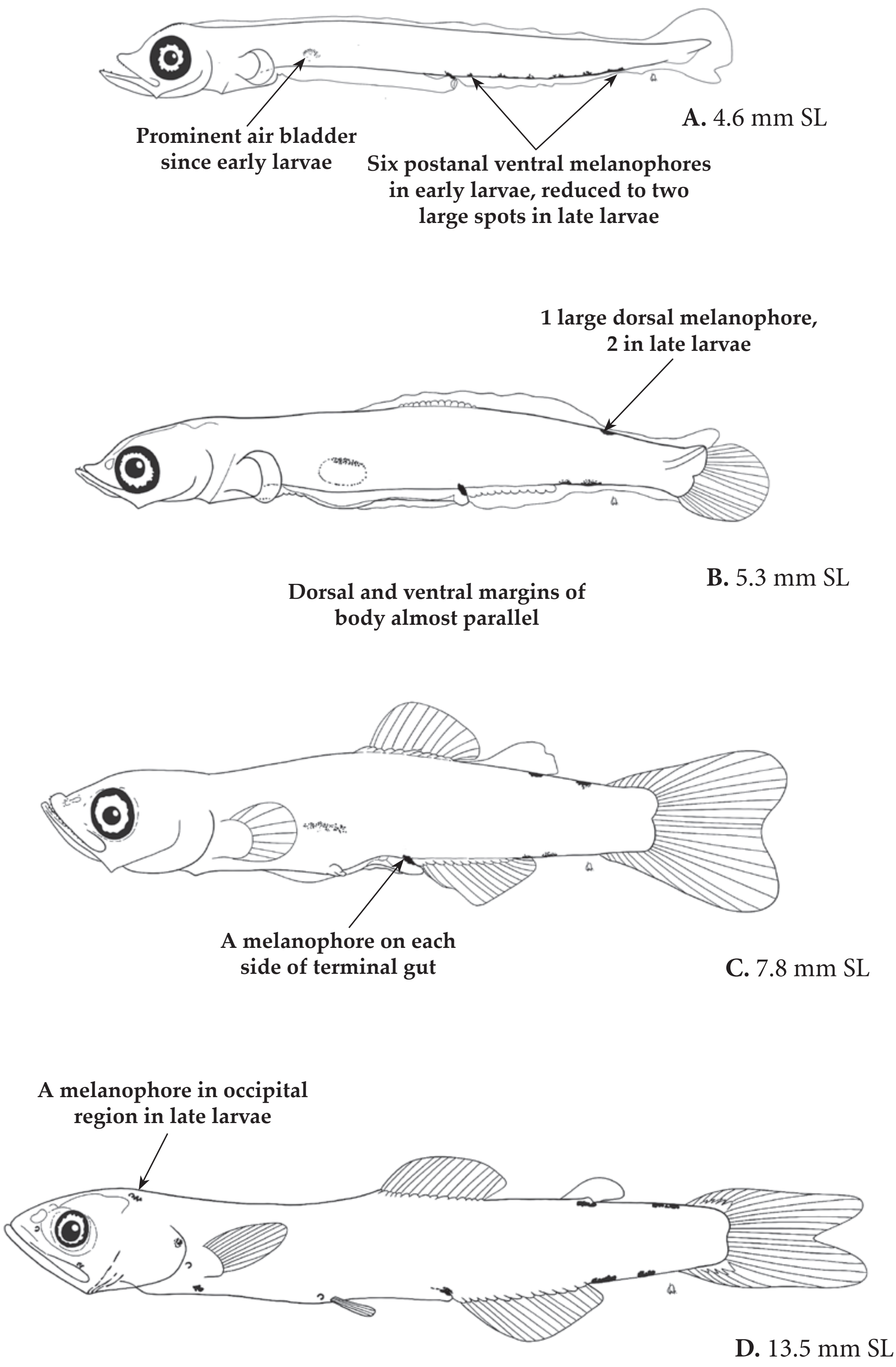
Pigmentation: 6 postanal ventral melanophores in early larvae, reduced to 2 large spots in late larvae, one over end of anal fin, the other close to caudal peduncle; one large dorsal melanophore in caudal region in early larvae, 2 in late larvae: one under adipose fin, the other close to caudal peduncle, opposite to posterior ventral ones; dorsum of air bladder pigmented; a dorso-lateral melanophore on each side of terminal gut; a melanophore in occipital region in late larvae
Length at flexion: 5.3-5.6 mm SL
Length at transformation: about 13.0 mm SL

PHOTOS — by J.M. Rodriguez



9.8 mm SL

Lepidophanes gaussi (Brauer, 1906)



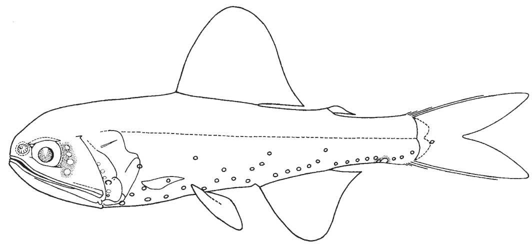
Literature: Fahay (2007), Hulley (1984, 1990), Moser and Ahlstrom (1974), Moser and Watson (2001, 2006)

Illustrations' sources: A-D: L. Rodríguez (**A, B, D:** redrawn from Moser and Watson, 2001; **C:** redrawn from Moser and Ahlstrom, 1974)

Lobianchia dofleini (Zugmayer, 1911) — Dofleini's lanternfish - Lanterne de Dofleini

Habitat: oceanic, mesopelagic, between 40 and 750 m depth
Distribution: eastern Atlantic Ocean between 40°S and 50°N, and the Mediterranean Sea
Spawning season: throughout the year with a peak between February and June (Mediterranean Sea)

Meristic characters
Myomeres: 33-35
Vertebrae: 33-35
Dorsal fin: 15-17
Anal fin: 13-15
Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

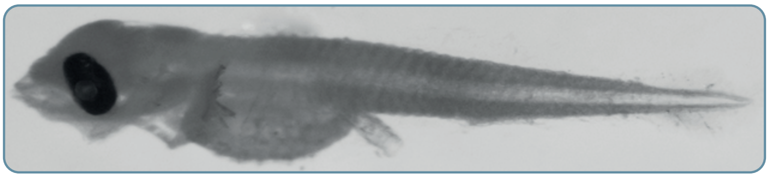
LARVAE

Figs. A-E

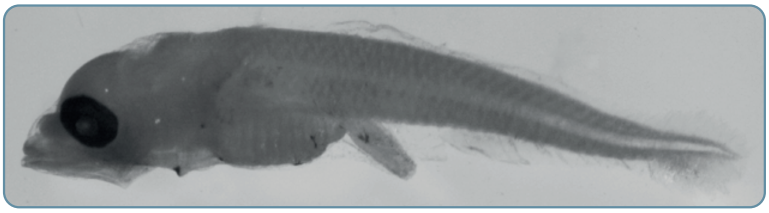
Body: elongate in early larvae, becomes short and thick; pectoral fins large with elongate upper rays
Head: large and broad; snout relatively long and pointed; forehead slightly concave in early larvae
Eye: small and round in early larvae, becomes slightly elliptical with development
Gut: fairly curved and thick; terminal gut prominent
Preanus length: increases from about 40% SL, in early larvae, to about 60% SL, in late larvae
Air bladder: present
Spination: none
Pigmentation: melanophores over lateral and ventral side of gut, on ventral midline anterior to cleithral symphysis, and along base of anal fin; a melanophore on each side of terminal gut; base and rays of pectoral fins pigmented; melanophores appear on dorsum of body in late larvae; air bladder pigmented
Length at flexion: 5.0-6.0 mm SL
Length at transformation: about 10.0-11.0 mm SL

PHOTOS

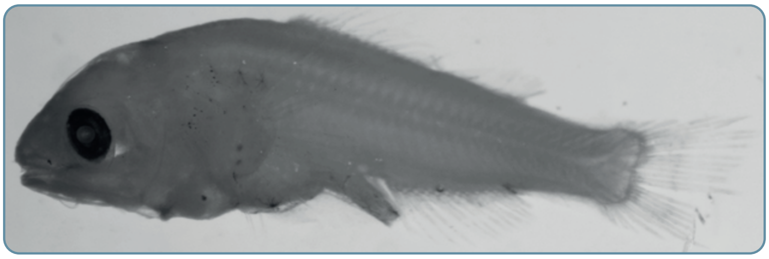
by J.M. Rodriguez



3.6 mm SL

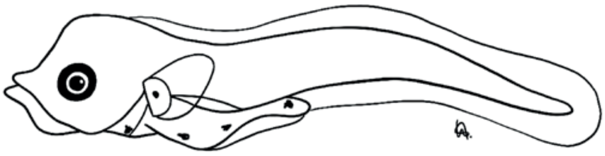


4.3 mm SL

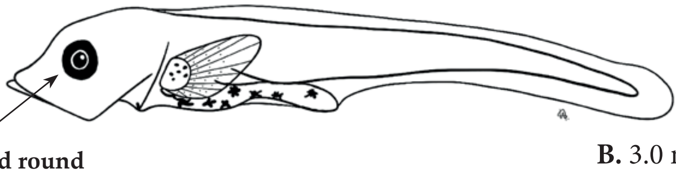


7.0 mm SL

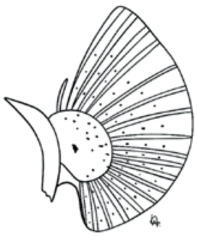
Lobianchia dofleini (Zugmayer, 1911)



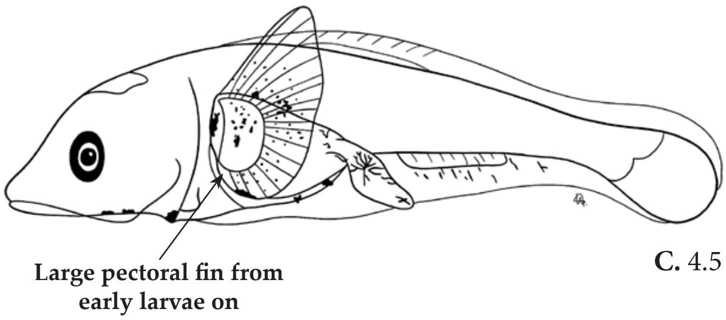
A. 2.2 mm SL



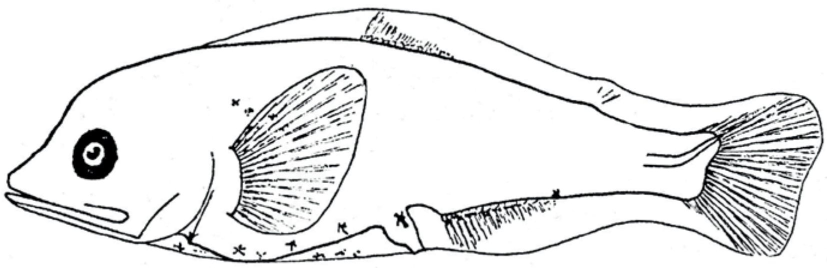
B. 3.0 mm SL



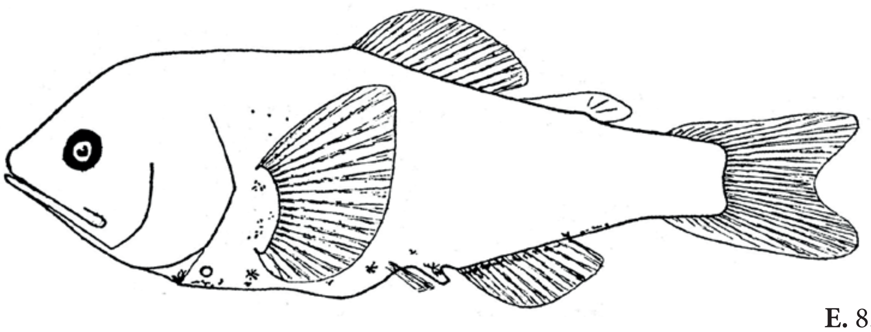
C. Detail of pectoral fin



C. 4.5 mm SL



D. 5.5 mm



E. 8.0 mm

Literature: Fahay (2007), Hulley (1984), Moser and Watson (2006), Tåning (1918)

Illustrations' sources: A-C: L. Rodríguez (redrawn from Alemany, 1997); **D, E:** Tåning (1918)

MYCTOPHIDAE

Lobiancha gemellarii (Cocco, 1838)

Gemellar's lanternfish

Habitat: oceanic, mesopelagic, between 25 and 500 m depth

Distribution: Atlantic Ocean and the Mediterranean Sea. Eastern Atlantic, from Mauritania to Ireland

Spawning season: peaks in late autumn and winter (Bermuda)

Meristic characters

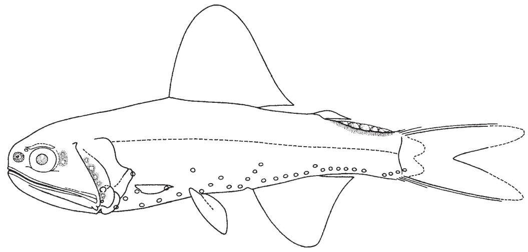
Myomeres: 34-35

Vertebrae: 34-35

Dorsal fin: 16-18

Anal fin: 13-15

Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

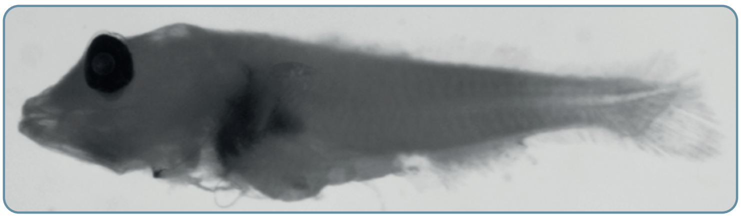
LARVAE

Figs. A-E

Body: deep and stout, mainly in anterior part (especially in late larvae); upper pectoral-fin rays strongly developed
Head: deep and broad; snout pointed in early larvae, becomes rounded with development; prominent teeth since early larvae
Eye: large and slightly oval, with lunate mass of choroid tissue ventrally, becomes rounded with development
Gut: thick anteriorly, with narrow terminal section
Preanus length: increases from about 52% SL, in early larvae, to about 60% SL in late larvae
Air bladder: present
Spination: none
Pigmentation: early larvae, melanophores anterior to pectoral fin and on pectoral-fin base, on foregut, and a pair on terminal gut; pectoral-fin rays with scattered pigment; a melanophore at end of anal-fin base; air bladder pigmented; late larvae add pigment on anterior region of body, and a large melanophore at caudal-fin base (2 in later larval stages)
Length at flexion: 5.0-6.0 mm SL
Length at transformation: 12.0-14.0 mm SL

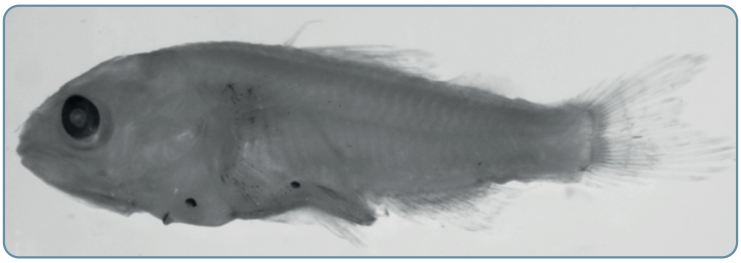
PHOTOS

by J.M. Rodriguez



4.9 mm SL

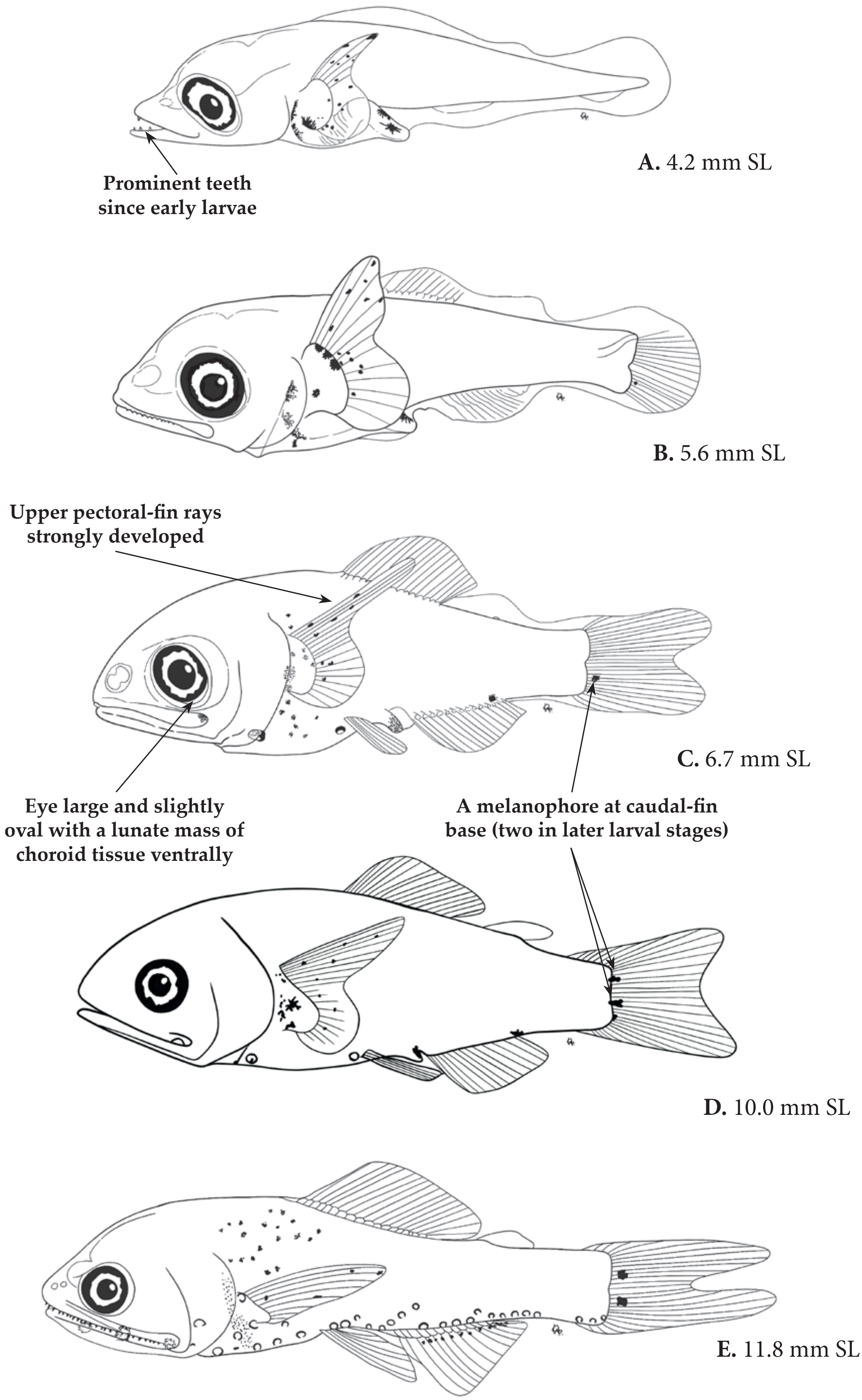
5.8 mm SL



8.1 mm SL

MYCTOPHIFORMES

Lobiancha gemellarii (Cocco, 1838)



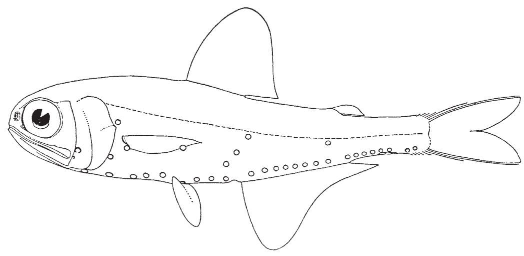
Literature: Fahay (2007), Hulley (1984), Moser and Ahlstrom (1974, 1996b), Moser and Watson (2001, 2006), Tåning (1918)

Illustrations' sources: A-E: L. Rodríguez (**A, B, E:** redrawn from Moser and Ahlstrom, 1996b; **C:** redrawn from Moser and Ahlstrom, 1974; **D:** redrawn from Tåning, 1918)

Myctophum affine (Lütken, 1892) — Metallic lanternfish

Habitat: oceanic, mesopelagic, between 0 and 600 m depth
Distribution: Atlantic Ocean. Eastern Atlantic, from Angola to Mauritania
Spawning season: unknown

Meristic characters
Myomeres: 37-38
Vertebrae: 37-38
Dorsal fin: 12-14
Anal fin: 17-20
Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

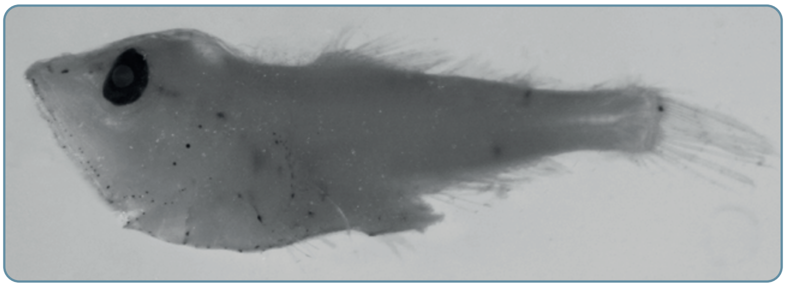
Figs. A-E

Body: relatively slender in early larvae, soon becomes stout and deep anteriorly
Head: very large and wide; snout pointed, mouth large and moderately oblique
Eye: slightly elliptical, stalked, with a small mass of unpigmented choroid tissue ventrally
Gut: large, triangular, with prominent terminal section
Preanus length: increases from 48-56% SL in early larvae, to 60-67% SL in late larvae
Air bladder: absent
Spination: none

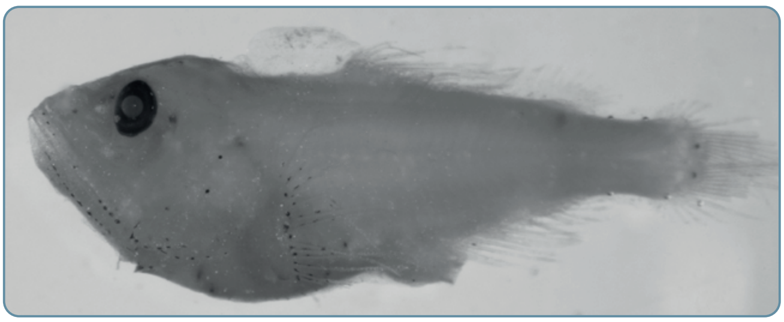
Pigmentation: melanophores on upper and lower jaws, at cleithrum, along isthmus and ventral surface of gut; one or more melanophores above and below terminal gut; a few spots on nostrils; melanophores on front and sides of forebrain; base and rays of pectoral fin pigmented; single melanophores on dorsal margin, near adipose fin, and on ventral margin, over middle of anal-fin base; large melanophores at caudal-fin base in late larvae
Length at flexion: 4.2-6.0 mm SL
Length at transformation: 11.5-13.0 mm SL

PHOTOS

by J.M. Rodriguez

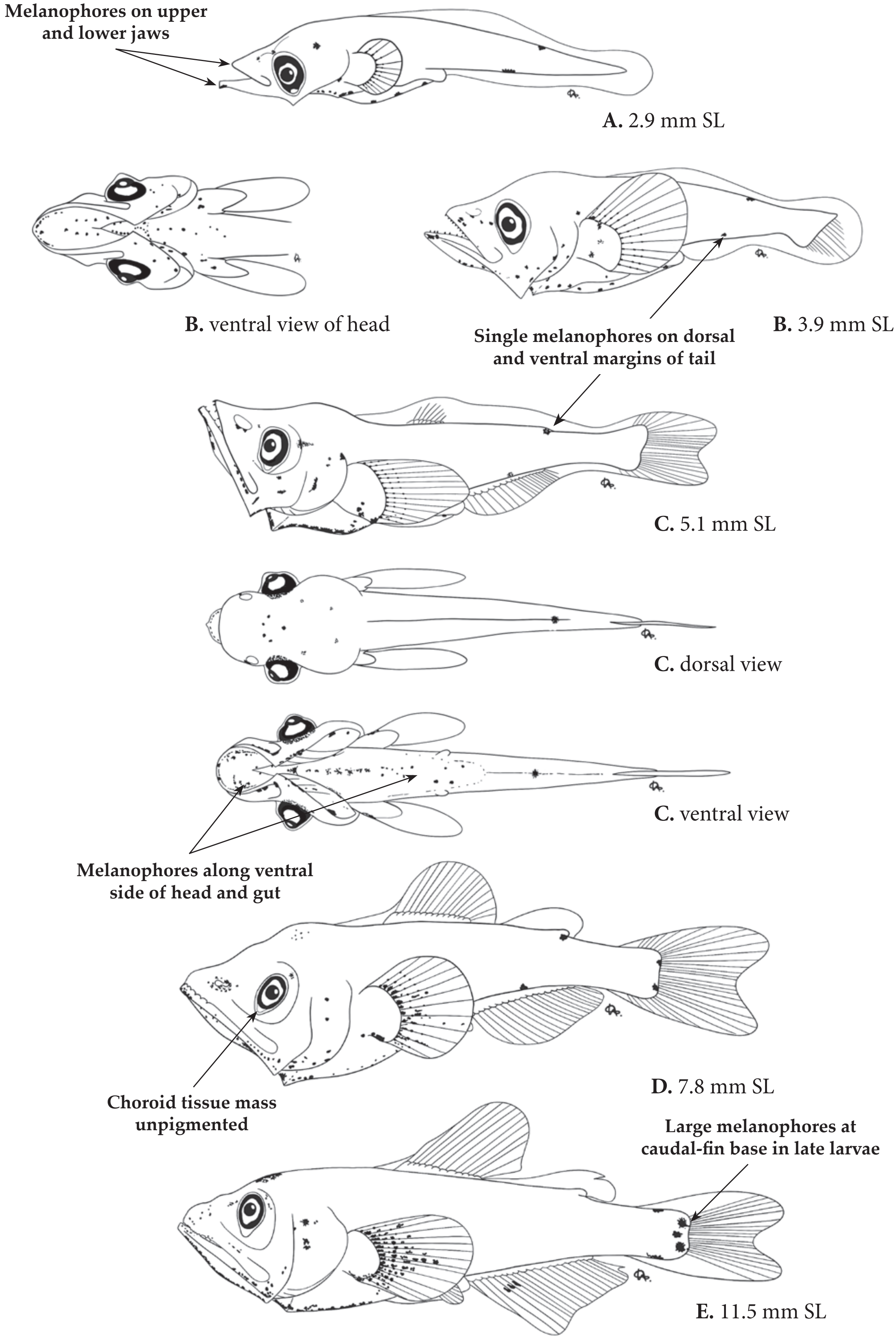


6.4 mm SL



8.7 mm SL

Myctophum affine (Lütken, 1892)



Literature: Fahay (2007), Hulley *et al.* (1990), Moser and Watson (2001, 2006)

Illustrations' sources: A-E: L. Rodríguez (redrawn from Moser and Watson, 2001)

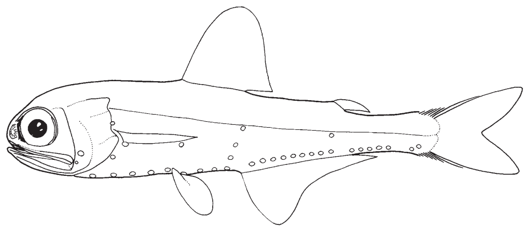
MYCTOPHIDAE

Myctophum nitidulum Garman, 1899

Pearlyspotted lanternfish

Habitat: oceanic, mesopelagic, between 0 and 950 m depth
Distribution: Atlantic, Pacific, and Indian oceans. Eastern Atlantic, from South Africa to Morocco
Spawning season: peaks in early spring

Meristic characters
Myomeres: 36-39
Vertebrae: 36-39
Dorsal fin: 12-14
Anal fin: 18-21
Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

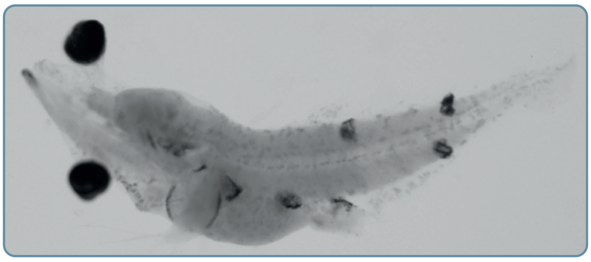
Figs. A-E

Body: stout, deepest anteriorly; pectoral fin precocious, with large base
Head: very large and wide; snout pointed, mouth large and moderately oblique
Eye: slightly elliptical, on short stalk, with a fairly prominent, conical mass of choroid tissue ventrally
Gut: large, triangular, with prominent terminal section
Preanus length: increases from about 50% SL in early larvae to 60% SL in late larvae
Air bladder: absent
Spination: none

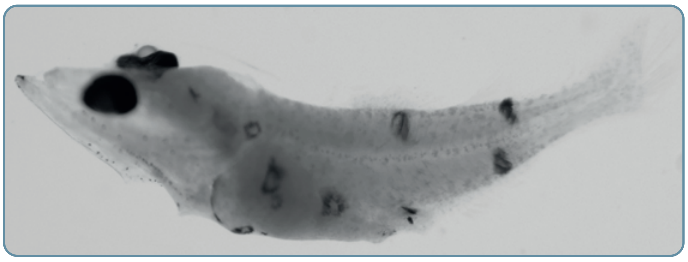
Pigmentation: early larvae, melanophores at tip of lower jaw; one at midway along postanal, ventral region; 2 pairs on anterior surface of gut and a dorso-lateral pair on terminal section of gut; late larvae, one melanophore near nostril, one behind eye, one at angle of opercle; a series of melanophores on isthmus; rows of melanophores on upper and lower jaws; 4 opposing melanophores on dorsal and ventral margins of tail; two parallel lines of melanophores on anterior, ventral surface of gut; melanophores on caudal-fin base in transforming larvae
Length at flexion: 6.5-7.0 mm SL
Length at transformation: about 11.0 mm SL

PHOTOS

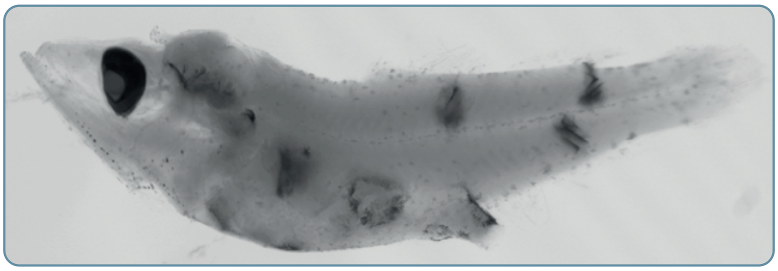
by S. Isari



4.2 mm SL



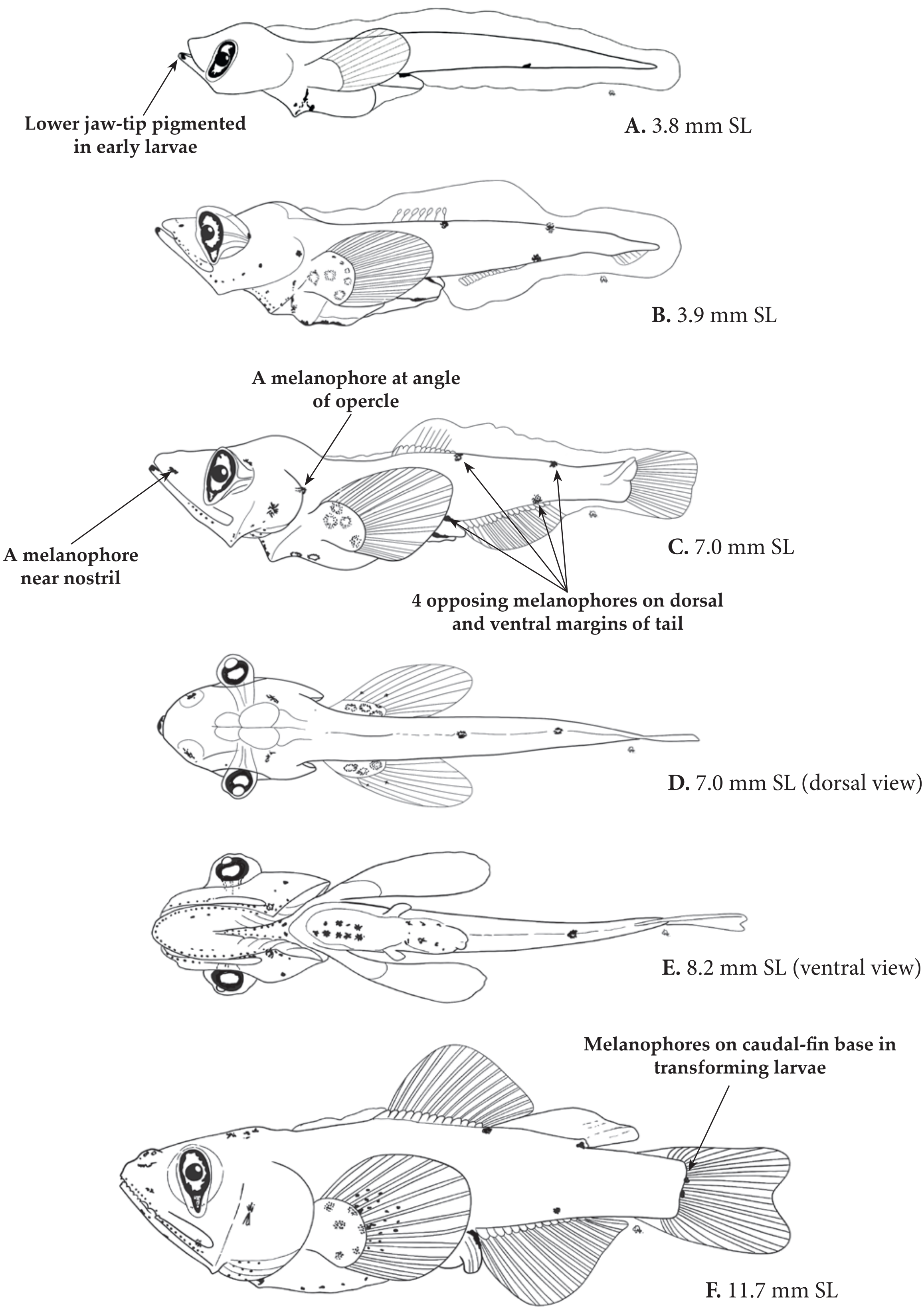
5.6 mm SL



9.4 mm SL

MYCTOPHIFORMES

Myctophum nitidulum Garman, 1899



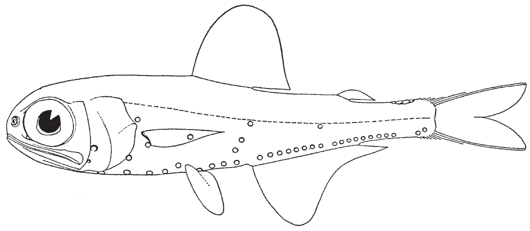
Literature: Fahay (2007), Froese and Pauly (2022), Hulley (1984), Moser and Ahlstrom (1970, 1974, 1996b), Moser and Watson (2001, 2006), Olivar and Fortuño (1991)

Illustrations' sources: A-F: L. Rodríguez (**A-C:** redrawn from Moser and Ahlstrom, 1996b; **D-F:** redrawn from Moser and Watson, 2001)

Myctophum punctatum Rafinesque, 1810 — Spotted lanternfish

Habitat: oceanic, mesopelagic, between 40 and 1 000 m depth
Distribution: eastern Atlantic Ocean, from the Mauritanian upwelling region to 65°N, and the Mediterranean Sea
Spawning season: late winter to early spring

Meristic characters
Myomeres: 40
Vertebrae: 40
Dorsal fin: 13
Anal fin: 19-21
Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

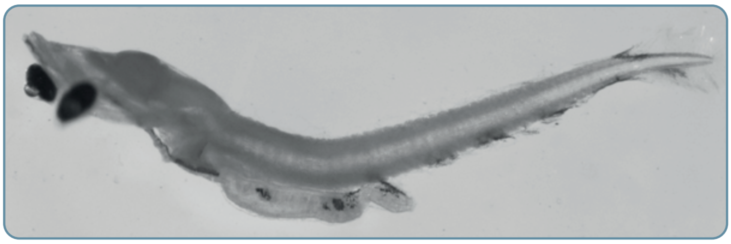
LARVAE — Figs. A-E

Body: elongate in early larvae, becoming slightly deeper during development; pectoral fins large
Head: large and flat; forehead slightly concave in early larvae (duck-billed shaped); snout pointed and broad
Eye: elliptical, stalked in early larvae, with tapered choroid mass ventrally
Gut: elongate (tube-like) in early larvae
Preanus length: about 50-60% SL
Air bladder: absent
Spination: none

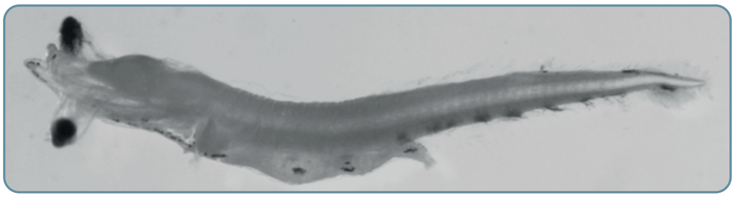
Pigmentation: melanophores on edges of both jaws and on upper part of opercle; several ventral, postanal melanophores; ventral series of melanophores from head to anus; single, well developed melanophores on dorsal and ventral tail end; melanophore on caudal-fin base; posterior rays of dorsal and anal fins may be pigmented; rays and base of pectoral fins pigmented; dorsal melanophores on tail in late larvae
Length at flexion: about 7.0 mm
Length at transformation: about 21.0-22.0 mm

PHOTOS

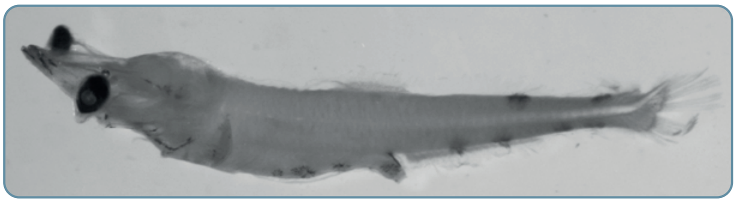
by J.M. Rodriguez



4.8 mm SL



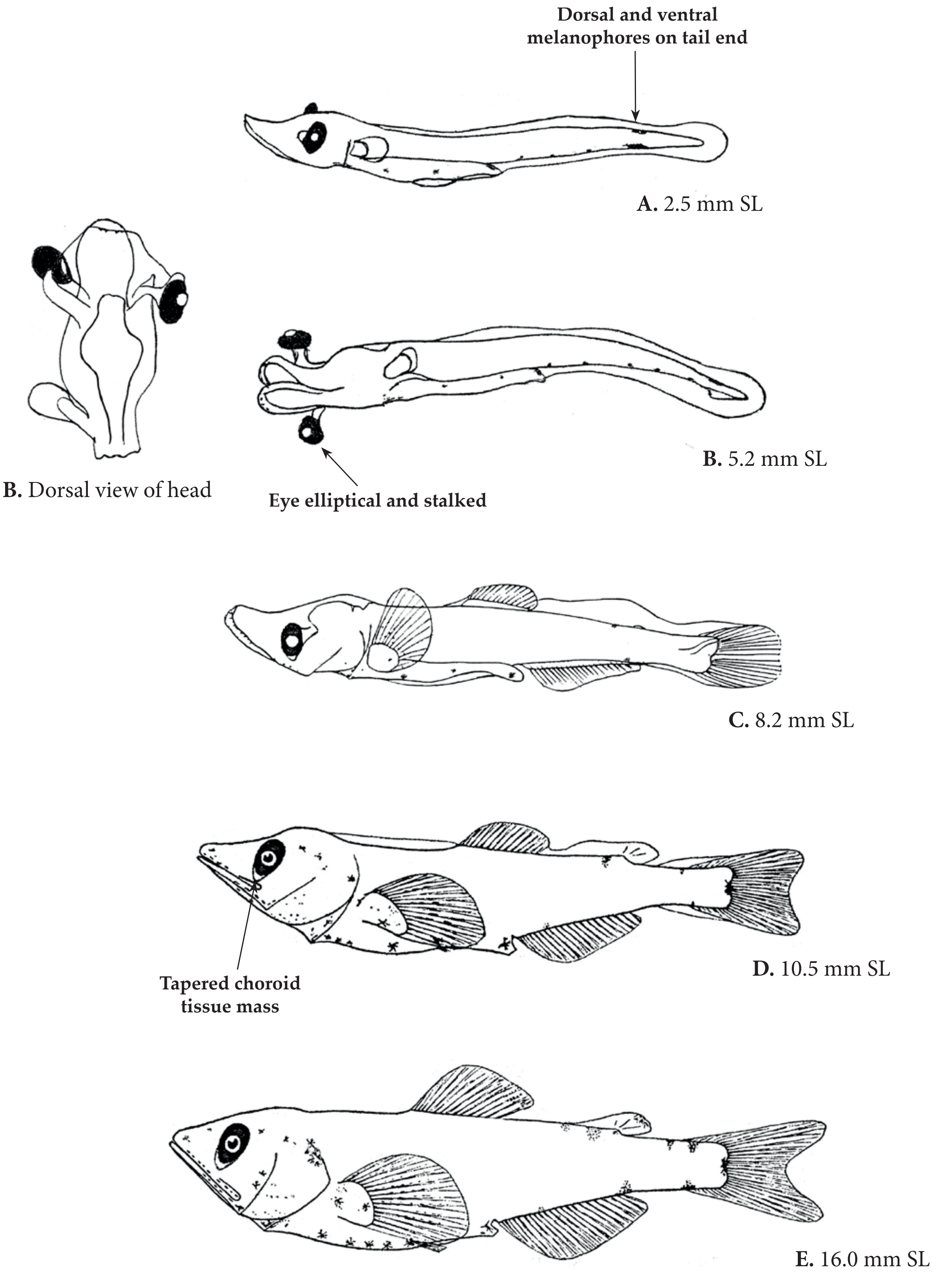
6.1 mm SL



8.6 mm SL

6.7 mm SL
(dorsal view)

Myctophum punctatum Rafinesque, 1810



Literature: Fahay (1983), Hulley (1984), Tåning (1918), Tortonese (1956d)

Illustrations' sources: A-C: Alemany (1997); **D, E:** Tåning (1918)

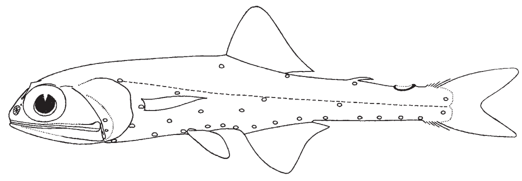
MYCTOPHIDAE

Notolychnus valdiviae (Brauer, 1904)

Topside lampfish

Habitat: oceanic, mesopelagic, between 25 and 700 m depth
Distribution: worldwide in tropical, subtropical, and temperate waters. Eastern Atlantic, from South Africa to the British Isles (absent from the Mediterranean Sea)
Spawning season: peaks in early summer

Meristic characters
Myomeres: 27-31
Vertebrae: 27-31
Dorsal fin: 10-12
Anal fin: 12-15
Adipose fin: present



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

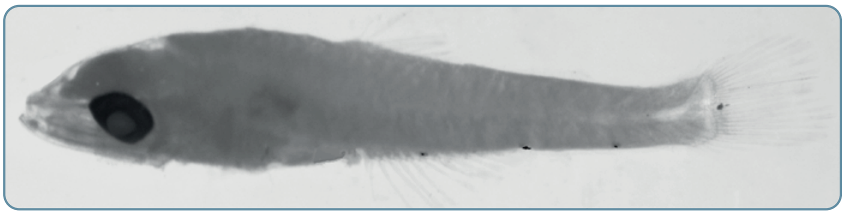
Figs. A-E

Body: elongate and slender, with long caudal peduncle
Head: moderately large; snout pointed, mainly in early larvae, becomes somewhat elongated with development
Eye: relatively narrow, becomes irregularly oval; a crescent mass of choroid-like tissue appears on dorsal surface of eye at about 4.0 mm SL and on ventral surface at about 6.0 mm SL
Gut: short, thick anteriorly, tapers gradually with slow curvature; anus slightly protruding
Preanus length: increases from 35% SL in early larvae to 50% SL in late larvae
Air bladder: prominent
Spination: none
Pigmentation: early larvae, a melanophore on lateral sides of mid-gut; a pair of melanophores over terminal gut; postanal, ventral line of 1-4 melanophores; gas bladder pigmented; late larvae, up to 3 melanophores laterally on gut; usually 3-4 (range from 2 to 7) postanal, ventral melanophores, displaced to either side of anal-fin base; a melanophore at mid-base of caudal fin; head and dorsum of body unpigmented
Length at flexion: 4.4-6.2 mm SL
Length at transformation: 10.0-10.8 mm SL

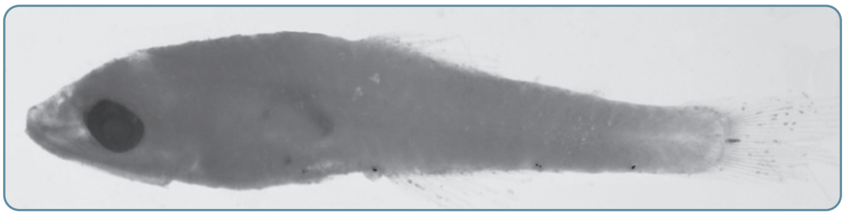
PHOTOS

by J.M. Rodriguez

4.2 mm SL



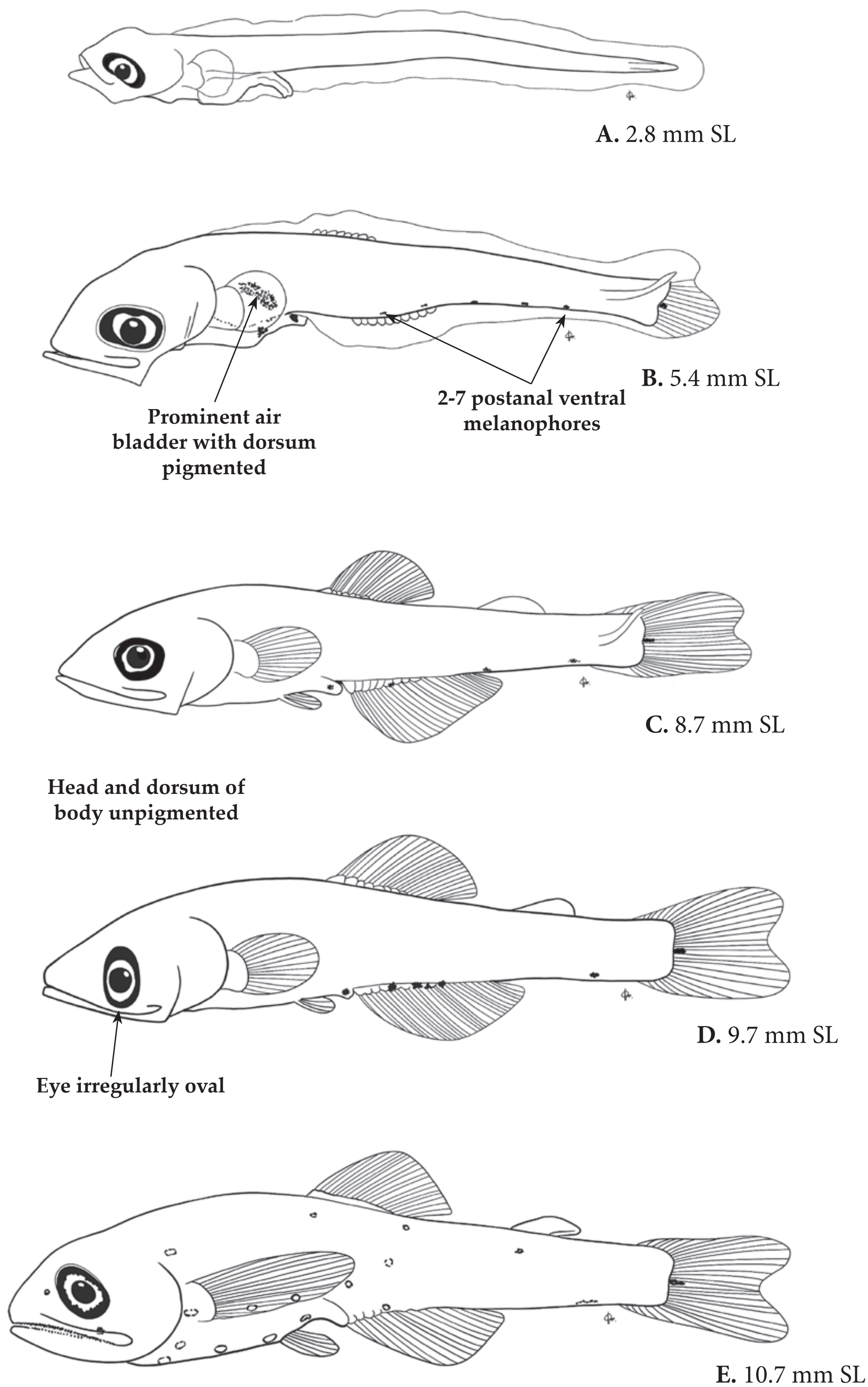
6.0 mm SL



8.3 mm SL

MYCTOPHIFORMES

Notolychnus valdiviae (Brauer, 1904)



Literature: Fahay (2007), Hulley (1984, 1990), Moser and Ahlstrom (1974, 1996b), Moser and Watson (2001, 2006), Tåning (1918)

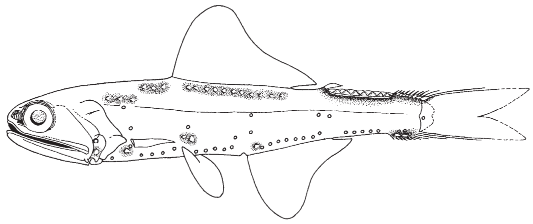
Illustrations' sources: A-E: L. Rodríguez (redrawn from Moser and Ahlstrom, 1996b)

MYCTOPHIDAE

Notoscopelus resplendens (Richardson, 1845) — Patchwork lanternfish

Habitat: oceanic, meso-bathypelagic, between 300 and 2 100 m depth
Distribution: eastern Atlantic Ocean (absent from the Mediterranean Sea).
Spawning season: unknown

Meristic characters
Myomeres: 35-38
Vertebrae: 35-38
Dorsal fin: 21-24
Anal fin: 17-20
Adipose fin: present



EGGS

Undescribed

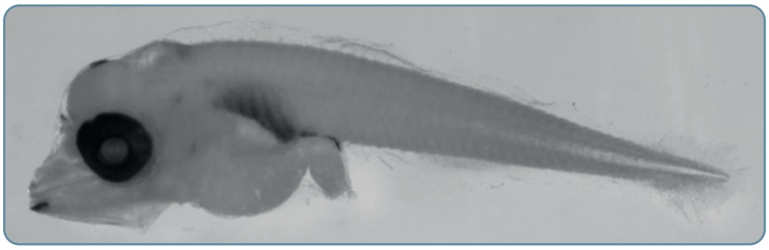
YOLK–SAC LARVAE

Undescribed

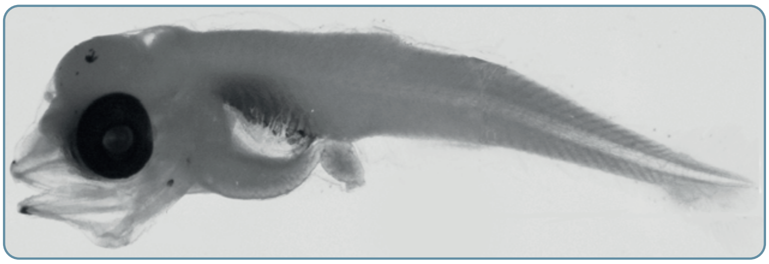
LARVAE — Figs. A-D

Body: elongate and slender in early larvae becomes deeper and laterally compressed throughout development
Head: large, deep and compressed; snout rounded
Eye: round and large
Gut: short, thick in its anterior part; terminal section of gut protruding
Preanus length: increases from about 40% SL to 60% SL
Air bladder: prominent
Spination: none
Pigmentation: increases with development; early larvae, melanophores at jaw tips and on top of head; peritoneum and dorsum of swimbladder pigmented; a melanophore over terminal gut; late larvae, two parallel dorsal rows of melanophores, two ventral and a lateral, over body midline
Length at flexion: 5.0-6.5 mm
Length at transformation: about 20.0 mm SL

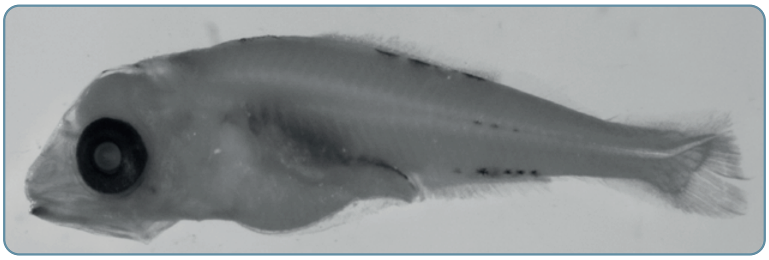
PHOTOS — by J.M. Rodriguez



4.7 mm SL



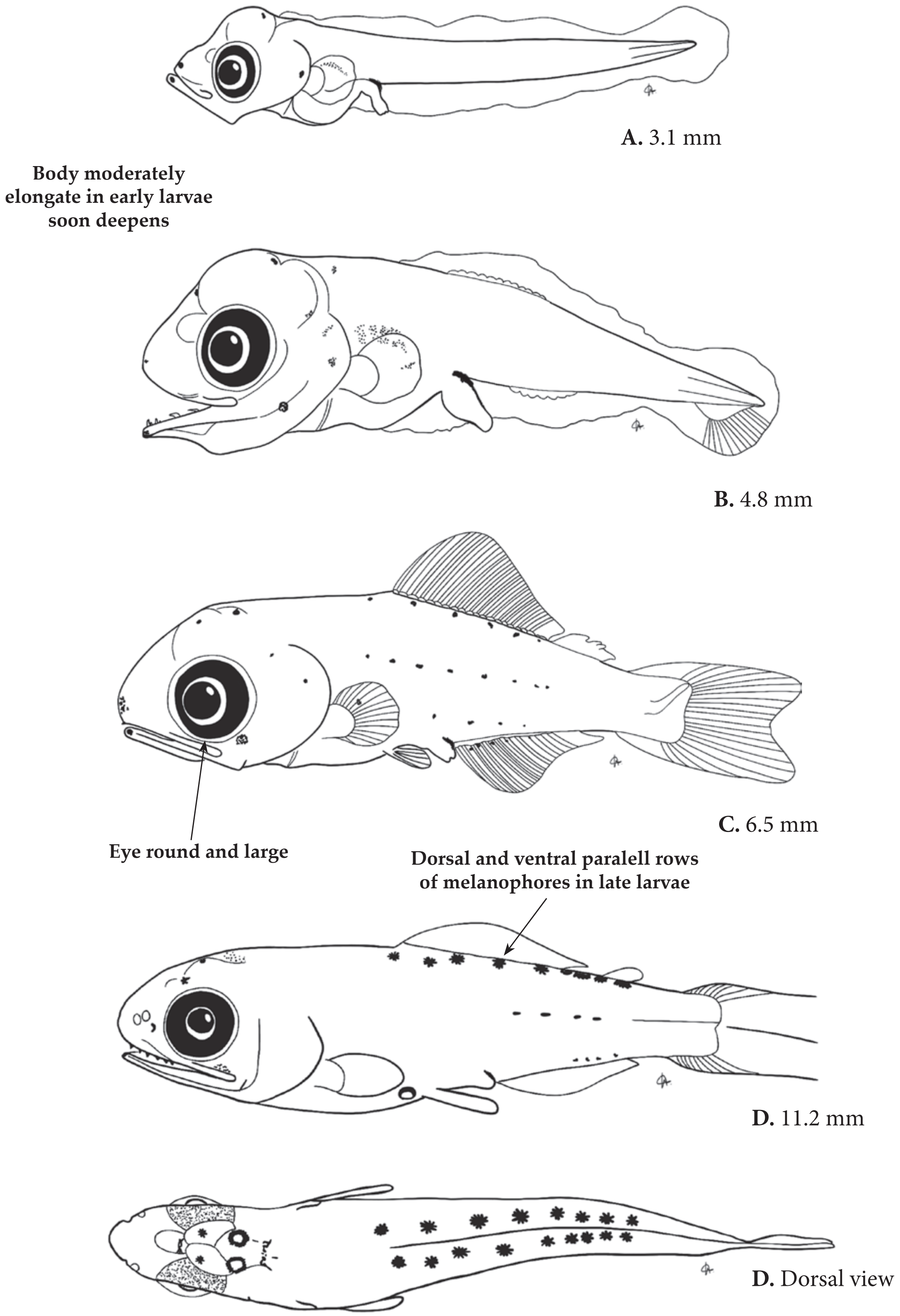
5.1 mm SL



6.2 mm SL

MYCTOPHIFORMES

Notoscopelus resplendens (Richardson, 1845)



Literature: Badcock and Merret (1976), Fahay (2007), Froese and Pauly (2022), Moser and Ahlstrom (1996b)

Illustrations' sources: A-D: L. Rodríguez (**A-C:** redrawn from Moser and Ahlstrom, 1996b; **D:** redrawn from Moser and Ahlstrom, 1972)

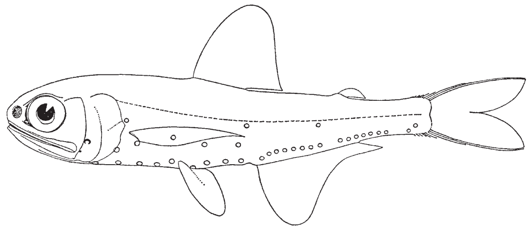
MYCTOPHIDAE

Symbolophorus veranyi (Moreau, 1888)

Large scale lantern fish - Lanterne à grandes écailles

Habitat: oceanic, mesopelagic, between 100 and 800 m depth
Distribution: Atlantic Ocean. Eastern Atlantic, from 26°N to 54°N, and the Mediterranean Sea
Spawning season: unknown

Meristic characters
Myomeres: about 39-40
Vertebrae: 39-40
Dorsal fin: 12-13
Anal fin: 21-23



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

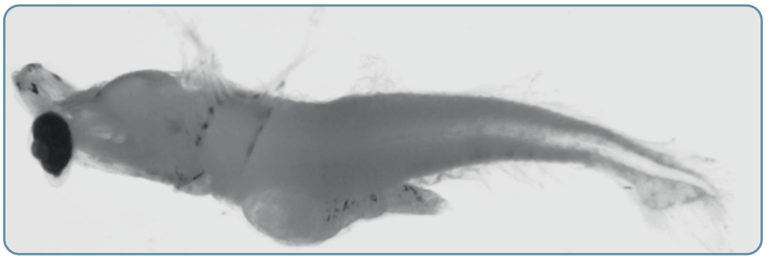
Figs. A-G

Body: moderately elongate, somewhat deeper anteriorly; pectoral fins very large with large base
Head: moderately large; snout pointed, flattened and concave in early larvae, becomes rounded during development
Eye: elliptical, stalked in early larvae, with tapered choroid mass ventrally
Gut: relatively elongate, globose anteriorly, narrows towards its end
Preanus length: > 60% SL

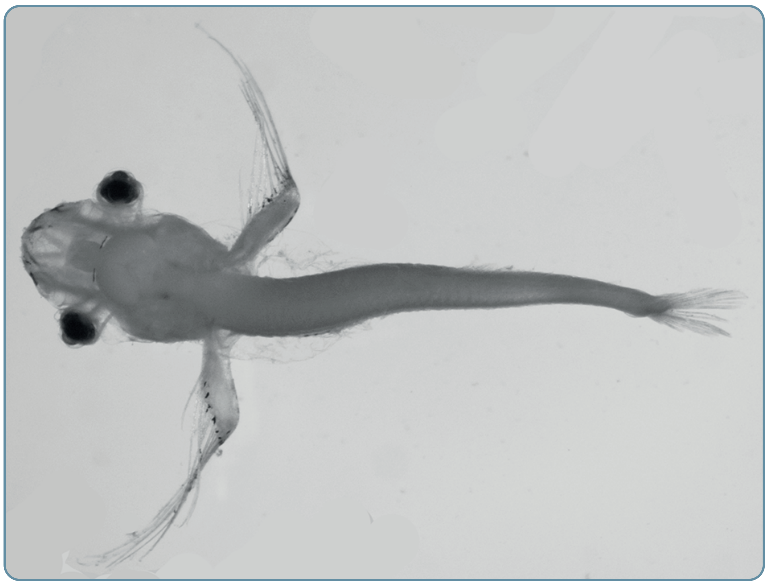
Air bladder: absent
Spination: none
Pigmentation: melanophores on tips of snout and lower jaw; large spot on posterior edge of opercle; few preanal, ventral melanophores; row of postanal ventral melanophores; row of spots over gut; pectoral-fin rays pigmented (heavier at ray base); pigmentation decreases towards end of larval period
Length at flexion: < 8.0 mm SL
Length at transformation: about 20.0 mm

PHOTOS

by J.M. Rodriguez



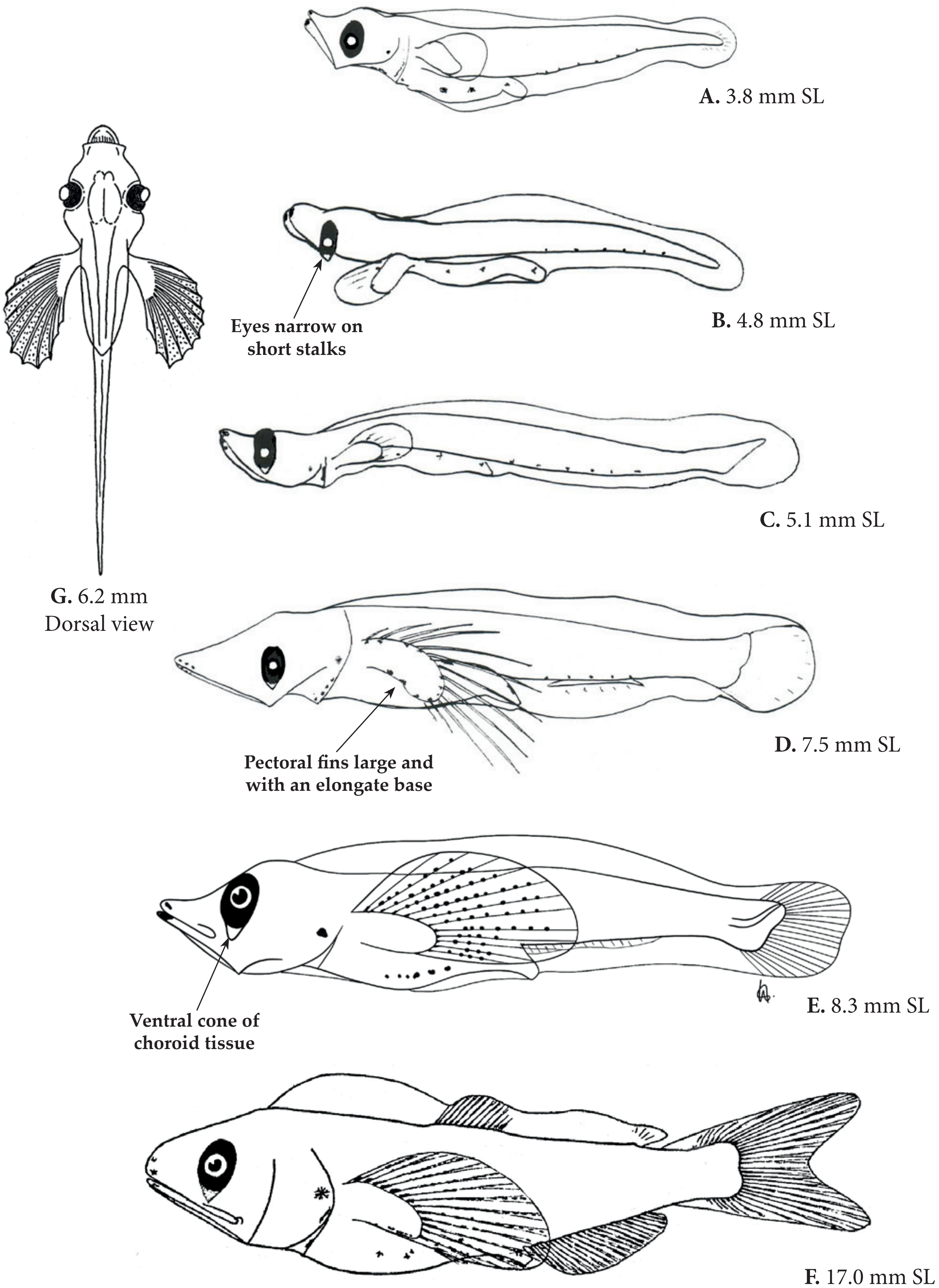
6.2 mm SL



6.6 mm SL (dorsal view)

MYCTOPHIFORMES

Symbolophorus veranyi (Moreau, 1888)



Literature: Fahay (2007), Hulley (1984), Tåning (1918), Tortonese (1956d)

Illustrations' sources: A-D: Alemany (1997); **E:** L. Rodríguez (redrawn from Tåning, 1918); **G:** Tortonese (1956d)

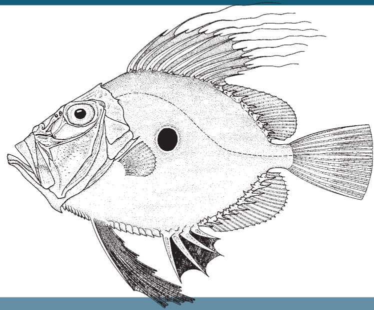
ZEIDAE

Zeus faber Linnaeus, 1758

John dory - Saint Pierre

Habitat: neritic, near the bottom or in midwater, from close to the shore down to 400 m depth
Distribution: eastern Atlantic Ocean from South Africa to Norway, and the Mediterranean Sea
Spawning season: June to August (Bay of Biscay)

Meristic characters
Myomeres: 65
Vertebrae: 65
1st dorsal fin: IX-XI
2nd dorsal fin: 21-25
Anal fin: III-V + 20-25



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 1.96-2.00 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: one; diam. 0.35-0.40 mm; unpigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

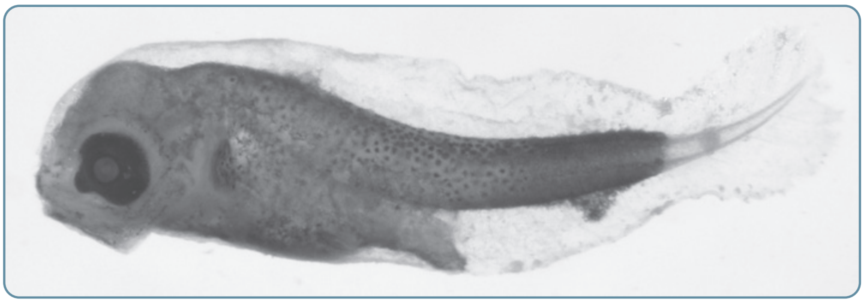
Hatch size: about 4.3 mm
Body: short with deep abdominal region; mouth open
Yolk sac: ovoid
Oil globule location: at posterior, ventral edge of yolk sac
Anus: located close behind yolk sac, reaches finfold border
Preanus length: about 40% SL
Pigmentation: head, yolk sac and base of finfold covered with large stellate melanophores that extend to finfold border forming 2 patches close behind mid-tail; caudal region unpigmented; eye pigmented

LARVAE — Figs. C-E

Body: relatively short, rhomboid and very high, tapering to narrow tail; pelvic fins, well developed from early larvae on, have 6 rays
Head: large and very high
Mouth: very large, oblique, reaching to level of mid-eye
Eye: rounded, large and well forward on head
Gut: triangular and swollen
Preanus length: increases through development, from about 50% SL in early larvae to about 70% SL in late larvae
Air bladder: absent
Spination: none
Pigmentation: similar to yolk-sac larvae; pelvic fins heavily pigmented; anterior half of dorsal fin pigmented; caudal region unpigmented
Length at flexion: begins at about 6.0 mm
Length at transformation: unknown

PHOTOS

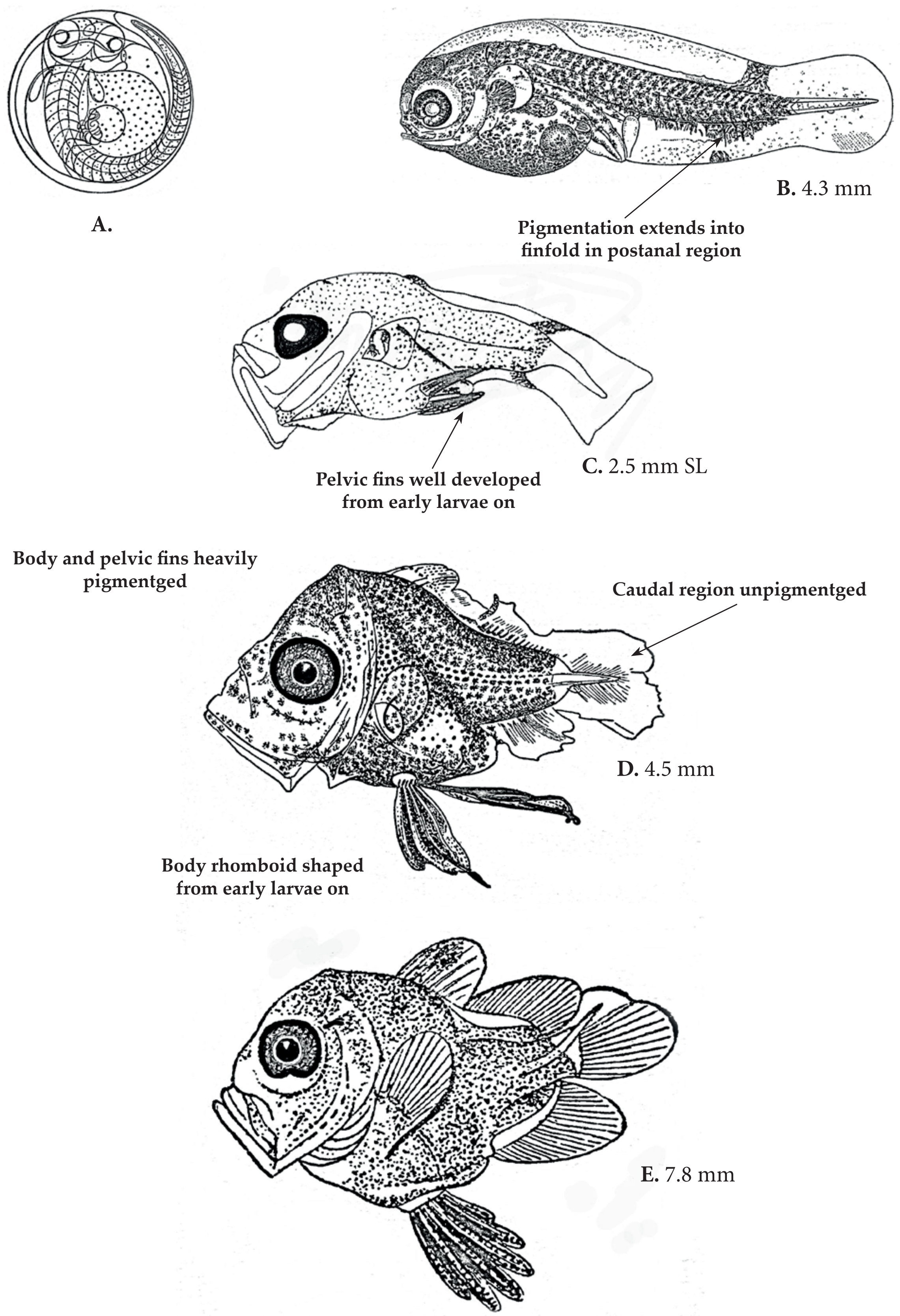
by J.M. Rodriguez



4.3 mm SL

ZEIFORMES

Zeus faber Linnaeus, 1758



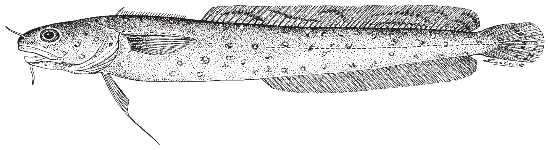
Literature: Alemany (1997), Froese and Pauly (2022), Quero (1986b), Russell (1976), Sanzo (1956a)

Illustrations' sources: A, B, D, E: Sanzo (1956a); **C:** Alemany (1997)

Gaidropsarus biscayensis (Collett, 1890) — Mediterranean bigeye rockling - Motelle

Habitat: neritic and upper-slope, benthopelagic, between 80 and 600 m depth
Distribution: eastern Atlantic Ocean, from Morocco to the Bay of Biscay, and the western Mediterranean Sea
Spawning season: February

Meristic characters
Myomeres: 45-46
Vertebrae: 45-46
2nd dorsal fin: 51-54
Anal fin: 42-47



EGGS

Undescribed

YOLK–SAC LARVAE

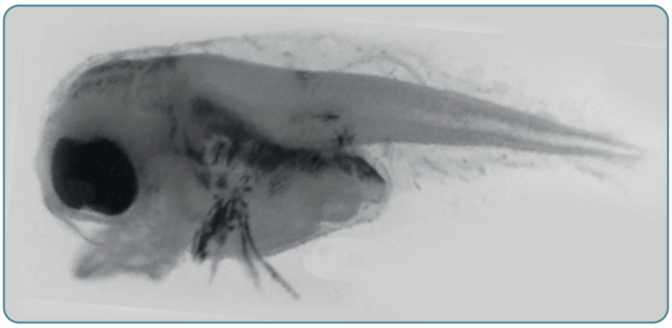
Undescribed

LARVAE — Figs. A-E

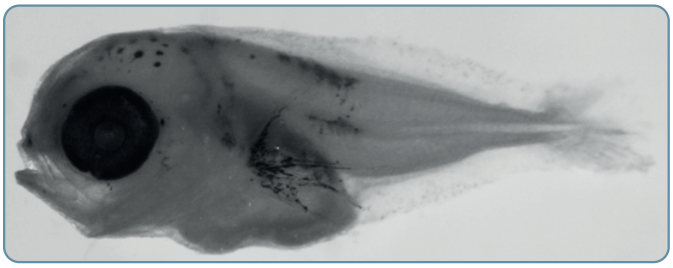
Body: deep and stubby, with caudal region slender in early larvae; pelvic fins large
Gut: relatively short, globose and triangular
Head: large and rounded
Eye: round and large
Preanus length: decreases from about 60% SL in early larvae to about 46% SL in late larvae
Air bladder: absent
Spination: 2 prominent cephalic spines on each side of head

Pigmentation: melanophores on top of head and on lateral surface of trunk; dorsal side of peritoneum strongly pigmented; melanophores on lateral surface of trunk increase in number throughout development and widen joining those on head, forming a continuous bar; upper and lower jaw tips pigmented; pelvic fins heavily pigmented; most postanal region unpigmented in early larvae, reduced to caudal region in later larvae
Length at flexion: starts at about 4.0-4.5 mm
Length at transformation: unknown

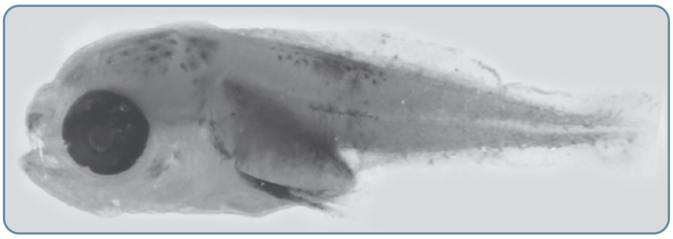
PHOTOS — by J.M. Rodriguez



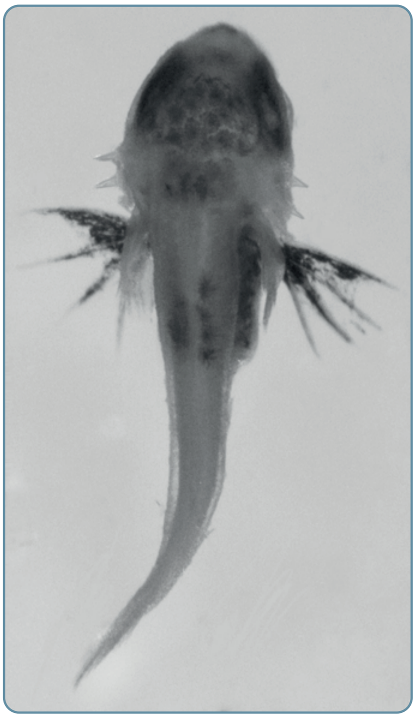
2.6 mm SL



3.5 mm SL

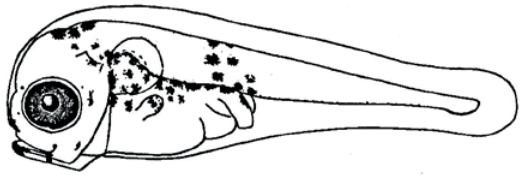


3.9 mm SL

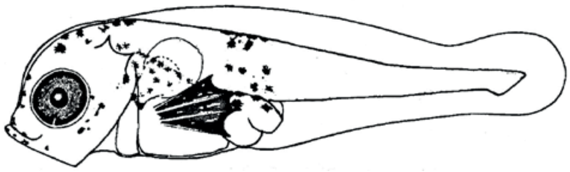


3.0 mm SL (dorsal view)

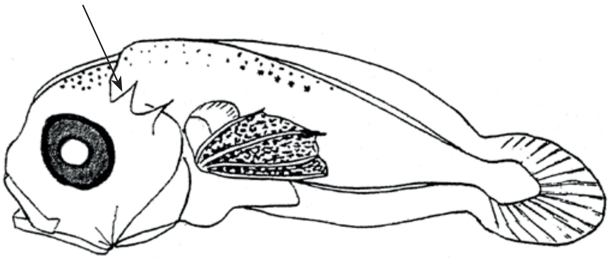
Gaidropsarus biscayensis (Collett, 1890)



A. 2.3 mm SL

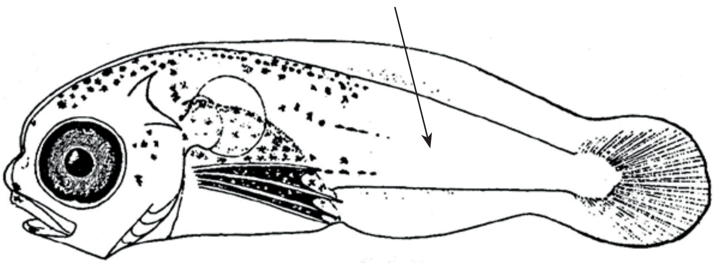


B. 3.2 mm SL

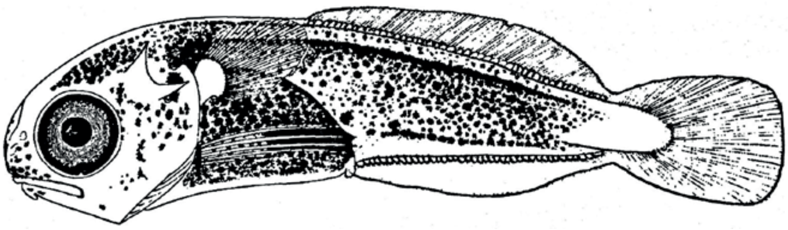


C. 3.3 mm SL

C. Dorsal view



D. 5.9 mm SL



E. 10.4 mm SL

Literature: Cohen *et al.* (1990), Alemany (1997), Demir (1982), Svetovidov (1986a)

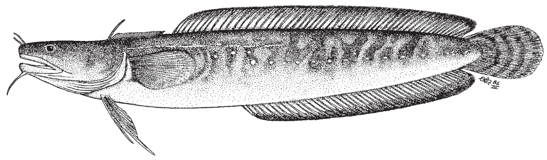
Illustrations' sources: A, B, D, E: Demir (1982); **C:** Alemany (1997)

LOTIDAE

Gaidropsarus mediterraneus (Linnaeus, 1758) Shore rockling – Motelle de Méditerranée

Habitat: neritic and upper slope, demersal, between 1 and 450 m depth
Distribution: eastern Atlantic Ocean, from north of Morocco to Norway, and the Mediterranean Sea
Spawning season: September to March (Mediterranean Sea)

Meristic characters
Myomeres: 46-49
Vertebrae: 46-49
1st dorsal fin: an elongate flexible ray
2nd dorsal fin: 51-63
Anal fin: 43-53



EGGS Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.66-0.72 mm
Perivitelline space: small
Yolk: unsegmented; unpigmented
Oil globules: one; diam. 0.15-0.19 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE Fig. B

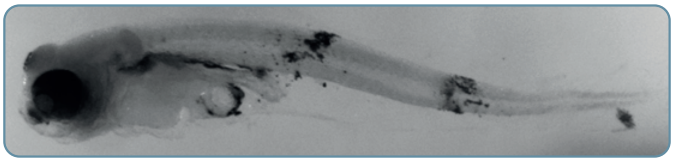
Hatch size: 1.8-1.9 mm
Body: relatively elongate and slender
Yolk sac: elongated
Oil globule location: at posterior edge of yolk sac
Anus: close to yolk sac, opens on lateral side of finfold
Preanus length: about 50% SL
Pigmentation: melanophores on head, tip of upper jaw and dorsum of trunk; a band of pigment at about mid-tail; a melanophore on ventral side of caudal region; oil globule pigmented

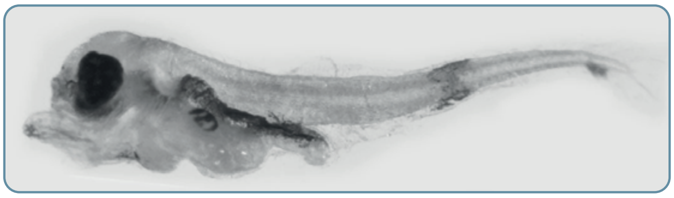
LARVAE Figs. C-F

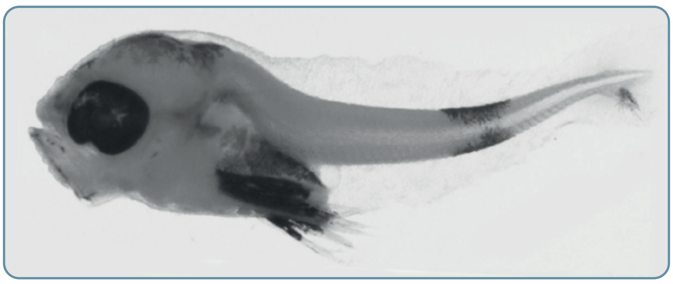
Body: relatively short with a large and deep abdominal region; pelvic fins large since early larvae
Head: large and rounded
Eye: round and large
Gut: triangular, globose
Preanus length: < 50% SL
Air bladder: present
Spination: 2 large cephalic spines on each side of head

Pigmentation: a band of pigment at about mid-tail that with development gradually changes to a mid-dorsal pigmented area which progressively enlarges, first anteriorly, later posteriorly; pigment patch on ventral side of caudal fin; melanophores on neck, head, lower jaw and peritoneal region; pelvic fins heavily pigmented
Length at flexion: 4.0-4.5 mm
Length at transformation: unknown

PHOTOS by J.M. Rodriguez

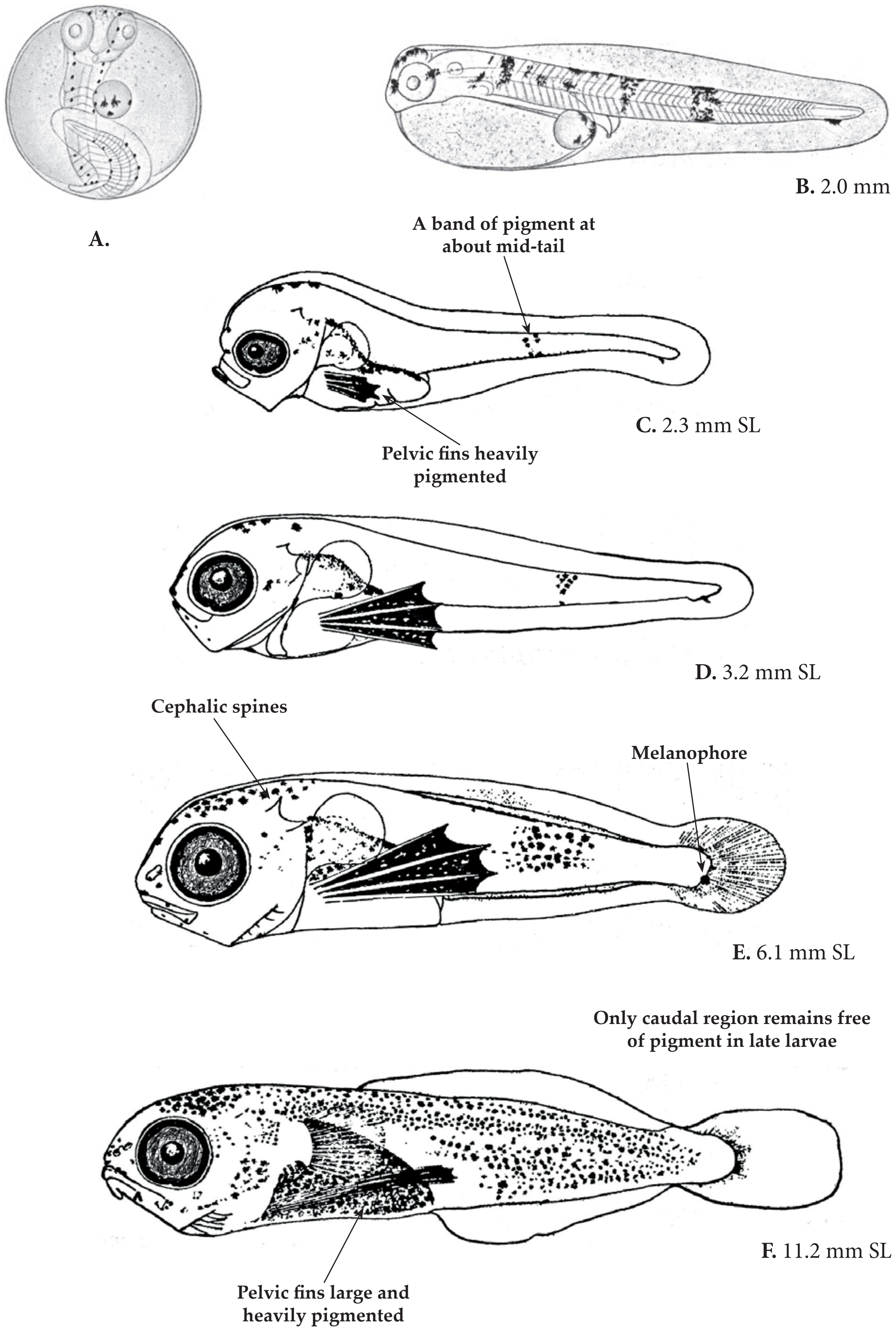

2.0 mm SL


2.4 mm SL


3.5 mm SL

GADIFORMES

Gaidropsarus mediterraneus (Linnaeus, 1758)



Literature: Aboussouan (1964), Cipria (1939), D'Ancona (1933a), Demir (1982), Froese and Pauly (2022), Svetovidov (1986a)

Illustrations' sources: A, B: Cipria (1939); **C-F:** Demir (1982)

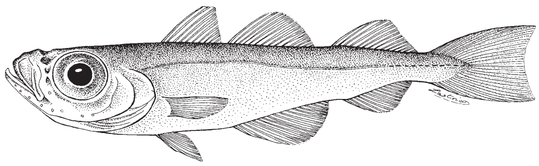
GADIDAE

Gadiculus argenteus Guichenot, 1850

Silvery put - Merlan argenté

Habitat: oceanic, bathypelagic, between 200 and 1 000 m depth
Distribution: eastern Atlantic Ocean, from Morocco to North Cape (Norway), and the western Mediterranean Sea
Spawning season: January and February

Meristic characters
Myomeres: about 37-40
Vertebrae: 37-40
1st dorsal fin: 8-12
2nd dorsal fin: 10-14
3rd dorsal fin: 11-15
1st anal fin: 15-18
2nd anal fin: 12-16



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

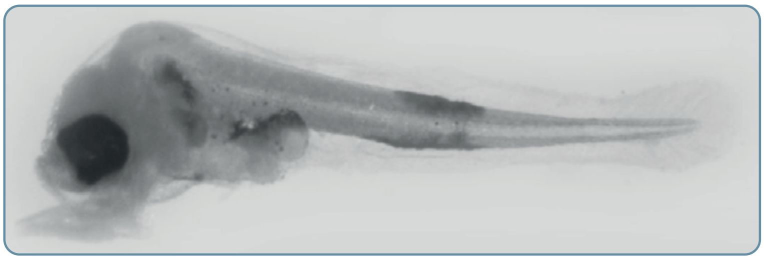
Figs. A-D

Body: short and plump, with deep abdominal region and tapered tail (spindle-shaped, typical of gadid species)
Head: large
Eye: round and relatively large
Gut: relatively short, globose and triangular
Preanus length: < 50% SL
Air bladder: absent
Spination: none

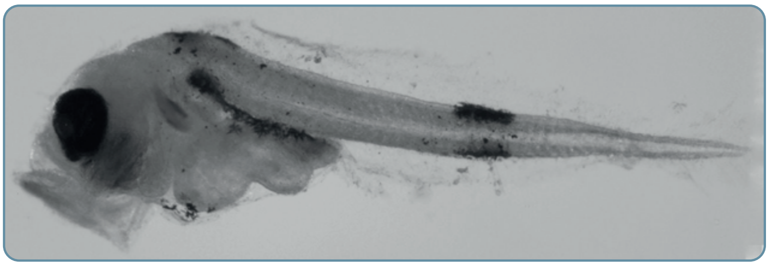
Pigmentation: 2 opposing groups of melanophores (dorsal and ventral) at about mid-tail in early larvae, growing on lateral sides of body to form a continuous bar in late larvae; some melanophores on head; upper and lower jaw-tips and peritoneal region pigmented; caudal fin pigmented; pelvic fins unpigmented
Length at flexion: unknown
Length at transformation: unknown

PHOTOS

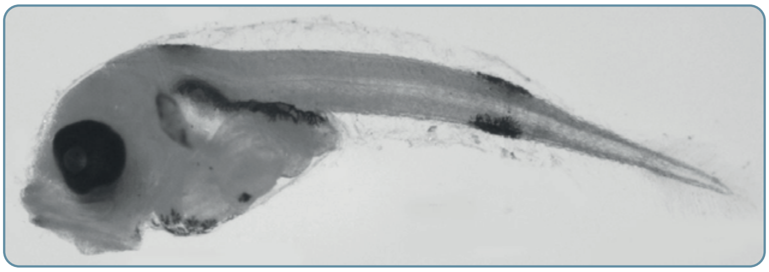
by J.M. Rodriguez



2.1 mm SL



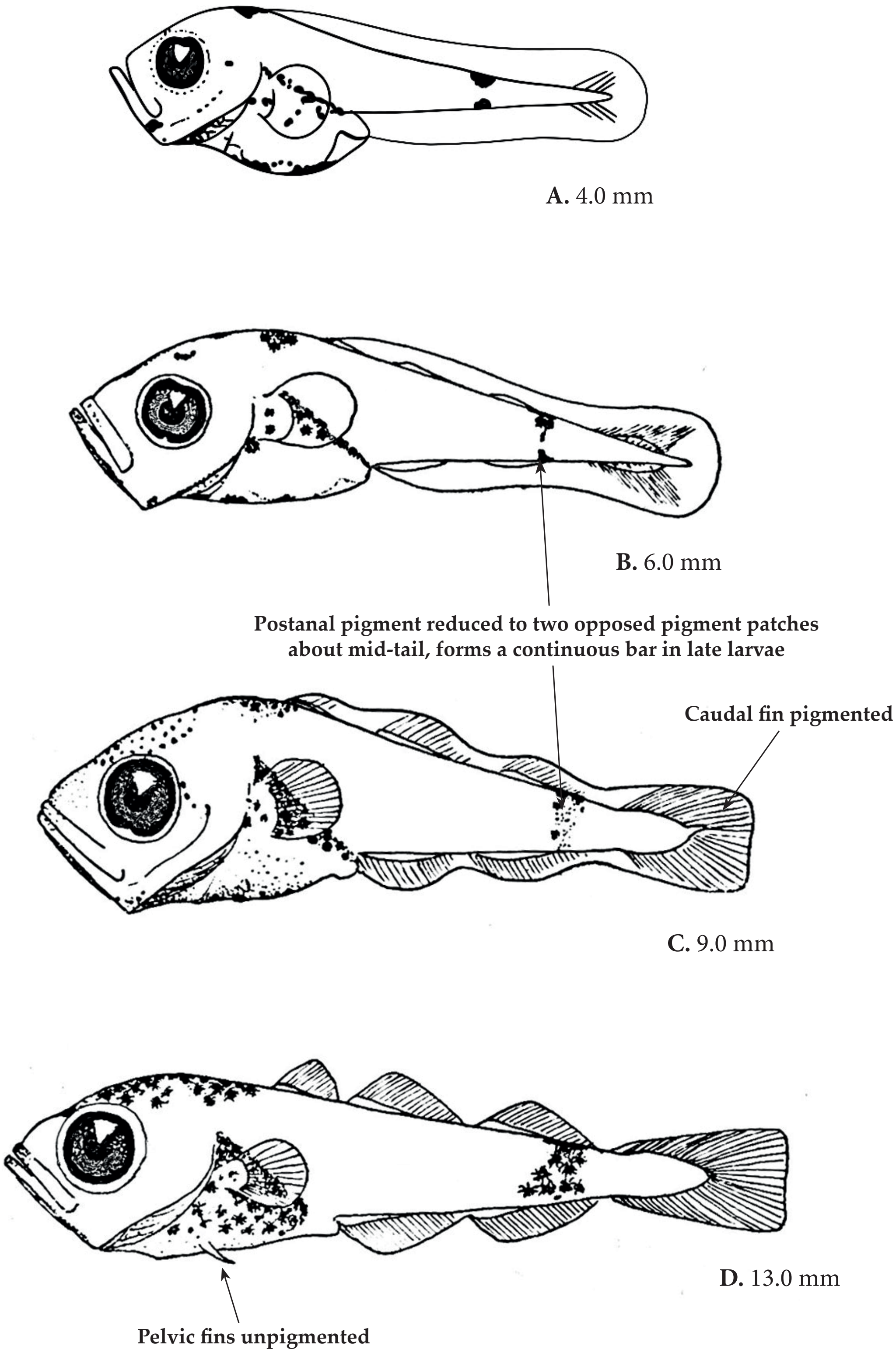
2.5 mm SL



2.7 mm SL

GADIFORMES

Gadiculus argenteus Guichenot, 1850



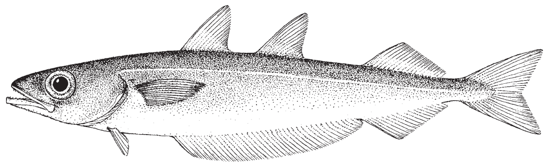
Literature: Cohen *et al.* (1990), D'Ancona (1933a), Froese and Pauly (2022), Russell (1976), Sabatés (1988), Svetovidov (1986a)

Illustrations' sources: A-D: D'Ancona (1933a)

Micromesistius poutassou (Risso, 1827) — Blue Whiting(=Poutassou) - Merlan bleu

Habitat: oceanic, meso-benthopelagic over the continental slope, from 150 m to 3 000 m depth
Distribution: North Atlantic Ocean, and the Mediterranean Sea. Eastern Atlantic, from Cape Bojador to the Barents Sea
Spawning season: January to March

Meristic characters
Myomeres: 55-58
Vertebrae: 55-58
1st dorsal fin: 12-14
2nd dorsal fin: 12-14
3rd dorsal fin: 23-28
1st anal fin: 33-39
2nd anal fin: 24-27



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 1.00-1.14 mm
Perivitelline space: small
Yolk: unsegmented; unpigmented
Oil globules: none
Colour: transparent

YOLK–SAC LARVAE — Fig. B

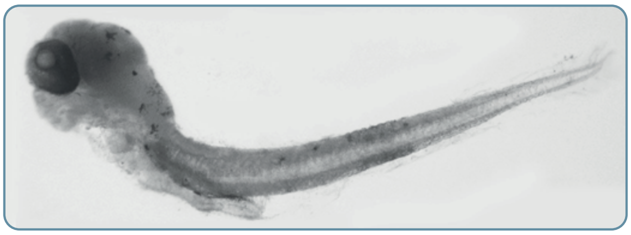
Hatch size: 2.0–2.2 mm
Body: relatively elongate and slender
Yolk sac: oval, and relatively large
Anus: close to yolk sac opens on lateral side of finfold
Preanus length: about 50% SL
Pigmentation: melanophores over head; scattered melanophores over body, except caudal region; posteriorly, dorsal and ventral bars of melanophores appear on trunk and a cap of melanophores on head; yolk sac unpigmented

LARVAE — Figs. C-G

Body: relatively long with a relatively large head, deep abdominal region and tapered tail (spindle-shaped, typical of Gadid species)
Gut: triangular
Head: large; mouth oblique and relatively small
Eye: round and large
Preanus length: decreases with development to about 40% SL after flexion
Air bladder: absent
Spination: none

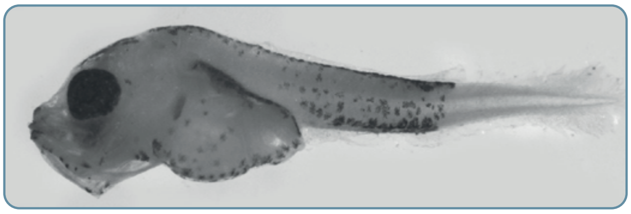
Pigmentation: dorsal (from head) and ventral (from anus) rows of paired melanophores to about mid–tail (extending backwards during development), with dorsal rows extending more backwards than ventral ones; melanophores on head; peritoneal region pigmented; no melanophores on lateral sides of trunk in larvae < 6.0 mm; end of tail and caudal region unpigmented
Length at flexion: 8.0-13.0 mm
Length at transformation: > 20.0 mm

PHOTOS — by J.M. Rodriguez

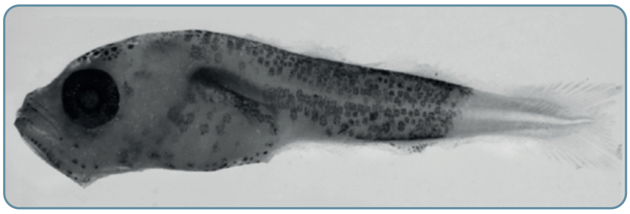


2.4 mm SL

4.1 mm SL

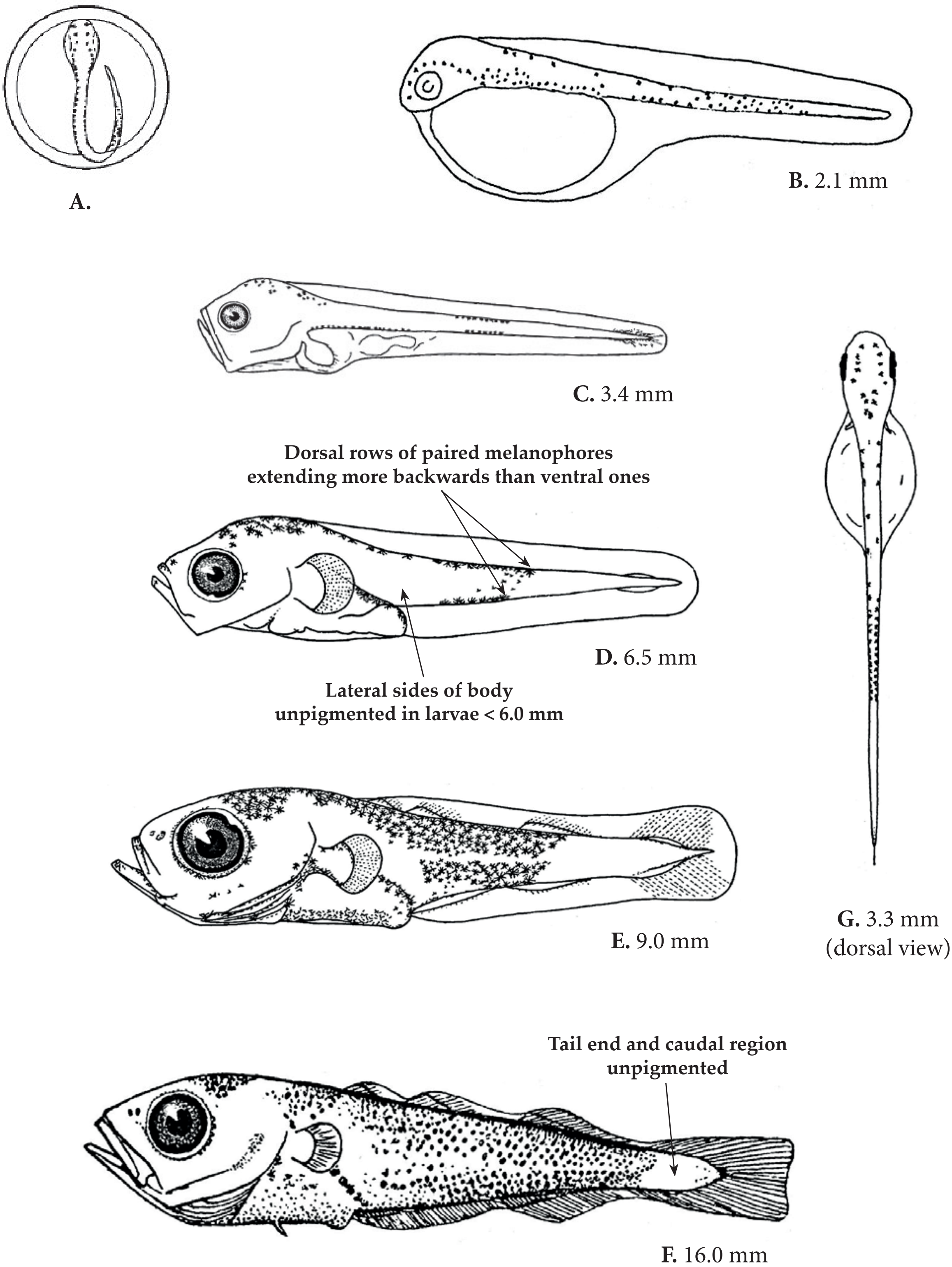


6.0 mm SL



8.0 mm SL

Micromesistius poutassou (Risso, 1827)



Literature: Cohen *et al.* (1990), D'Ancona (1933a), Fahay (2007), Russell (1976), Seaton and Bailey (1971), Schmidt (1905), Svetovidov (1986a)

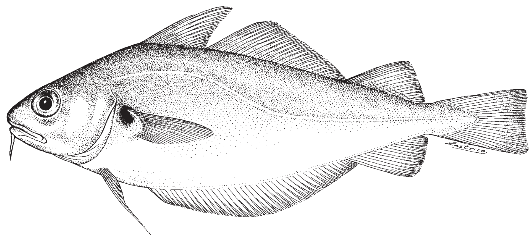
Illustrations' sources: A-C, G: Seaton and Bailey (1971); **D, E:** Schmidt (1905); **F:** D'Ancona (1933a)

GADIDAE

Trisopterus luscus (Linnaeus, 1758) — Pouting (=Bib) – Tacaud commun

Habitat: benthopelagic, between 50 and 100 m depth
Distribution: eastern Atlantic Ocean, from Morocco to the North Sea, and the Mediterranean Sea
Spawning season: December to April

Meristic characters
Myomeres: 47-49
Vertebrae: 47-49
1st dorsal fin: 11-14
2nd dorsal fin: 20-24
3rd dorsal fin: 18-20
1st anal fin: 30-34
2nd anal fin: 19-22



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.90-1.23 mm
Perivitelline space: small
Oil globules: none
Yolk: unsegmented; unpigmented
Colour: transparent

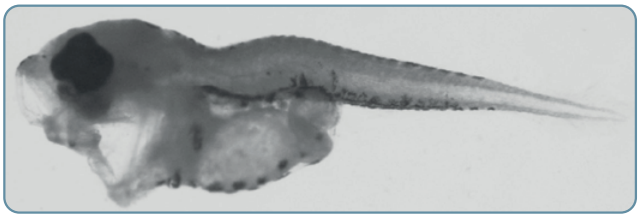
YOLK–SAC LARVAE — Fig. B

Hatch size: about 3.0 mm
Body: relatively elongate and slender
Yolk sac: oval, and relatively large
Anus: close behind yolk sac, opens on lateral side of finfold
Preanus length: about 50% SL
Pigmentation: melanophores distributed over anterior region of body: last third of body and yolk sac unpigmented

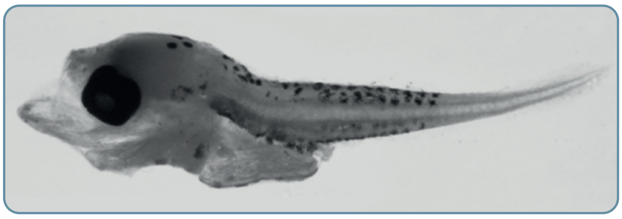
LARVAE — Figs. C-F

Body: relatively short (shorter than that of *M. poutassou*) with deep abdominal region and tapered tail (spindle-shaped, typical of gadid species)
Head: large and deep; mouth oblique
Gut: relatively short, globose and triangular
Eye: round and relatively large
Preanus length: about 50% SL
Air bladder: absent
Spination: none
Pigmentation: dorsal (from head) and ventral (from anus) rows of melanophores, ending at same level, at about mid–tail; peritoneum, ventral side of abdomen and occipital region pigmented; 1-2 melanophores on lateral sides of body in early larvae, increasing in number with development; posterior mid-tail and caudal region unpigmented
Length at flexion: unknown
Length at transformation: unknown

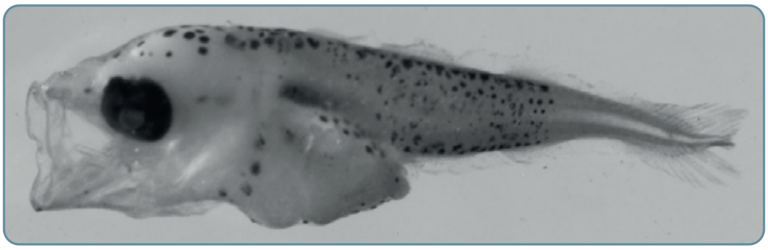
PHOTOS — by J.M. Rodriguez



3.7 mm SL



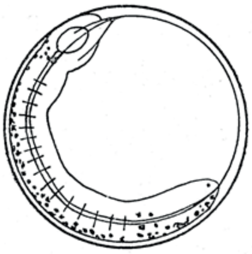
4.6 mm SL



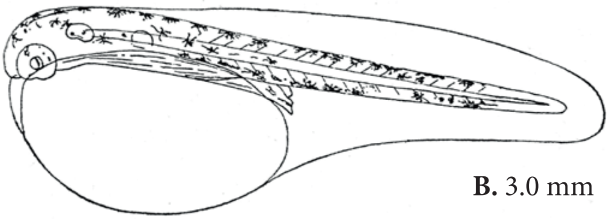
7.8 mm SL

GADIFORMES

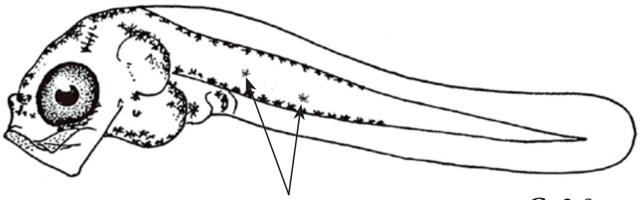
Trisopterus luscus (Linnaeus, 1758)



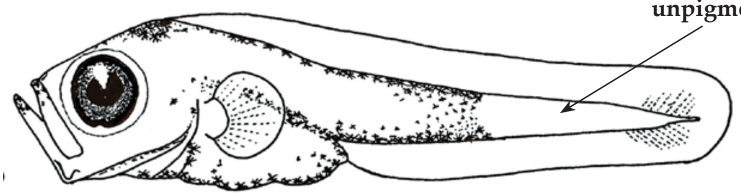
A.



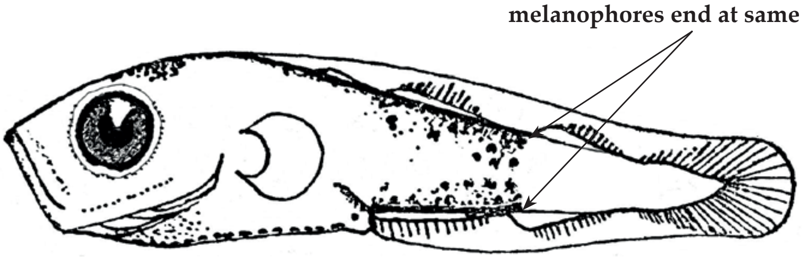
B. 3.0 mm



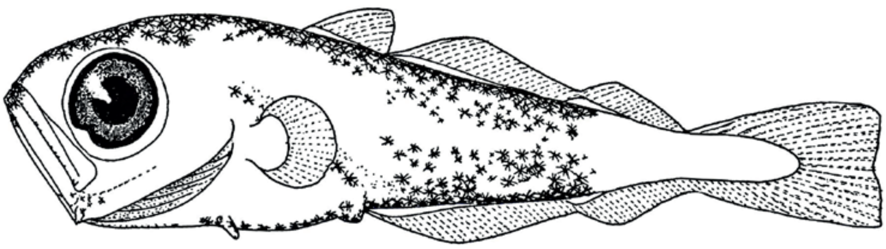
C. 3.8 mm



D. 4.5 mm



E. 7.3 mm



F. 11.0 mm

Literature: Cohen *et al.* (1990), D'Ancona (1933a), Russell (1976), Svetovidov (1986a)

Illustrations' sources: A, B, E: D'Ancona (1933a); **C, D, F:** Munk and Nielsen (2005)

GADIDAE

Trisopterus minutus (Linnaeus, 1758)

Poor cod - Capelan de Méditerranée

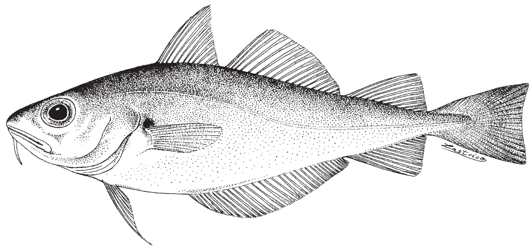
Habitat: neritic, demersal, between 10 and 200 m depth

Distribution: eastern Atlantic Ocean, from Morocco to Norway, and the western Mediterranean Sea

Spawning season: December to March

Meristic characters

Myomeres: 47-48
Vertebrae: 47-48
1st dorsal fin: 12-13
2nd dorsal fin: 23-27
3rd dorsal fin: 20-25
1st anal fin: 25-29
2nd anal fin: 15-20



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.95-1.03 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: none
Colour: transparent

YOLK–SAC LARVAE — Fig. B

Hatch size: about 2.5 mm
Body: elongate and slender
Yolk sac: oval
Anus: close behind yolk sac, opens on lateral side of finfold
Preanus length: about 43% SL
Pigmentation: dorsal and ventral rows of melanophores; eyes pigmented

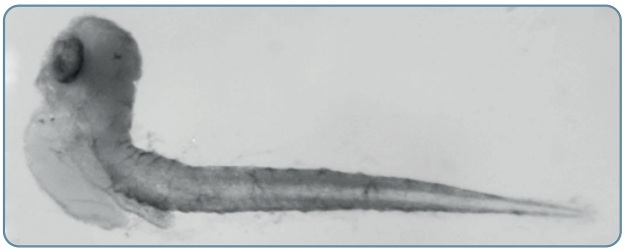
LARVAE — Figs. C-F

Body: relatively long (slender than that of *T. luscus*) and with a tapered tail (spindle-shaped, typical of gadid species)
Gut: relatively short, globose and triangular
Head: relatively large; mouth oblique
Eye: round and large
Preanus length: about 48% SL
Air bladder: absent
Spination: none

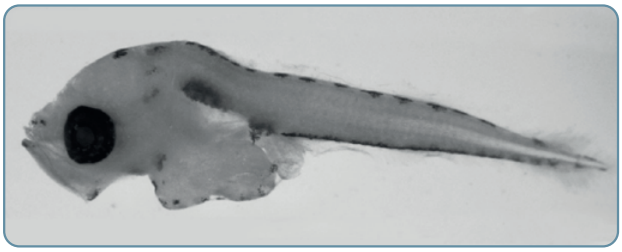
Pigmentation: single dorsal and ventral rows (about 9 in each row) of large melanophores, extending posteriorly for approximately same distance from caudal-fin base; a melanophore on each side of head, above eye; peritoneum and upper jaw pigmented; a few large preanal ventral melanophores; some melanophores appear above and below urostyle at about 6.0 mm; lateral sides of body unpigmented
Length at flexion: unknown
Length at transformation: unknown

PHOTOS

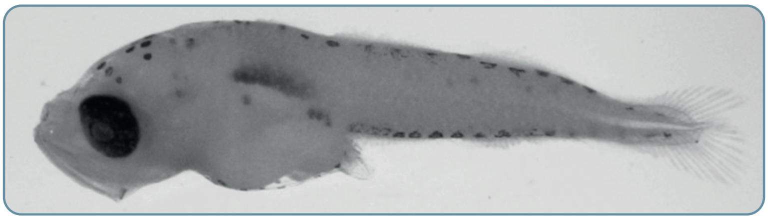
by J.M. Rodriguez



2.6 mm SL



5.6 mm SL

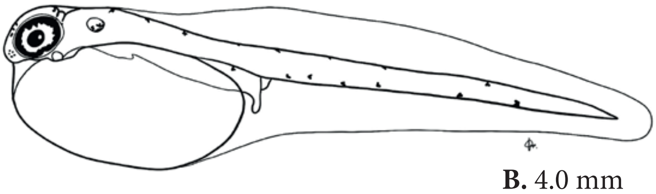


8.2 mm SL

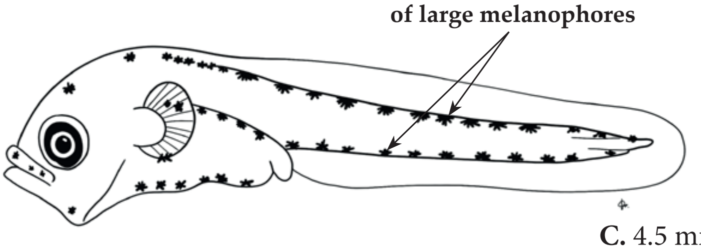
GADIFORMES

Trisopterus minutus (Linnaeus, 1758)

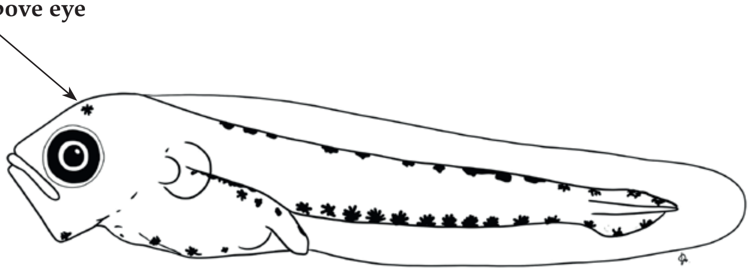
A.



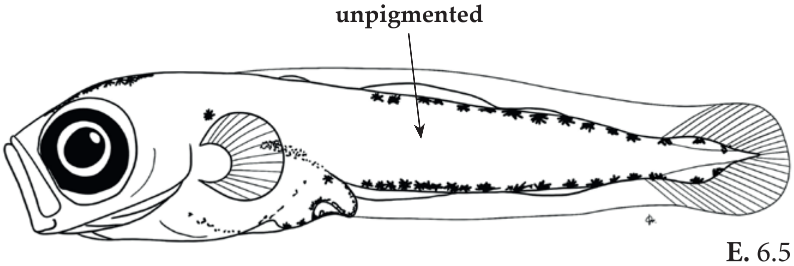
B. 4.0 mm



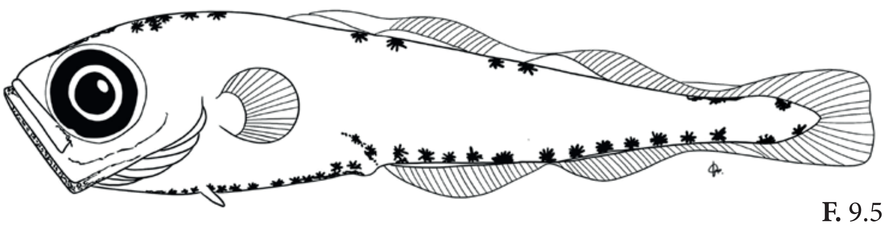
C. 4.5 mm



D. 6.0 mm



E. 6.5 mm



F. 9.5 mm

Literature: Froese and Pauly (2022), Munk and Nielsen (2005), Russell (1976), Svetovidov (1986a)

Illustrations' sources: A-F: L. Rodríguez (**A-C, E, F:** redrawn from Munk and Nielsen, 2005; **D:** redrawn from Russell, 1976)

MERLUCCIIDAE

Merluccius merluccius (Linnaeus, 1758)

European hake – Merlu européen

Habitat: neritic and slope, benthopelagic, demersal, between 30 and 1 000 m depth

Distribution: eastern Atlantic Ocean, from Mauritania to Norway, and the Mediterranean Sea

Spawning season: January to March (Morocco)

Meristic characters

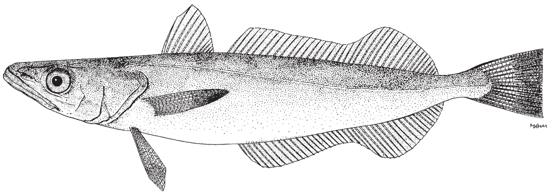
Myomeres: 49-54

Vertebrae: 49-54

1st dorsal fin: I, 7-10

2nd dorsal fin: 36-40

Anal fin: 36-40



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.94-1.03 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: one; diam. 0.25-0.28 mm; pigmented
Colour: transparent

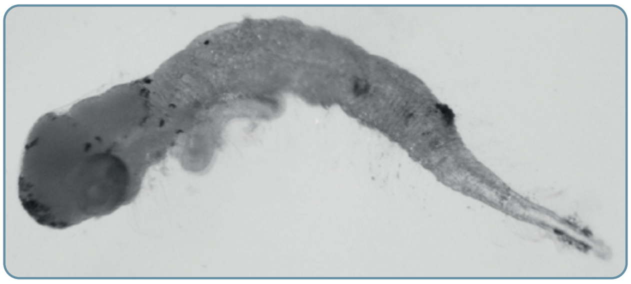
YOLK–SAC LARVAE — Fig. B

Hatch size: about 3.0 mm
Body: relatively elongate and slender
Yolk sac: elongated
Oil globule location: at posterior edge of yolk sac
Anus: close behind yolk sac, opens on lateral side of finfold
Preanus length: about 37% SL
Pigmentation: 3 postanal, large, stellate melanophores; melanophores on head; peritoneal region and oil globule pigmented

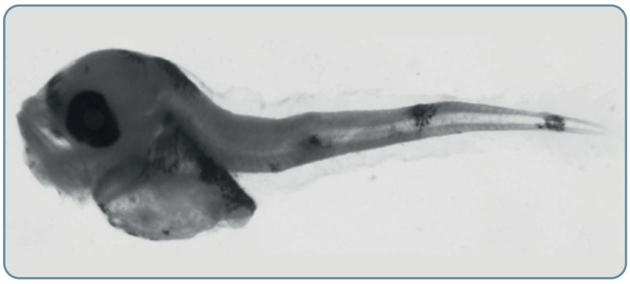
LARVAE — Figs. C-G

Body: relatively short with a large and deep abdominal region and tapered tail; pelvic fins appear in 4.0-6.0 mm larvae
Head: large and deep; mouth large, moderately oblique
Eye: round and relatively large
Gut: triangular, globose and short
Preanus length: about 45% SL
Air bladder: absent
Spination: none
Pigmentation: 3 stellate melanophores in lateral–postanal region; peritoneal region and pelvic fins pigmented; melanophores on snout, lower jaw and on neck; ventral side of tail unpigmented
Length at flexion: < 9.1 mm SL
Length at transformation: unknown

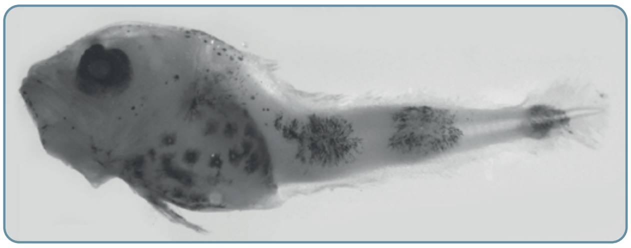
PHOTOS — by J.M. Rodriguez



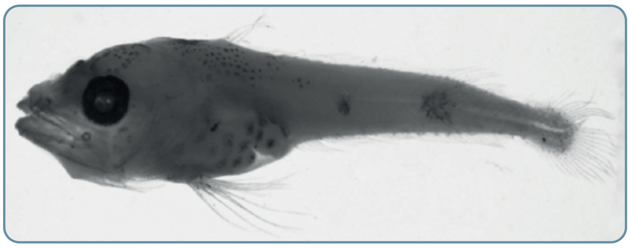
2.8 mm SL



3.8 mm SL



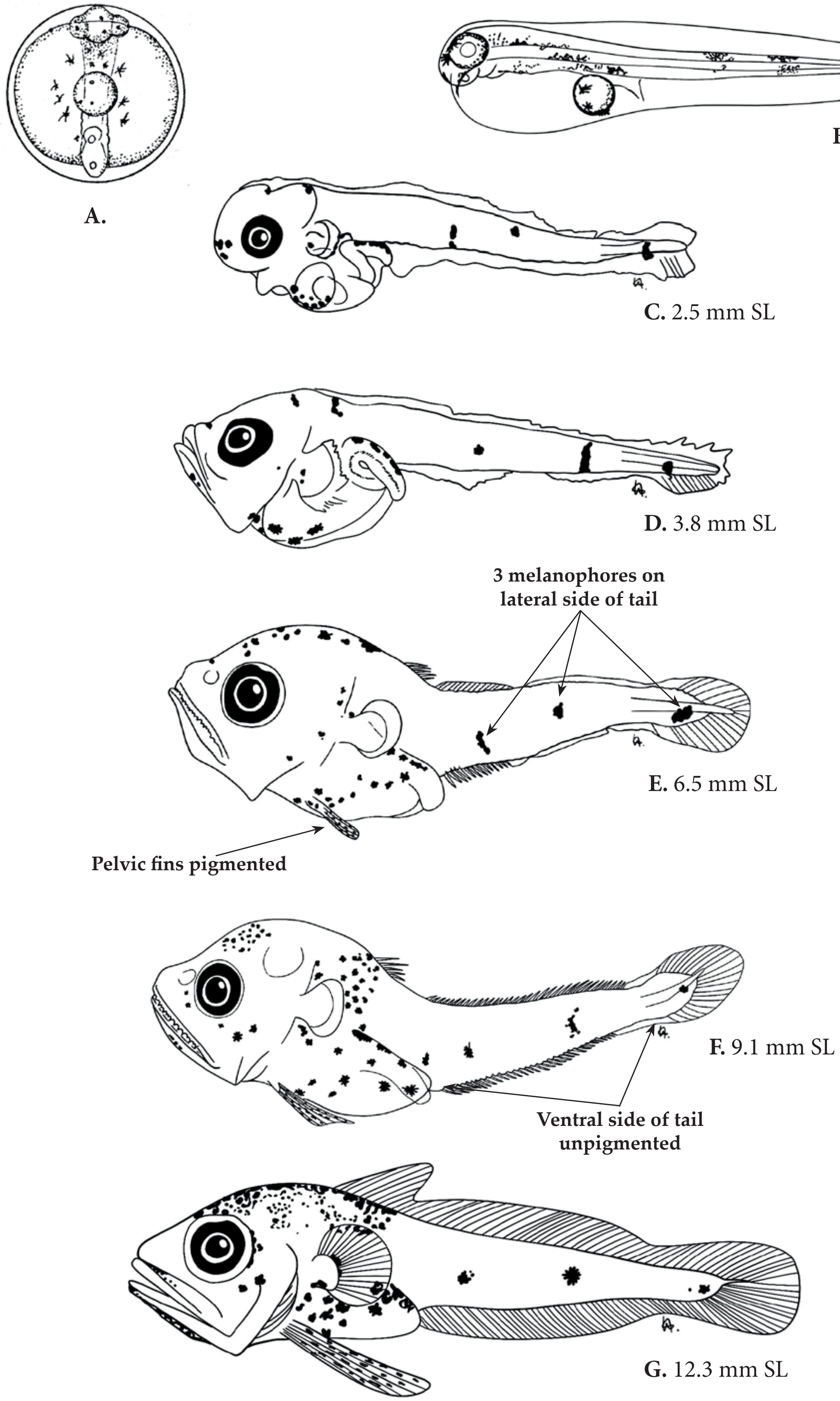
7.0 mm SL



10.8 mm SL

GADIFORMES

Merluccius merluccius (Linnaeus, 1758)



Literature: Cohen *et al.* (1990), D'Ancona (1933a) Palomera *et al.* (2005), Russell (1976), Svetovidov (1986b)

Illustrations' sources: A: D'Ancona (1933a); **B-G:** L. Rodríguez (**B, G:** redrawn from D'Ancona, 1933a; **C-F:** redrawn from Palomera *et al.*, 2005)

MELAMPHAIDAE

Melamphaes simus Ebeling, 1962

Habitat: oceanic, meso- to bathypelagic, below 150 m depth

Distribution: tropical and subtropical regions of the Atlantic, Pacific and Indian oceans.

Spawning season: unknown

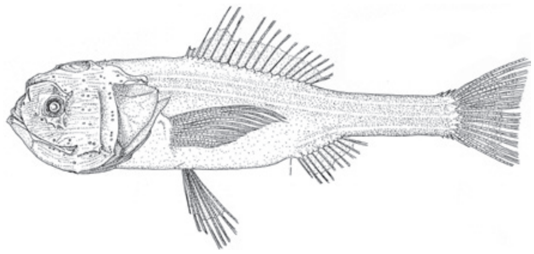
Meristic characters

Myomeres: 28-30

Vertebrae: 28-30

Dorsal fin: III + 15-17

Anal fin: I + 9-10



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

Figs. A-D

Body: elongate in early larvae, remains elongate throughout development; pelvic and pectoral fins well developed in early larvae; pelvic-fin origin moves backward with development; pelvic-fin rays long and fragile in early larvae, reduce in size with development

Head: relatively large; mouth slightly oblique

Eye: round and moderately large

Gut: thicker and triangular; terminal gut makes almost a right angle with body in early larvae; anus slightly protruding

Preanus length: increases from 29–35% SL in preflexion larvae to 61–64% SL in juveniles

Air bladder: absent

Spination: none

Pigmentation: a single melanophore on ventral mid-tail in early larvae; dorsum of body unpigmented in preflexion stage; pelvic-fin rays pigmented; throughout development, ventral spots expand to form a line between anal and caudal-fin base, and a dorsal line of melanophores that expands embracing most of body appears in late larvae; peritoneal region pigmented; melanophores over head and at caudal peduncle in late larvae

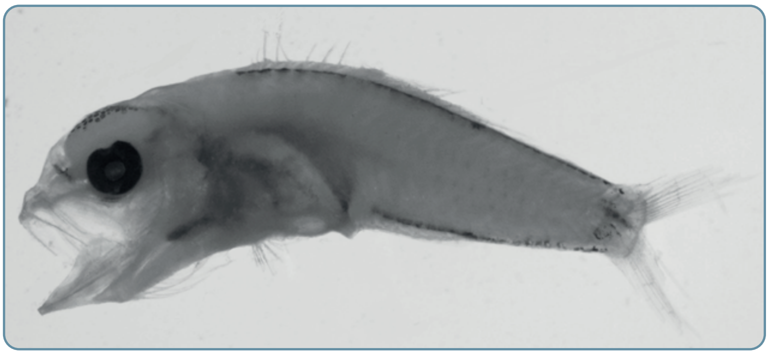
Length at flexion: 5.1-7.3 mm

Length at transformation: about 12.0-13.0 mm

PHOTOS

by J.M. Rodriguez

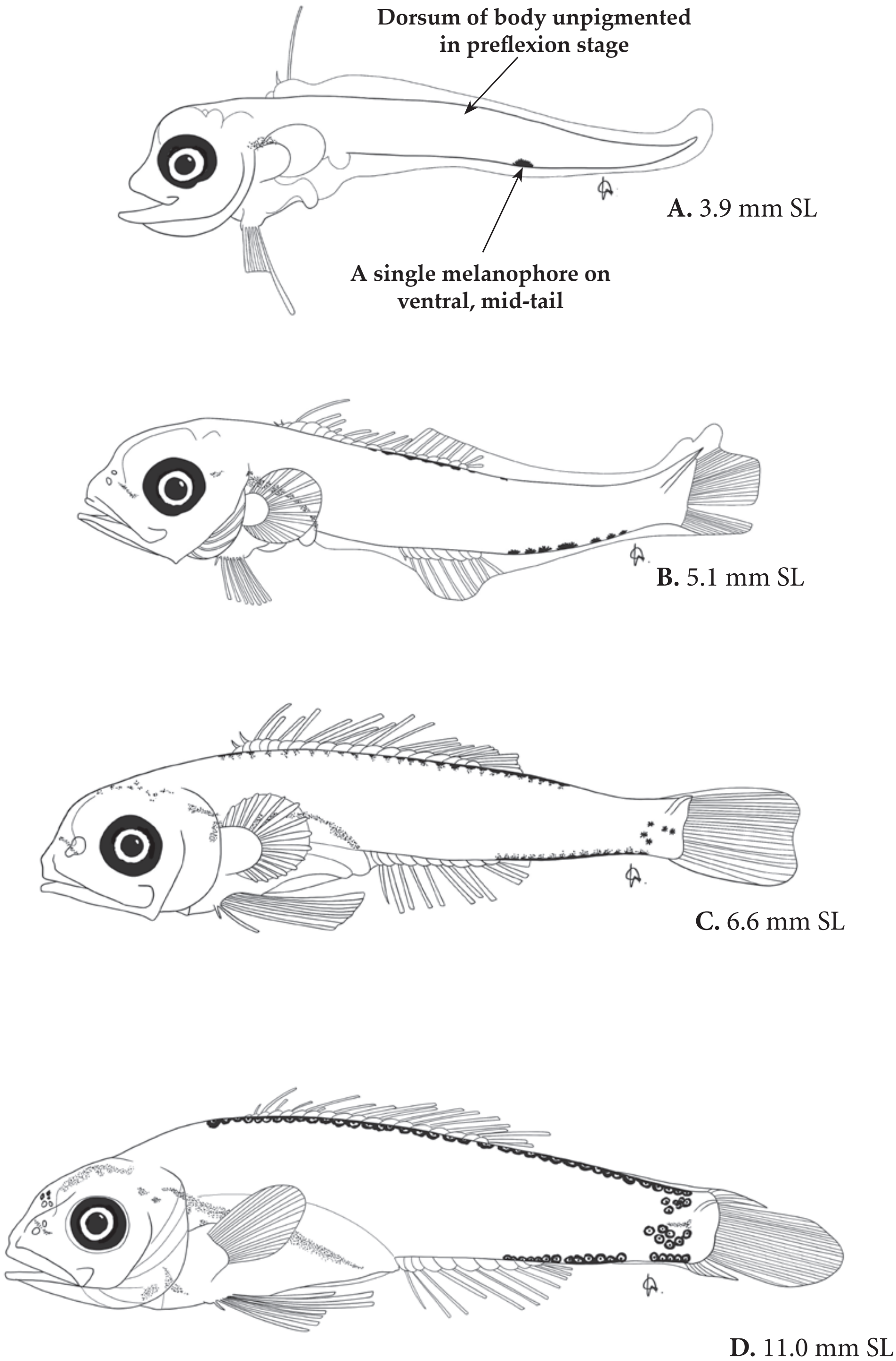
4.5 mm SL



8.1 mm SL

BERYCIFORMES

Melamphaes simus Ebeling, 1962



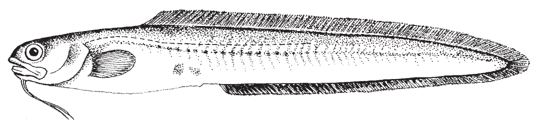
Literature: Ebeling and Weed (1963), Ebeling (1986), Fahay (2007), Frias-Torres (2006), Froese and Pauly (2022), Sandknop and Watson (1996)

Illustrations' sources: A-D: L. Rodríguez (redrawn from Sandknop and Watson (1996)

Parophidion vassali (Risso, 1810)

Habitat: neritic, demersal, between 0 and 150 m depth
Distribution: eastern Atlantic Ocean, from Mauritania to Portugal, and the Mediterranean Sea
Spawning season: summer (Mediterranean Sea)

Meristic characters
Myomeres: 71-73
Vertebrae: 71-73
Dorsal fin: 122-128
Anal fin: 107-110



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.96 mm
Perivitelline space: small
Yolk: unsegmented; unpigmented
Oil globules: none
Colour: transparent

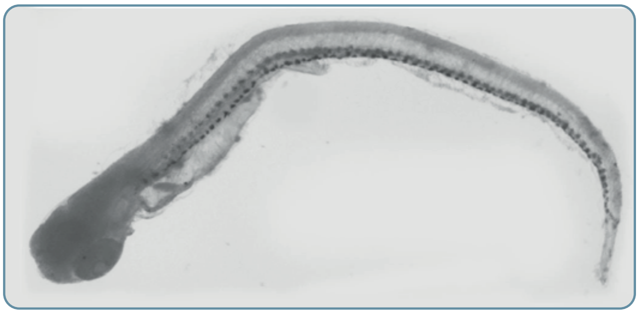
YOLK–SAC LARVAE — Fig. B

Hatch size: about 3.6 mm
Body: relatively elongate and slender
Yolk sac: elongated, reaches snout
Anus: detached from yolk sac, reaches border of finfold, forming a right angle with gut
Preanus length: about 50% SL
Pigmentation: melanophores over ventral profile of body and laterally at about mid-body

LARVAE — Figs. C-G

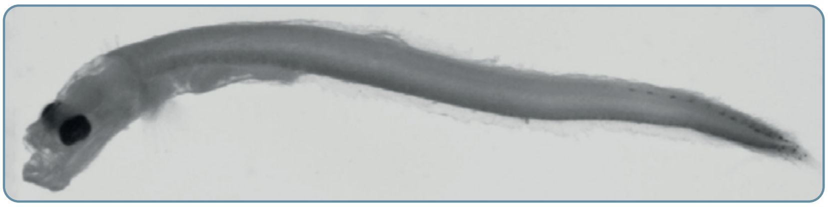
Body: elongate and slender
Head: relatively long and deep; jaws in angle pointing down
Eye: round and small
Gut: short, forms a swelling (probably a loop, like in other Ophidiidae species), midway along its length
Preanus length: about 42% SL
Air bladder: absent
Spination: none
Pigmentation: a ventral series of dotted melanophores extending from pectoral fin to urostyle end; ventral melanophores over gut; a series of melanophores on dorsal posterior half of tail; late larvae add melanophores on lower jaw and posterior edge of operculum; lateral sides of body unpigmented
Length at flexion: unknown
Length at transformation: unknown

PHOTOS — by J.M. Rodriguez



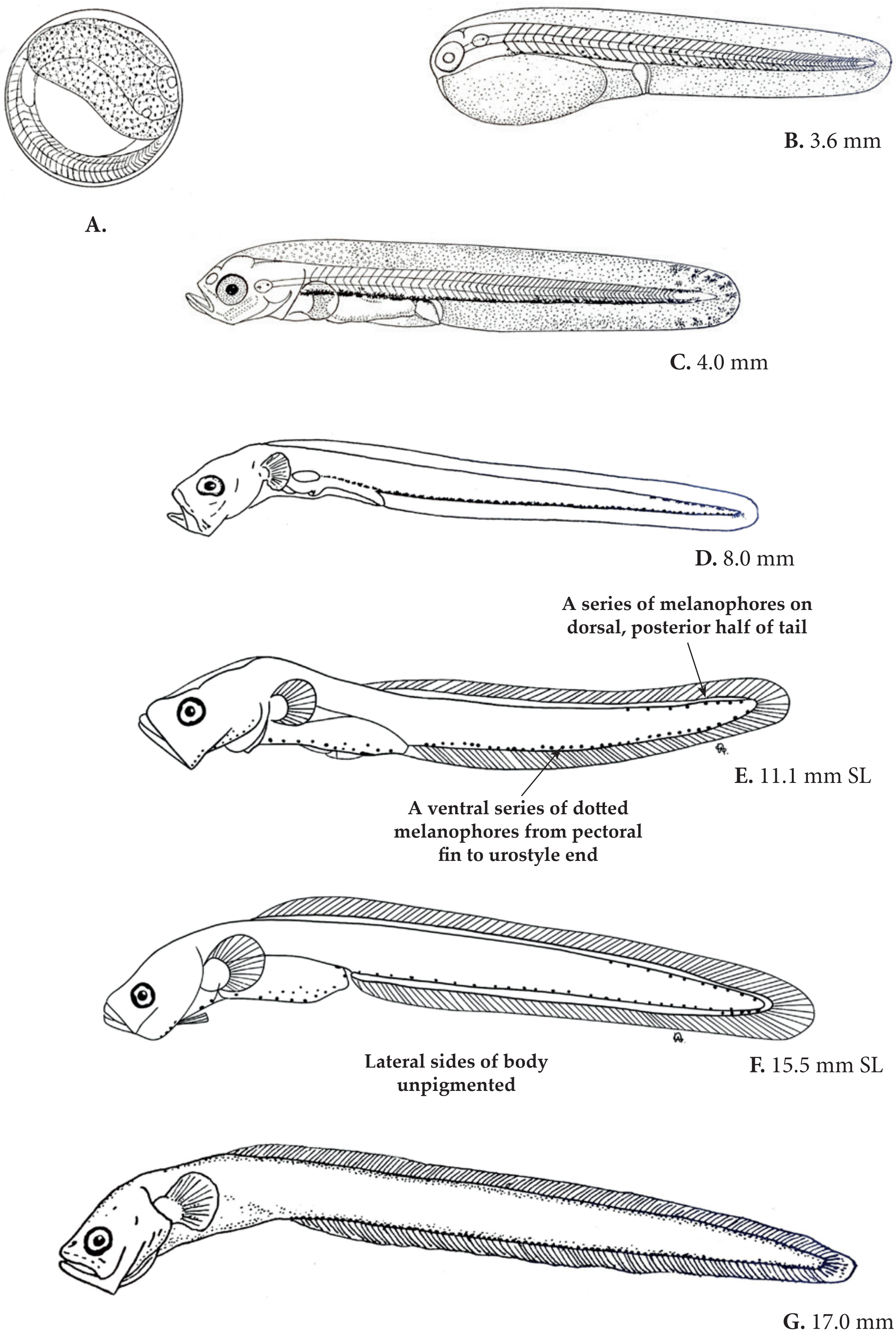
3.0 mm SL

6.3 mm SL



8.9 mm SL

Parophidion vassali (Risso, 1810)



Literature: Bas *et al.* (1976), Froese and Pauly (2022), Nielsen (1986b), Padoa (1956k), Tortonese (1975)

Illustrations' sources: A-D, G: Padoa (1956k); **E, F:** L. Rodríguez (redrawn from Alemany, 1997)

CARAPIDAE

Echiodon dentatus (Cuvier, 1829)

Habitat: oceanic, demersal, between 120 and 3 250 m depth
Distribution: eastern Atlantic Ocean, from the equator to North of Spain, and the Mediterranean Sea
Spawning season: winter (Mediterranean Sea)

Meristic characters
Myomeres: many
Vertebrae: NA
Dorsal fin: 144
Anal fin: 165

EGGS — Fig. A

Habitat: pelagic
Shape: ovoid
Chorion: smooth, embedded in slime; size 1.43 x 0.89 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: one; diam. 0.13-0.17 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

Hatch size: about 3.80 mm
Body: elongate and slender; incipient dorsal appendage situated above yolk sac
Yolk sac: large, slightly ovoid (almost circular)
Oil globule location: at anterior edge of yolk sac
Anus: close behind yolk sac, reaches finfold border
Preanus length: about 36% SL
Pigmentation: a melanophore at base of dorsal appendage; some melanophores on dorsal surface of yolk sac; 2 melanophores in ventral tail region; opposing dorsal and ventral melanophores at caudal region; oil globule and yolk sac pigmented

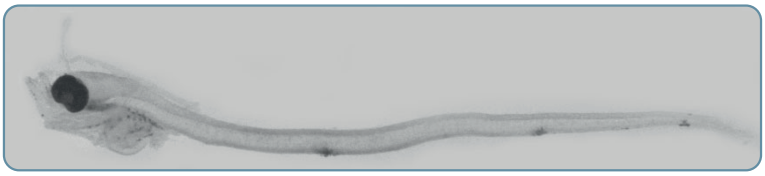
LARVAE — Figs. C-E

Body: very elongate and slender, tapering to a filamentous tip; a large dorsal appendage situated a little posterior to anus
Head: relatively long and curved downward; snout concave
Eye: round
Gut: short, coiled
Preanus length: about 20% SL
Air bladder: prominent
Spination: none

Pigmentation: melanophores on snout, on lower jaw and over gut; 3 relatively large and other small postanal ventral melanophores; opposing dorsal and ventral melanophores at caudal region; in late larvae, ventral melanophores migrate to sides of tail, dorsal melanophore on caudal region may disappear and ventral melanophore reduce in size and increase in number, up to 3; dorsal appendage strongly pigmented
Length at flexion: unknown
Length at transformation: unknown

PHOTOS

by J.M. Rodriguez



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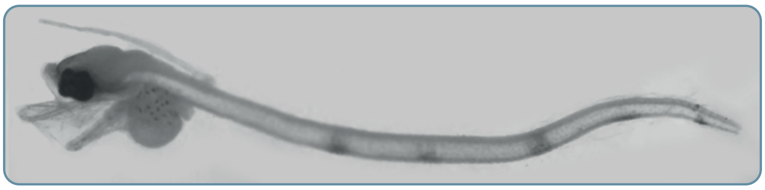

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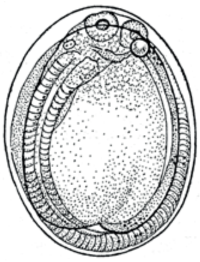
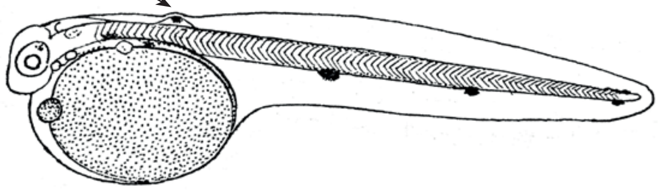
OPHIDIIFORMES

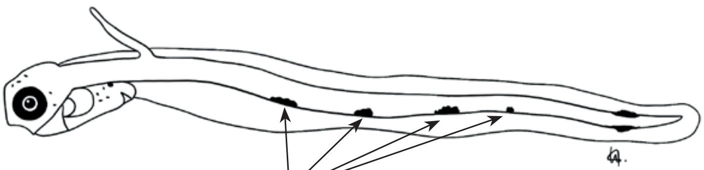
Echiodon dentatus (Cuvier, 1829)



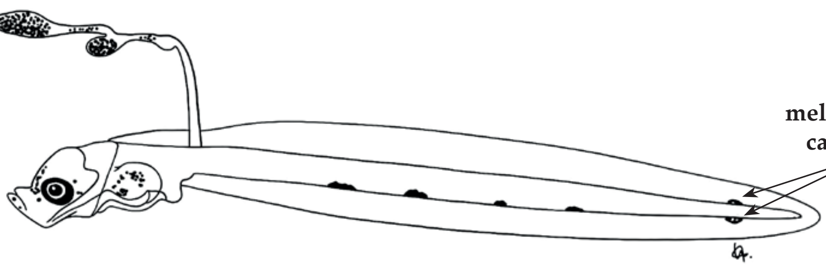
A.



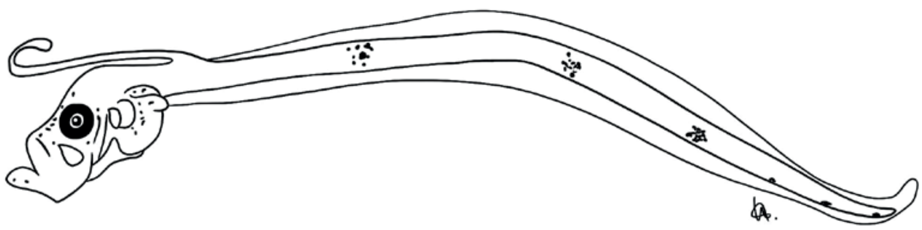
B. 3.8 mm



C. 4.3 mm SL



D. 6.4 mm



E. 16.2 mm SL

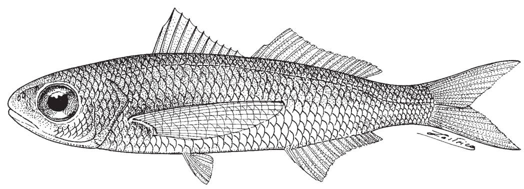
Literature: Alemany (1997), Froese and Pauly (2022), Padoa (1956g), Trot and Olney (1986)

Illustrations' sources: A, B: Padoa (1956g); **C-E:** L. Rodríguez (**C, E:** redrawn from Alemany, 1997, **D:** redrawn from Padoa, 1956g)

Cubiceps pauciradiatus Günther, 1872 — Bigeye cigarfish

Habitat: oceanic, epi- mesopelagic, between 58 and 1000 m depth
Distribution: worldwide in tropical and subtropical waters
Spawning season: unknown

Meristic characters
Myomeres: 30-31
Vertebrae: 30-31
Dorsal fin: XI-XII+15-18
Anal fin: II + 14-17



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.70-0.80 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: one; diam. 0.14-0.20; pigmented
Colour: transparent

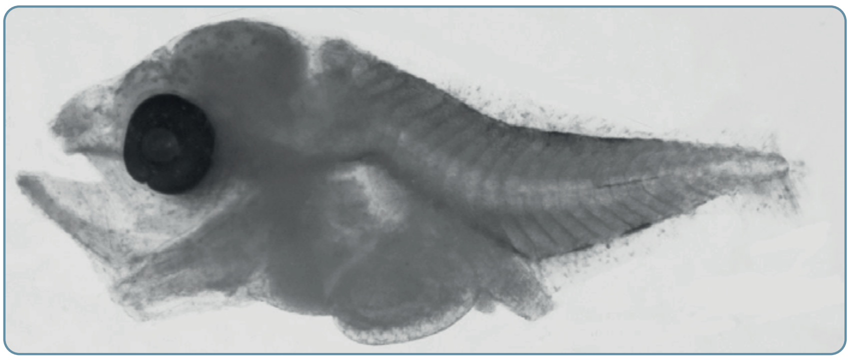
YOLK–SAC LARVAE — Fig. B

Hatch size: < 2.1 mm SL
Body: slender; gut straight
Yolk sac: no information
Oil globule location: anterior in yolk sac
Anus: detached from yolk sac, reaches finfold border
Preanus length: < 50% SL
Pigmentation: tip of jaws, peritoneal region, oil globule and yolk sac pigmented

LARVAE — Figs. C-F

Body: initially elongate, soon deepens, becoming moderately stocky with development
Head: moderately large; mouth relatively large and oblique
Eye: round and relatively large
Gut: initially straight, becomes bulky and triangular after coiling
Preanus length: increases from 52-59% SL to 59-65% SL throughout development
Air bladder: absent
Spination: 4-5 weak preopercular spines (forming at about 5.0 mm SL); a few spines on lateral ridge (forming at about 8.5 mm SL) are reabsorbed at about 11.2 mm SL
Pigmentation: melanophores on head; tips of jaws and peritoneal region pigmented; melanophores form three stripes (on dorsum, middle and ventral sides of body) at about mid-tail; pigmentation increases with development
Length at flexion: 3.8-4.5 mm
Length at transformation: unknown

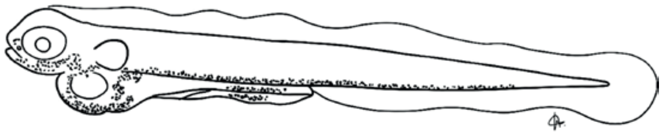
PHOTOS — by J.M. Rodriguez



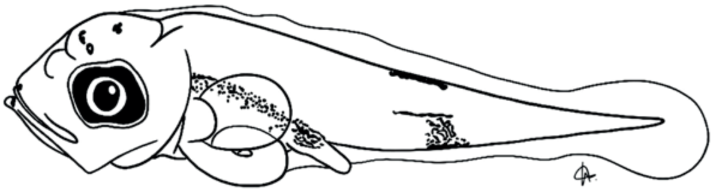
4.0 mm SL

Cubiceps pauciradiatus Günther, 1872

A.

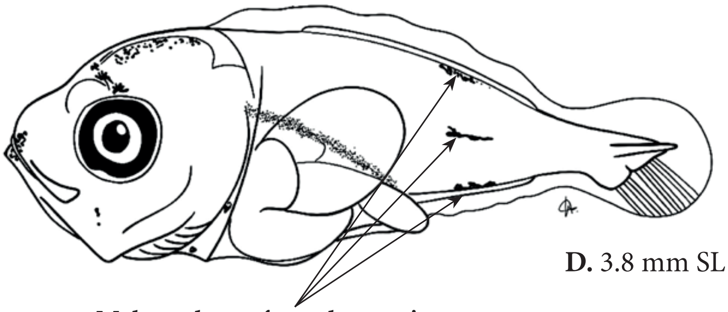


B. 2.1 mm SL



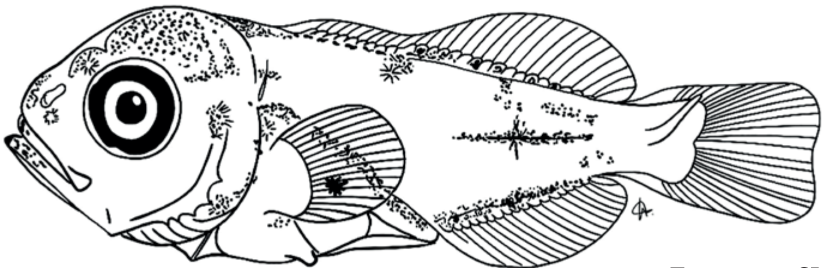
C. 3.1 mm SL

D. Ventral view

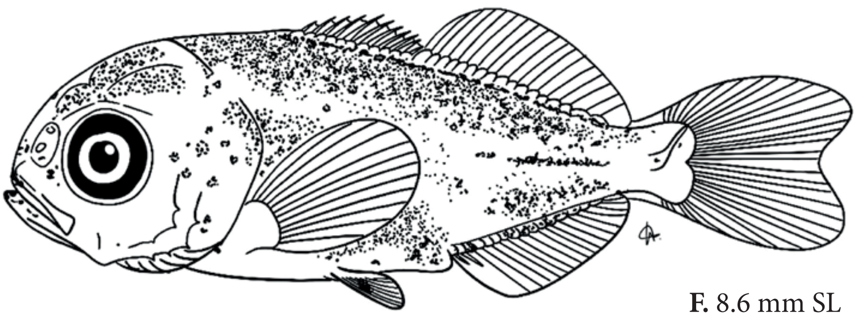


D. 3.8 mm SL

Melanophores form three stripes, on dorsum, middle and ventral sides of tail



E. 5.1 mm SL



F. 8.6 mm SL

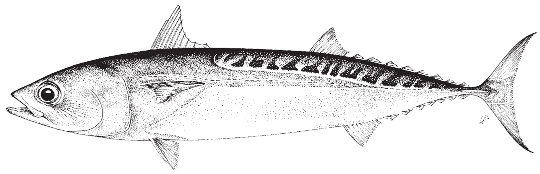
Literature: Ahlstrom *et al.* (1976), Fahay (2007), Froese and Pauly (2022), Lamkin (2006), Olivar and Fortuño (1991)

Illustrations' sources: A-F: L. Rodríguez (redrawn from Ahlstrom *et al.*, 1976)

Auxis rochei (Risso, 1810) — Bullet tuna - Bonitou

Habitat: neritic-oceanic, epipelagic
Distribution: worldwide, in tropical and temperate waters
Spawning season: November to August

Meristic characters
Myomeres: 39
Vertebrae: 39
1st dorsal fin: XX-XXII
2nd dorsal fin: 10-12
Dorsal finlets: 8
Anal-fin: 11-14
Anal finlets: 7



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam 0.82-1.10 mm
Perivitelline space: small
Yolk: unsegmented; unpigmented
Oil globules: one; diam. 0.24-0.29 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE

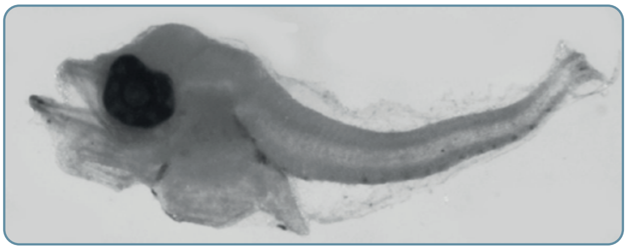
Hatch size: about 2.14 mm
Body: elongate
Yolk sac: no information
Oil globule location: no information
Anus: no information
Preanus length: about 37% SL
Pigmentation: melanophores on head; a row of melanophores on postanal ventral region; gut pigmented

LARVAE — Figs. B-G

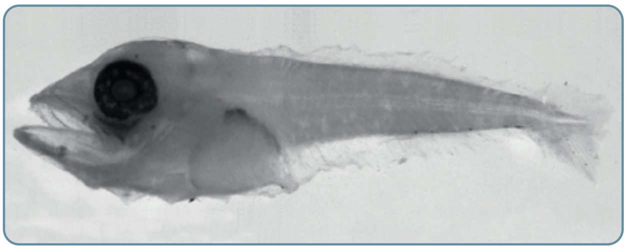
Body: moderately elongate in early larvae, becoming deeper with development
Head: slightly bigger than in *Scomber* larvae, showing a fairly blunt profile; jaws short (compared with other tuna species)
Eye: round and large
Gut: triangular and compact
Preanus length: increases from 37 to 50% SL during development
Air bladder: absent
Spination: preopercular spines on edge and lateral ridge well developed with spine at angle longer; 2-3 post-temporal spines in late larvae

Pigmentation: early larvae similar to yolk–sac larvae; late larvae, origin of ventral postanal row of melanophores moves backwards and melanophores decrease in number; melanophores on top of head; peritoneal pigment increases; 2 dorsal melanophores on caudal peduncle that spread forward with development; a melanophore at cleithral symphysis
Length at flexion: 4.5-6.0 mm SL
Length at transformation: unknown

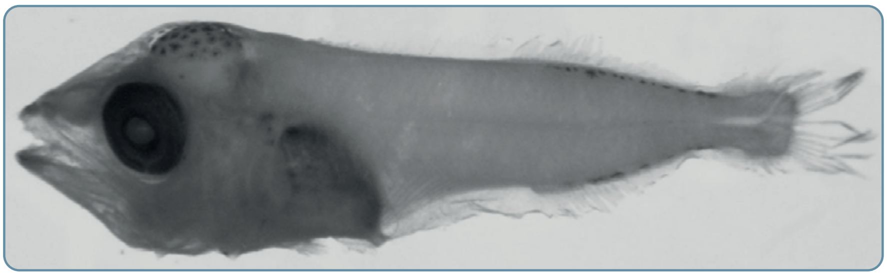
PHOTOS — by J.M. Rodriguez



2.4 mm SL

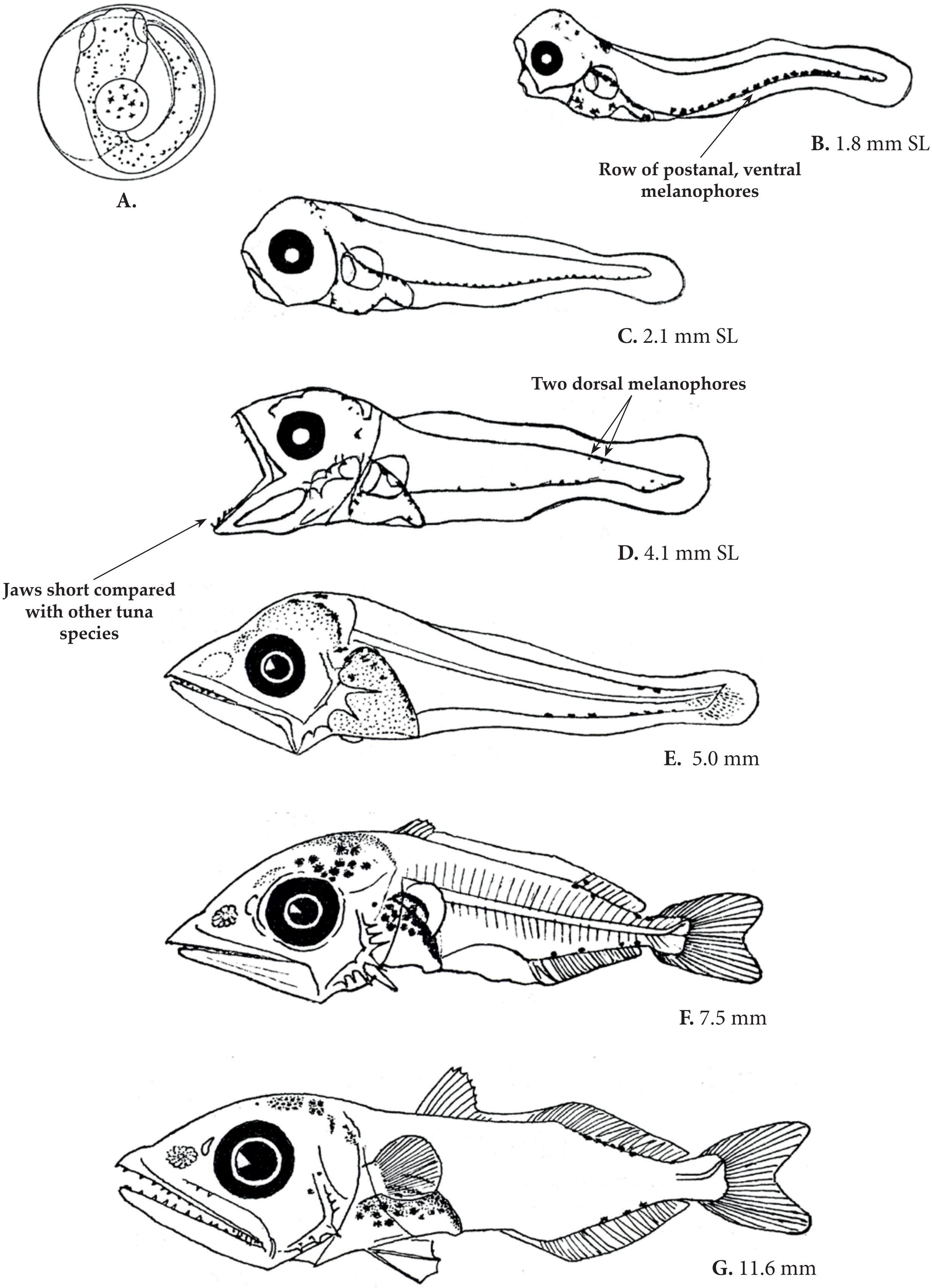


4.9 mm SL



7.0 mm SL

Auxis rochei (Risso, 1810)



Literature: Collette (1986b), Fahay (2007), Froese and Pauly (2022), Padoa (1956n), Richards (2006g)

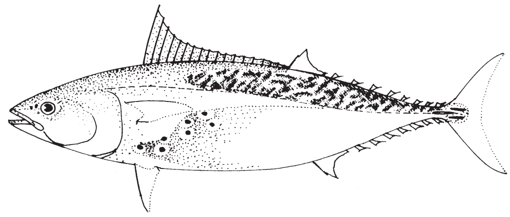
Illustrations' sources: A: Richards (2006g); **B-D:** Alemany (1997); **E-G:** Padoa (1956n)

SCOMBRIDAE

Euthynnus alletteratus (Rafinesque, 1810) — Little tunny - Thonine commune

Habitat: neritic, epipelagic in coastal waters
Distribution: Atlantic Ocean, in tropical and temperate waters, and the Mediterranean Sea
Spawning season: April to November

Meristic characters
Myomeres: 39
Vertebrae: 39
1st dorsal fin: XIII-XV
2nd dorsal fin: 11-12
Dorsal finlets: 8
Anal fin: 11-13
Anal finlets: 7-8



EGGS

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.84-1.08 mm
Perivitelline space: no information
Yolk: unsegmented
Oil globules: one; diam. 0.28 mm
Colour: transparent

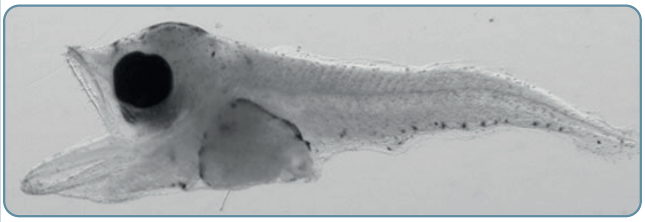
YOLK–SAC LARVAE

Undescribed

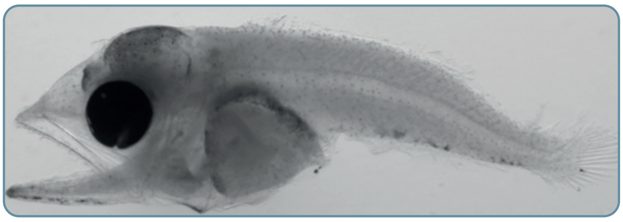
LARVAE — Figs. A-E

Body: moderately stubby (deeper than similar-sized *Auxis* larvae)
Head: large, with a large and pointed snout; mouth large, reaching beyond mid-point of eye; each jaw with 14 relatively large teeth, since early larvae
Eye: round and large
Gut: triangular and compact
Preanus length: increases from 50 to 70% SL during development
Air bladder: absent
Spination: preopercular spines well developed on edge and lateral ridge, with spine at angle longer; 1-2 post-temporal spines
Pigmentation: row of melanophores over lower jaw that increases in number and length with development; tip of upper jaw pigmented; around 11 postanal, ventral, regularly spaced melanophores; a melanophore at base of caudal fin; melanophores on top of head, increase in number with development and extend anteriorly to area in front of eyes; peritoneum pigmented; dorsal fin pigmented; lateral sides of trunk and tail unpigmented until later larvae
Length at flexion: 5.5-7.5 mm SL
Length at transformation: unknown

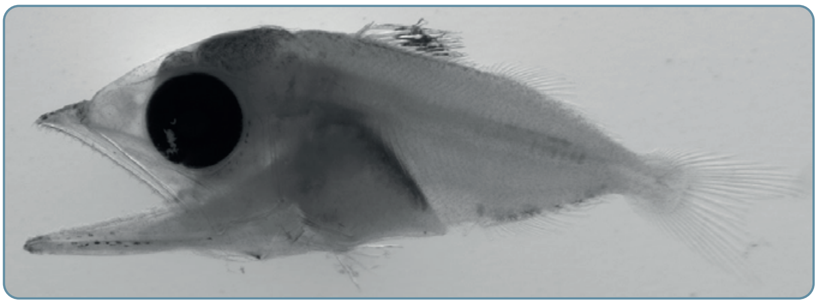
PHOTOS — by S. Isari



4.3 mm SL



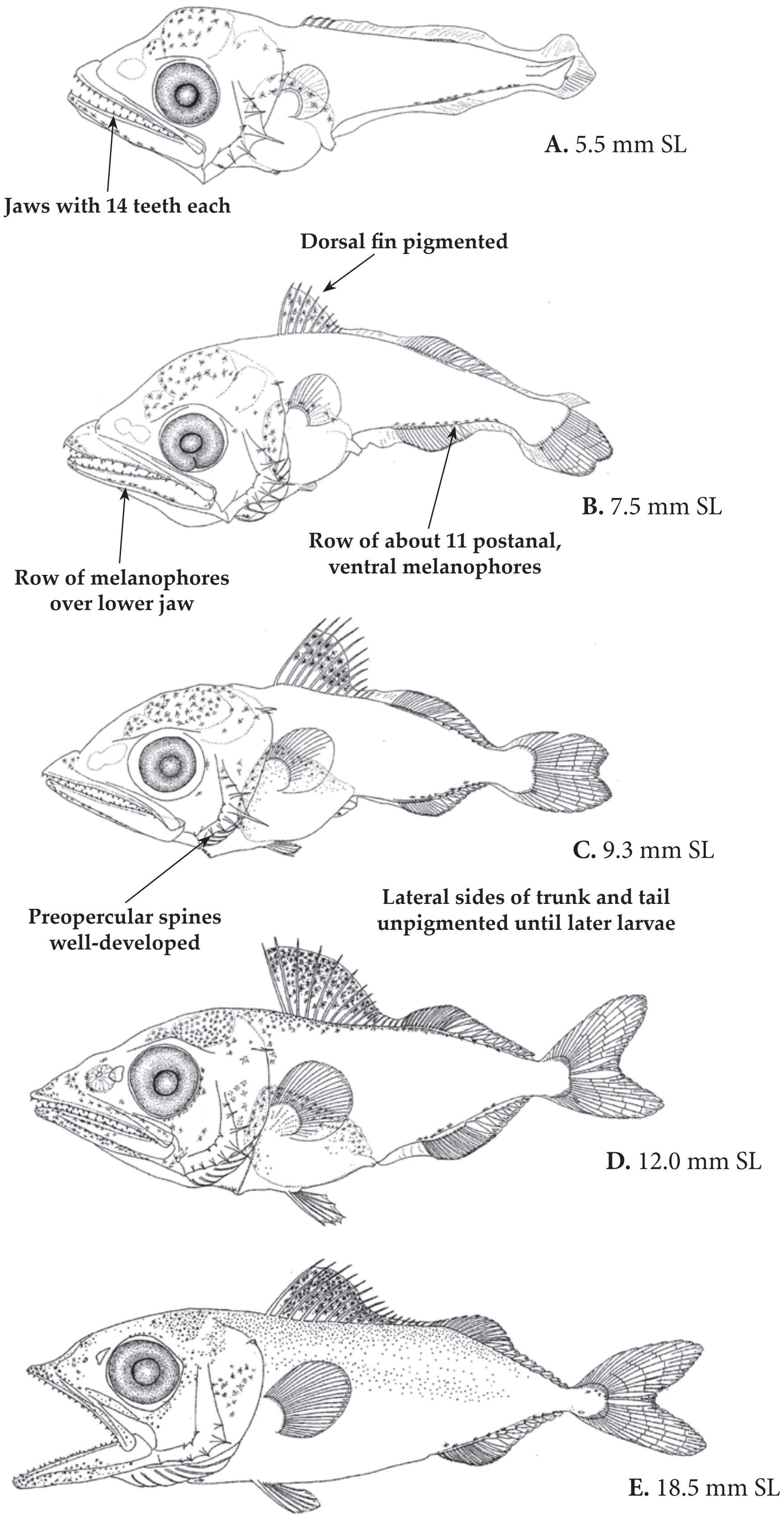
6.4 mm SL



9.3 mm SL

SCOMBRIFORMES

Euthynnus alletteratus (Rafinesque, 1810)



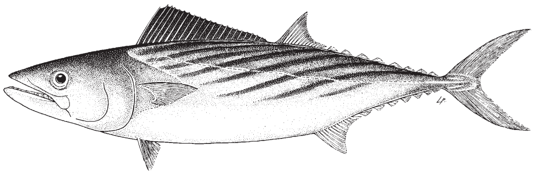
Literature: Collette (1986b), Collette and Nauen (1983), Fahay (2007), Matsumoto (1959, 1962), Richards (2006g)

Illustrations' sources: A-E: Matsumoto (1959)

Sarda sarda (Bloch, 1793) — Atlantic bonito – Bonite à dos rayé

Habitat: neritic, epipelagic
Distribution: tropical and temperate Atlantic Ocean. Eastern Atlantic, from South Africa to Norway, and the Mediterranean Sea
Spawning season: December to July

Meristic characters
Myomeres: 50-55
Vertebrae: 50-55
1st dorsal fin: XX–XXIII
2nd dorsal fin: 13–18
Dorsal finlets: 7-9
Anal fin: 14-16
Anal finlets: 6-8



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 1.20-1.32 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: 1-5; diam. 0.28–0.32 mm, when single; 0.02–0.24 mm when multiple; pigmented
Colour: transparent

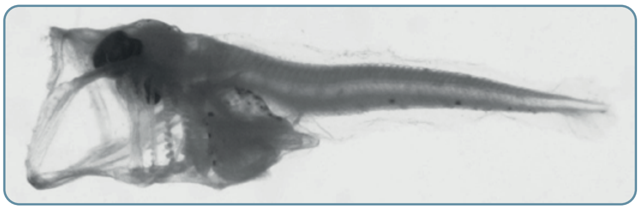
YOLK–SAC LARVAE — Fig. B

Hatch size: about 4.0 mm
Body: elongate and slender
Yolk sac: large, ovoid
Oil globules location: at posterior edge of yolk sac
Anus: detached from yolk sac, reaches finfold border
Preanus length: about 45% SL
Pigmentation: some small melanophores on head; some isolated melanophores on lateral and ventral sides of body; anterior, dorsal and ventral finfold borders pigmented; yolk sac and oil globule(s) pigmented

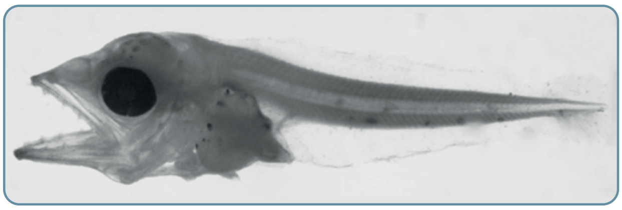
LARVAE — Figs. C-F

Body: moderately elongate in early larvae, deepest through pectoral region with development
Head: large with pointed snout; mouth large, extends to midpoint of eye, with large jaws; prominent teeth from early larvae on
Eye: round and large
Gut: triangular and compact
Preanus length: increases from about 50% SL to > 60% SL
Air bladder: absent
Spination: supraoccipital crest with a single spine; two series of preopercular spines, internal one larger; an opercular spine in upper part of operculum; supraocular crest with several strong spines; postemporal spines
Pigmentation: a series of large spots along ventral tail region that move up internally, between myomeres, with development; top of head and peritoneal region well–pigmented; melanophores at cleithral symphysis, at snout and lower jaw tip; a group of melanophores in lateral caudal region in late larvae; caudal–fin base pigmented
Length at flexion: 6.0-7.0 mm SL
Length at transformation: unknown

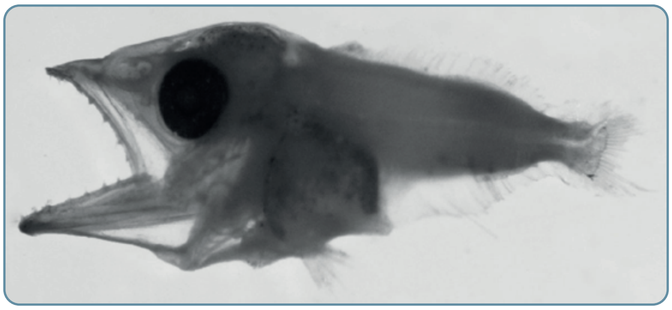
PHOTOS — by J.M. Rodriguez



4.1 mm SL

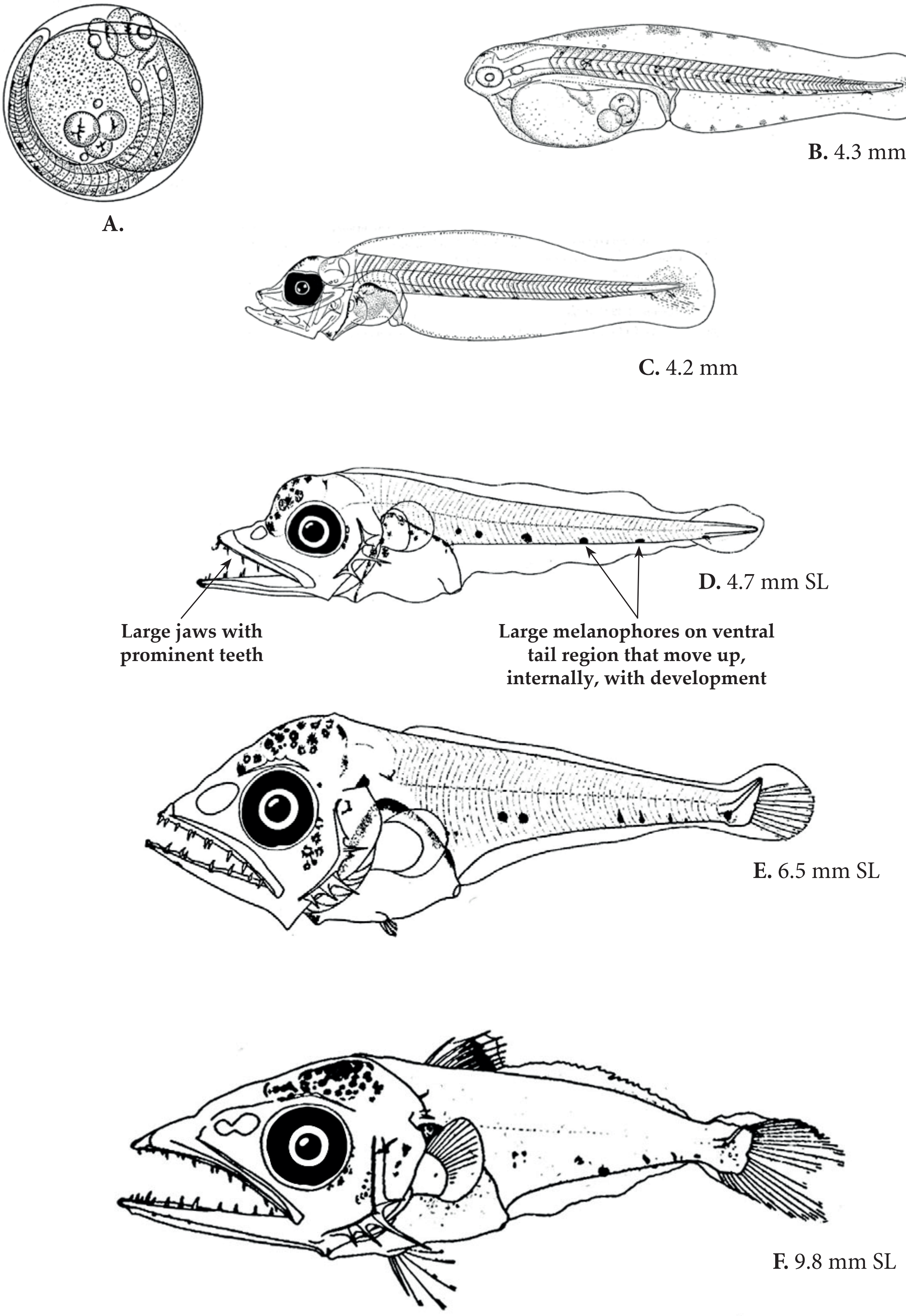


5.8 mm SL



7.6 mm SL

Sarda sarda (Bloch, 1793)



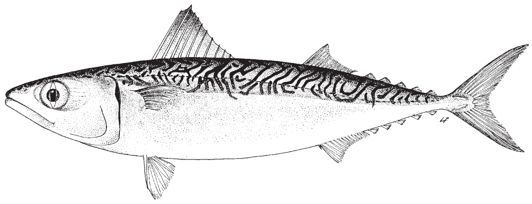
Literature: Collete and Nauen (1983), Fahay (2007), Padoa (1956n), Richards (2006g), Sabatés (1988)

Illustrations' sources: A-C: Padoa (1956n); **D-F:** Richards (2006g)

Scomber colias Gmelin, 1789 — Atlantic chub mackerel - Maquereau espagnol

Habitat: neritic, epipelagic
Distribution: warm and temperate waters of the Atlantic Ocean and the Mediterranean Sea. Eastern Atlantic, from South Africa to the Bay of Biscay
Spawning season: April to August

Meristic characters
Myomeres: 31
Vertebrae: 31
1st dorsal fin: IX–XIII
2nd dorsal fin: 11–12
Dorsal finlets: 5
Anal fin: I + 11-14
Anal finlets: 5



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 1.04-1.14 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: one; diam. 0.26-0.27 mm; pigmented
Colour: transparent

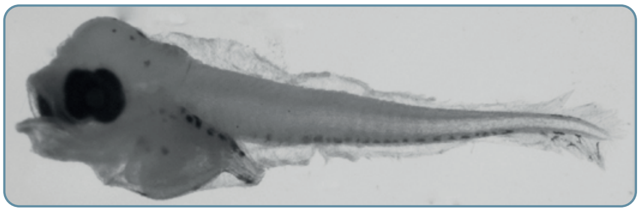
YOLK–SAC LARVAE — Fig. B

Hatch size: about 3.0 mm
Body: relatively elongate and slender
Yolk sac: large, ovoid
Oil globule location: at posterior edge of yolk sac
Anus: close behind yolk sac, reaches finfold border
Preanus length: about 50% SL
Pigmentation: melanophores irregularly distributed along dorsal and ventral contours of body; melanophores on snout and behind eye; yolk sac and oil globule pigmented

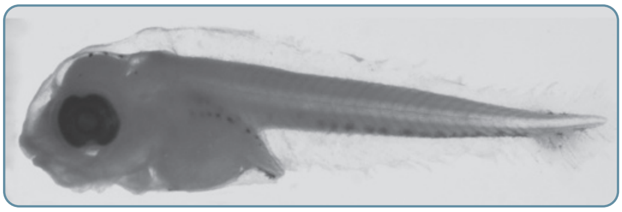
LARVAE — Figs. C-F

Body: moderately elongate, becoming stubby with development (stubbier than comparable sizes of *Scomber scombrus*)
Head: moderate, snout rounded; mouth moderate; teeth prominent from 4.0 mm larvae on
Eye: round and large
Gut: triangular and compact
Preanus length: increases from about 50% SL to about 60% SL during development (larger than in *S. scombrus*)
Air bladder: absent
Spination: none
Pigmentation: a postanal ventral row of melanophores, beginning some distance from anus; 1-2 dorsal melanophores on caudal peduncle in larvae < 7.0 mm; peritoneum pigmented; melanophores at caudal–fin base, on head and on body sides (absent in preflexion stages); no melanophores at cleithral symphysis
Length at flexion: 5.0-7.0 mm
Length at transformation: unknown

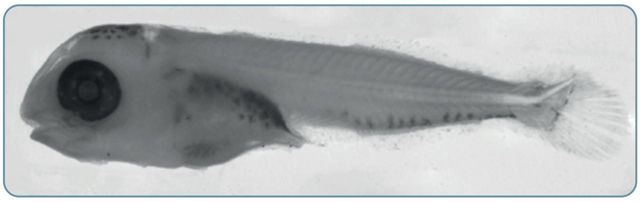
PHOTOS — by J.M. Rodriguez



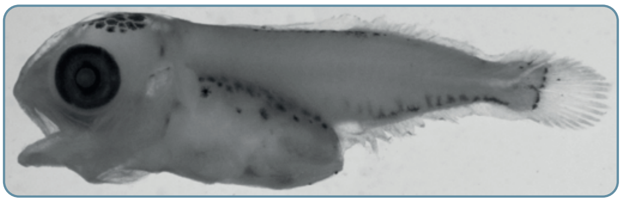
3.0 mm SL



4.9 mm SL



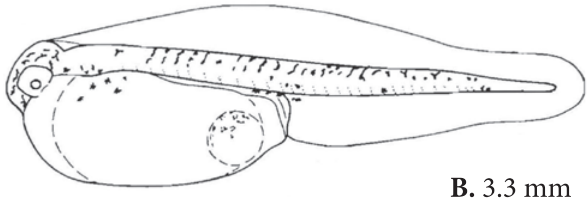
7.0 mm SL



7.3 mm SL

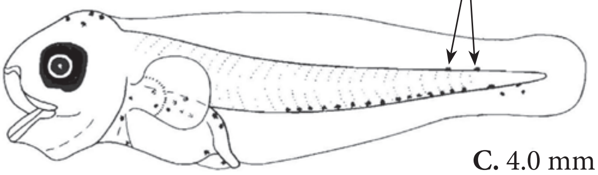
Scomber colias Gmelin, 1789

A.



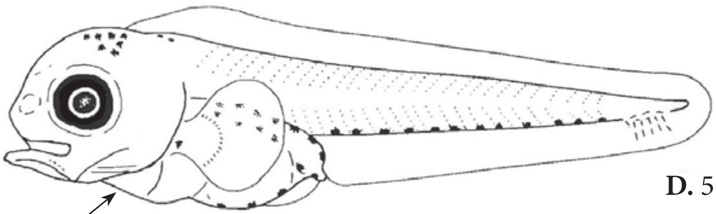
B. 3.3 mm

1-2 melanophores



C. 4.0 mm SL

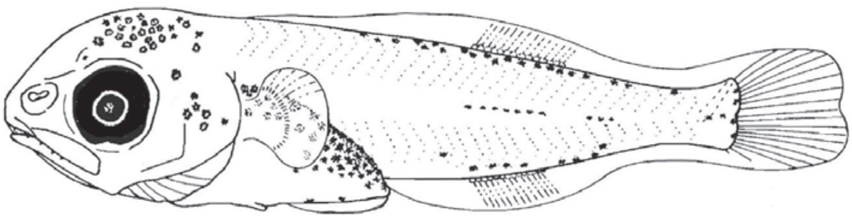
Lateral sides of body unpigmented in preflexion larvae



D. 5.0 mm SL

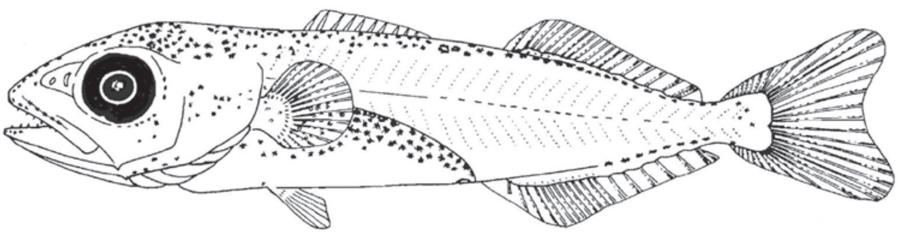
No melanophore at cleithral symphysis

Myomere count 31 in *Scomber*, 24 in Sparidae species



E. 7.8 mm SL

Greater preanus length than *S. scombrus*



F. 16.5 mm SL

Literature: Berrien (1978), Collette and Nauen (1983), Fahay (2007)

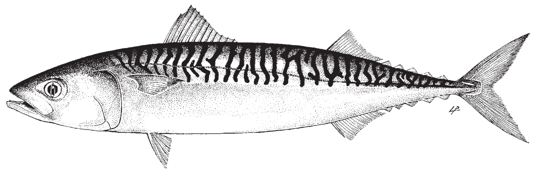
Illustrations' sources: A: Kramer (1969)*; **B-F:** Matarese (1989)*

*All illustrations are of *Scomber japonicus*, whose early life stages are very similar to those of *S. colias*

Scomber scombrus Linnaeus, 1758 — Atlantic mackerel – Maquereau commun

Habitat: neritic, pelagic and benthopelagic
Distribution: Atlantic Ocean and the Mediterranean Sea. Eastern Atlantic, from Morocco to Norway
Spawning season: spring

Meristic characters
Myomeres: 31
Vertebrae: 31
1st dorsal fin: X + 13-15
2nd dorsal fin: 11
Dorsal finlets: 5
Anal fin: II + 11
Anal finlets: 5



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 1.0-1.38 mm
Perivitelline space: small
Yolk: unsegmented; unpigmented
Oil globules: one; diam. 0.28-0.35 mm; unpigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

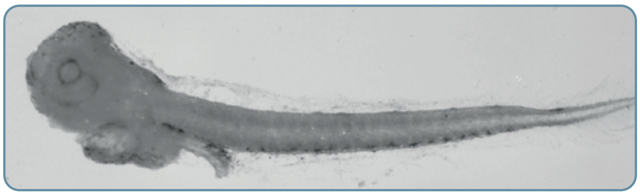
Hatch size: about 2.4 mm
Body: relatively elongate
Yolk sac: large, ovoid
Oil globule location: at posterior edge of yolk sac
Anus: close behind yolk sac, reaches finfold border
Preanus length: about 40% SL
Pigmentation: some melanophores on head; double rows of irregularly distributed melanophores (up to 14 each) along dorsal and ventral contours of body; melanophores on snout and behind eye; oil globule pigmented

LARVAE — Figs. C-G

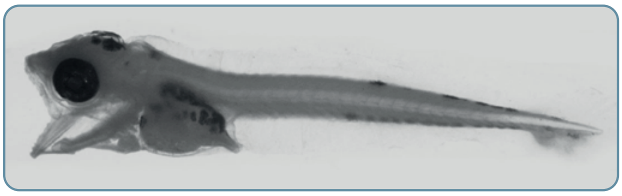
Body: moderately elongate, becoming stubby with development (slimmer than comparable sizes of *S. colias*)
Head: moderate, snout rounded; mouth moderate; teeth prominent from larvae 4.0 mm long
Eye: round and large
Gut: triangular and compact
Preanus length: increases from about 40% SL to 60% SL during development
Air bladder: absent

Spination: none
Pigmentation: postanal rows of dorsal and ventral melanophores; peritoneum pigmented; some melanophores on urostyle, along caudal–fin base, on head and sometimes on snout and lower jaw; no melanophores on body sides in preflexion larvae; a melanophore at cleithral symphysis
Length at flexion: 5.0-7.0 mm
Length at transformation: unknown

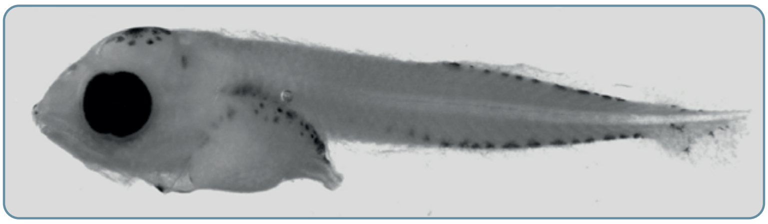
PHOTOS — by J.M. Rodriguez



3.7 mm SL



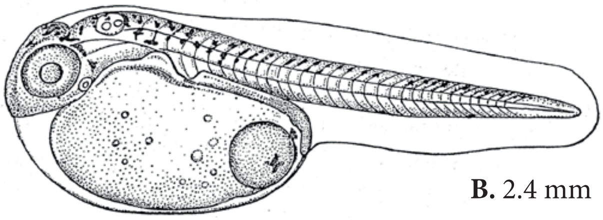
4.5 mm SL



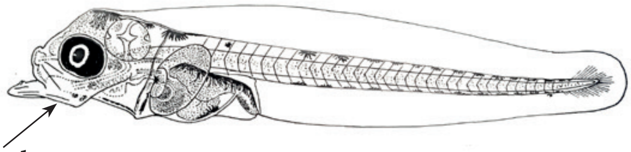
7.0 mm SL

Scomber scombrus Linnaeus, 1758

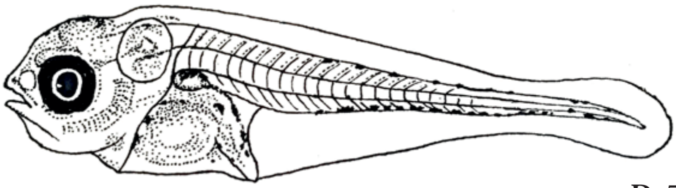
A.



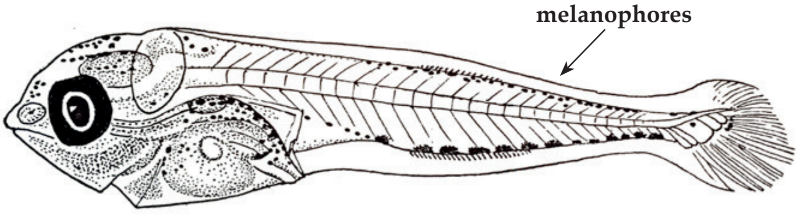
B. 2.4 mm



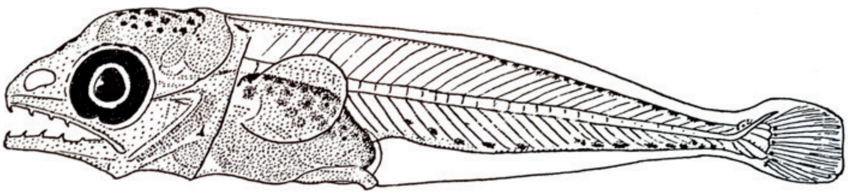
C. Not sized



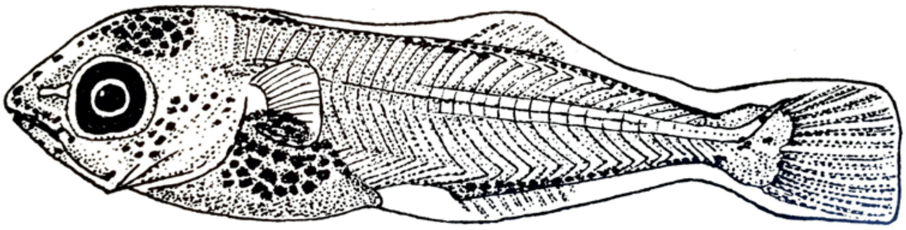
D. 5.0 mm



E. 7.2 mm



F. 8.6 mm



G. 11.2 mm

Literature: Berrien (1978), Collette (1986b), Fahay (2007), Froese and Pauly (2016), Padoa (1956n)

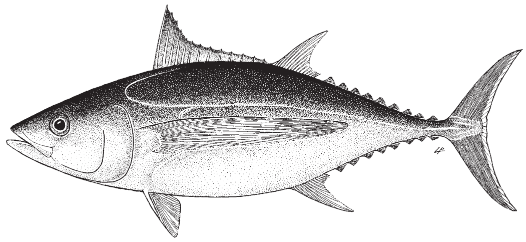
Illustrations' sources: A-G: Padoa (1956n)

SCOMBRIDAE

Thunnus alalunga (Bonnaterre, 1788) — Albacore - Germon

Habitat: epipelagic and mesopelagic, oceanic
Distribution: cosmopolitan in tropical and temperate waters. Eastern Atlantic, from South Africa to Great Britain
Spawning season: summer (Mediterranean Sea)

Meristic characters
Myomeres: 39
Vertebrae: 39
1st dorsal fin: XI-XIV
2nd dorsal fin: 12-16
Dorsal finlets: 7-9
Anal fin: 11-16
Anal finlets: 7-8



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.84-0.94 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: one; diam. 0.25-0.28 mm; pigmented
Colour: transparent

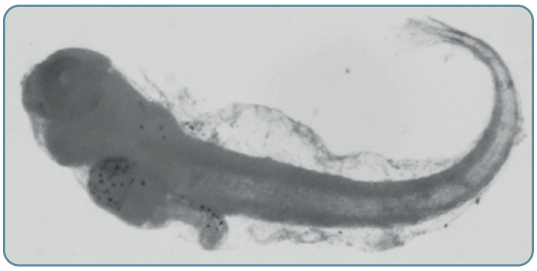
YOLK–SAC LARVAE — Fig. B

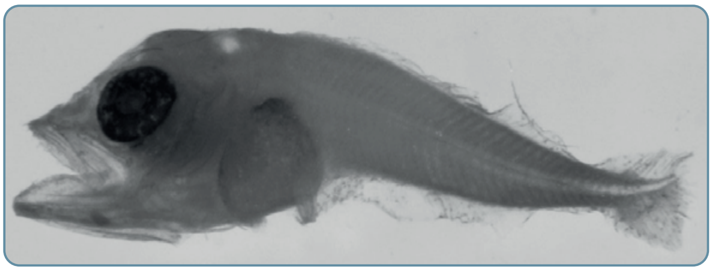
Hatch size: about 2.7 mm SL
Body: elongate
Yolk sac: oval and large
Oil globule location: at posterior end of yolk sac
Anus: detached from yolk sac, reaches finfold border
Preanus length: about 39% SL
Pigmentation: melanophores on yolk and on gut; dotted melanophores dorsal and ventral to urostyle

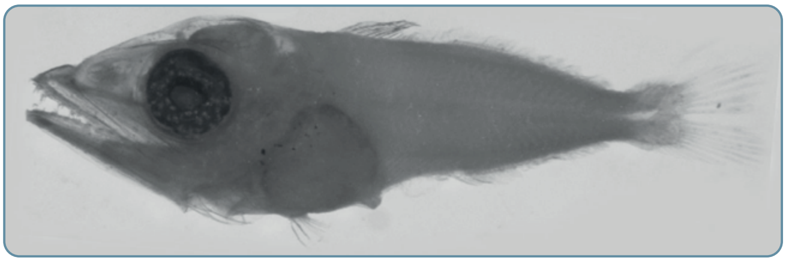
LARVAE — Figs. C-G

Body: moderately stocky, deepest through pectoral region, tapering to a narrow caudal peduncle
Head: large with a pointed snout and large jaws; prominent teeth since early larvae
Eye: round and large
Gut: compact and triangular
Preanus length: increases from about 40% SL to 55% SL during development
Air bladder: absent
Spination: a supraoccipital spine; several strong spines along edge and a few smaller on lateral ridge of opercle; 1-2 small post-temporal spines
Pigmentation: a melanophore ventral to urostyle in very early larvae; peritoneal region strongly pigmented, melanophores extend over lateral sides of gut with development; occipital region pigmented (strongly in late larvae); tips of jaws pigmented in larvae > 7.0 mm; melanophores appear on 1st dorsal fin at > 5.0 mm; tail unpigmented
Length at flexion: about 5.0-7.0 mm SL
Length at transformation: unknown

PHOTOS — by J.M. Rodriguez

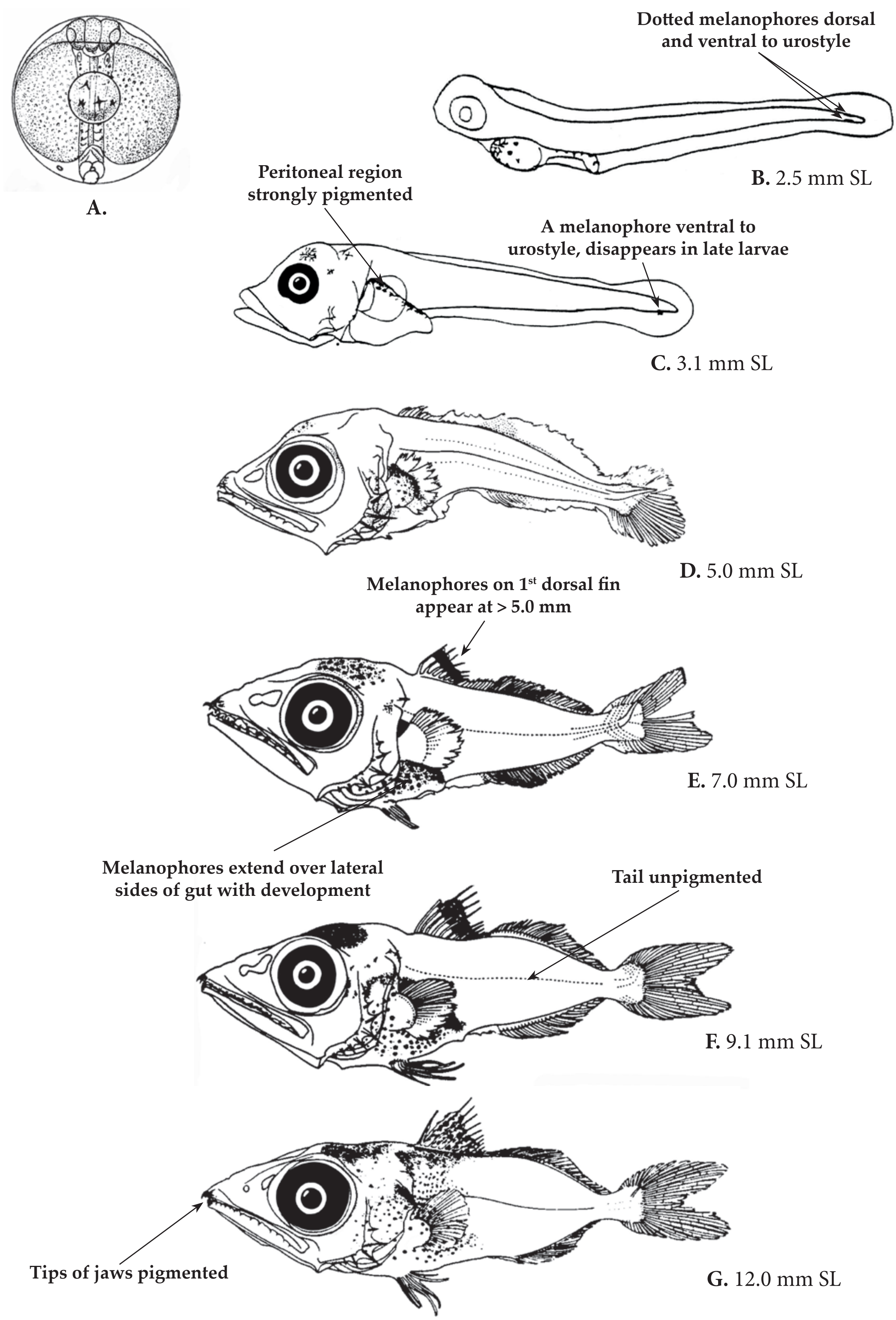

2.7 mm SL


5.2 mm SL


7.0 mm SL

SCOMBRIFORMES

Thunnus alalunga (Bonnaterre, 1788)



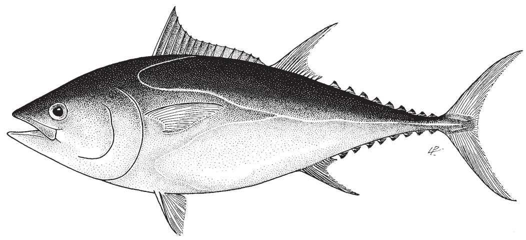
Literature: Alemany (1997), Collette (2016), Fahay (2007), Matsumoto *et al.* (1972), Olivar and Fortuño (1991), Richards (2006g), Padoa (1956n)

Illustrations' sources: A: Padoa (1956n); **B, C:** Alemany (1997); **D-G:** Ueyanagi (1969)

Thunnus thynnus (Linnaeus, 1758) Atlantic bluefin tuna - Thon rouge de l'Atlantique

Habitat: epipelagic and mesopelagic, oceanic, but seasonally close to the shore
Distribution: Atlantic Ocean and the Mediterranean Sea. Eastern Atlantic, from South Africa to Norway
Spawning season: June and July (Mediterranean Sea)

Meristic characters
Myomeres: 39
Vertebrae: 39
1st dorsal fin: XI-XIV
2nd dorsal fin: 12-16
Dorsal finlets: 8-10
Anal fin: 11-16
Anal finlets: 7-9



EGGS Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 1.10-1.12 mm
Perivitelline space: small
Yolk: unsegmented; unpigmented
Oil globules: one; diam. 0.25-0.28 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE Fig. B

Hatch size: about 2.8 mm TL
Body: elongate
Yolk sac: oval and large
Oil globule location: at posterior end of yolk sac
Anus: detached from yolk sac, reaches finfold border
Preanus length: about 34% SL
Pigmentation: melanophores from snout to midbrain; 3 large clusters of melanophores in dorsal midline; a line of melanophores above gut and on ventral tail region; a ventral cluster of melanophores in caudal region (opposite to last dorsal one); melanophores along lateral midline of trunk

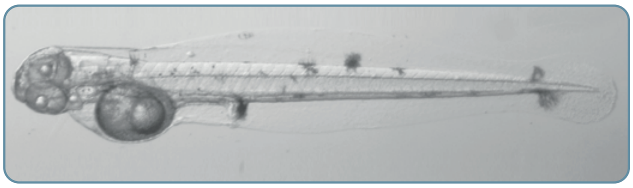
LARVAE Figs. C-F

Body: stout, deepest through pectoral region, tapering to a narrow caudal peduncle
Head: large with pointed snout and large jaws; prominent teeth since early larvae
Eye: round and large
Gut: compact and triangular
Preanus length: increases from about 40% SL to 55% SL throughout development
Air bladder: absent
Spination: several strong spines along edge and a few smaller ones on lateral ridge of opercle; 1-2 post-temporal spines develop at about 7.0 mm SL

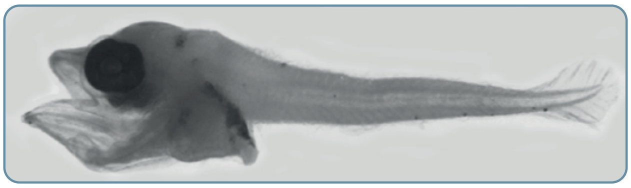
Pigmentation: about 4 dotted postanal-ventral melanophores in early larvae, increasing in number with development; a single melanophore on dorsal side of mid-tail in early larvae, migrates to dorsal fin in larvae > 5.0 mm; peritoneum strongly pigmented, melanophores extend over lateral sides of gut with development; melanophores on top of head; tips of upper and lower jaws pigmented; melanophores along lateral midline and on dorsal side of tail in late larvae
Length at flexion: 5.0-7.0 mm SL
Length at transformation: unknown

PHOTOS

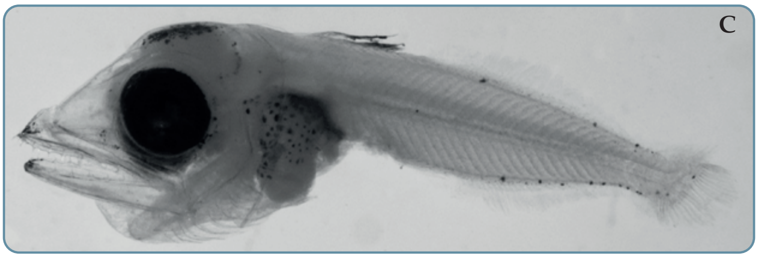
A: F. by F. de la Gándara; **B, C:** by J.M. Rodriguez



3.6 mm SL

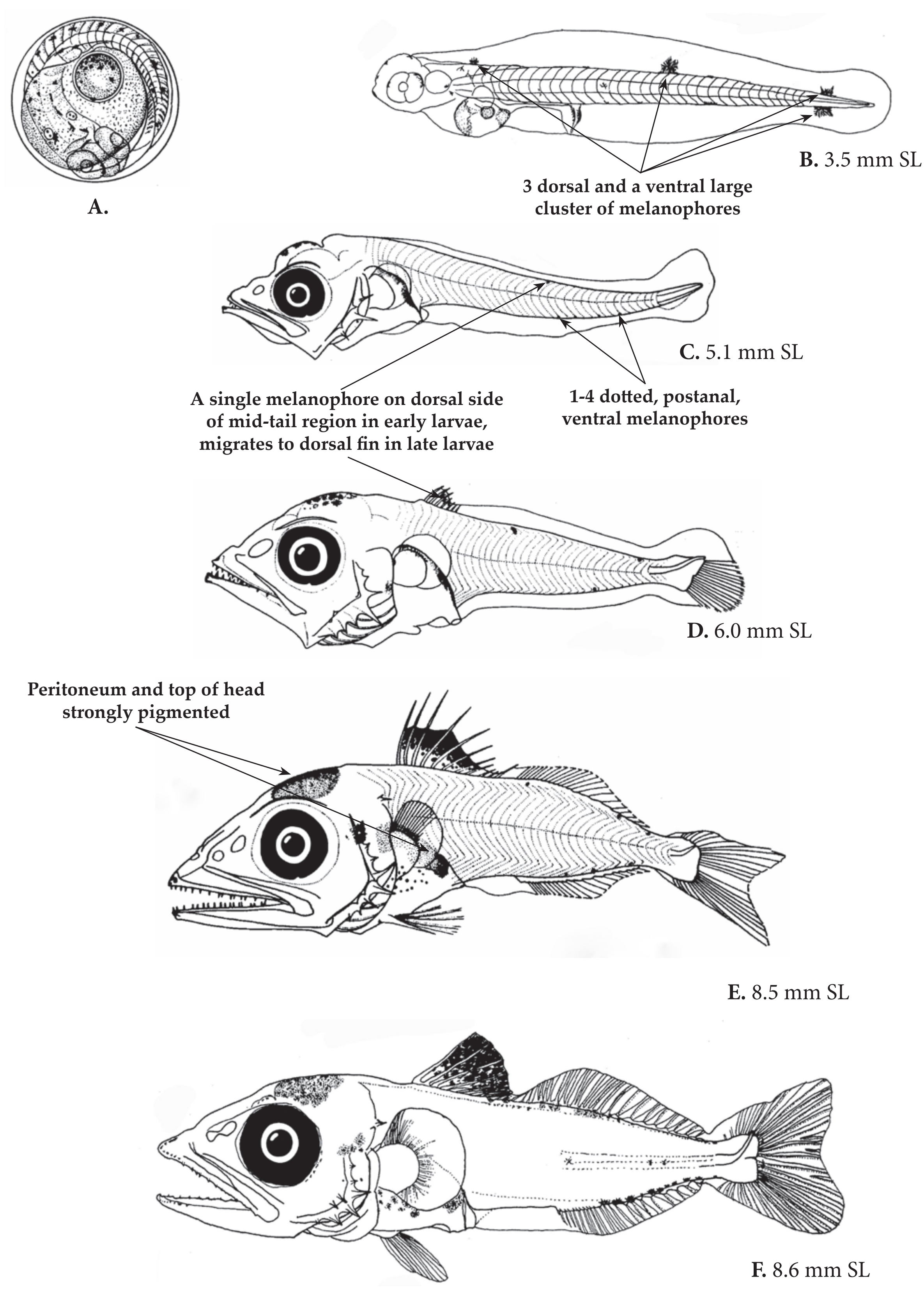


3.8 mm SL



6.7 mm SL

Thunnus thynnus (Linnaeus, 1758)



Literature: Alemany (1997), Collette (1986b), Fahay (2007), Matsumoto *et al.* (1972), Miyashita *et al.* (2001), Olivar and Fortuño (1991), Richards (2006g)

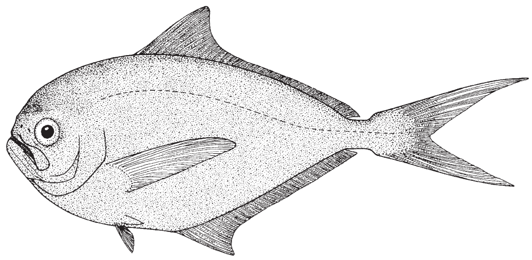
Illustrations' sources: A: Padoa (1956n); **B, F:** Miyashita *et al.* (2001); **C-E:** Richards (2006g)

Brama brama (Bonnaterre, 1788)

Atlantic pomfret – Grande castagnole

Habitat: oceanic, epi- to mesopelagic, to 1 000 m depth
Distribution: southern Pacific, Indian and Atlantic oceans, and the Mediterranean Sea. Eastern Atlantic, from South Africa to Norway
Spawning season: August to September (Mediterranean Sea)

Meristic characters
Myomeres: 41-43
Vertebrae: 41-43
Dorsal fin: 35-38
Anal fin: 29-32



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 1.50-1.60 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: one, oval; diam. 0.40 x 0.32 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

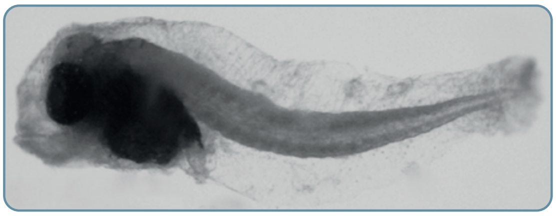
Hatch size: about 4.8 mm
Body: elongate and fairly slender; pectoral and caudal fins apparent
Yolk sac: ovoid
Oil globule location: at posterior, ventral side of yolk sac
Anus: close behind yolk sac, reaches finfold border
Preanus length: about 30% SL
Pigmentation: head, yolk sac, oil globule, pectoral and caudal fins pigmented; 2 prominent pigment patches in tail, one dorsal and another ventral extending into finfold

LARVAE — Figs. C-G

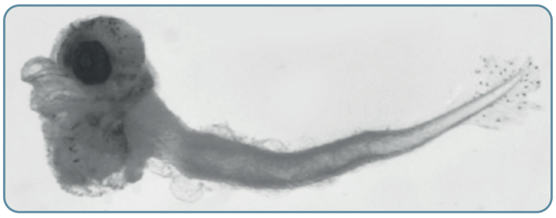
Body: elongate, fairly slender and laterally compressed in early larvae, becomes deep, especially through pectoral region, with development
Head: moderately large with "angry face"; mouth oblique; teeth present since early larvae
Eye: round in early larvae becomes oval in late larvae
Gut: round and bulky
Preanus length: about 30% SL increases during development
Air bladder: absent
Spination: a series of spines along preopercle edge
Pigmentation: head and gut heavily pigmented; pectoral and caudal fins pigmented; tail unpigmented
Length at flexion: 5.0-6.5 mm SL
Length at transformation: about 10.0 mm SL

PHOTOS

by J.M. Rodriguez

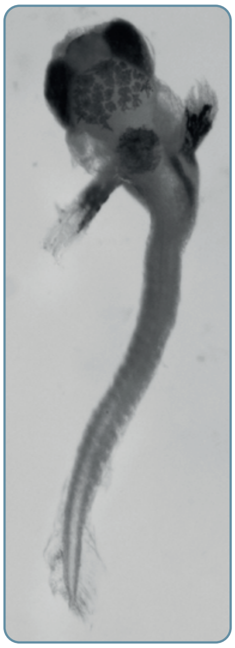


2.0 mm SL



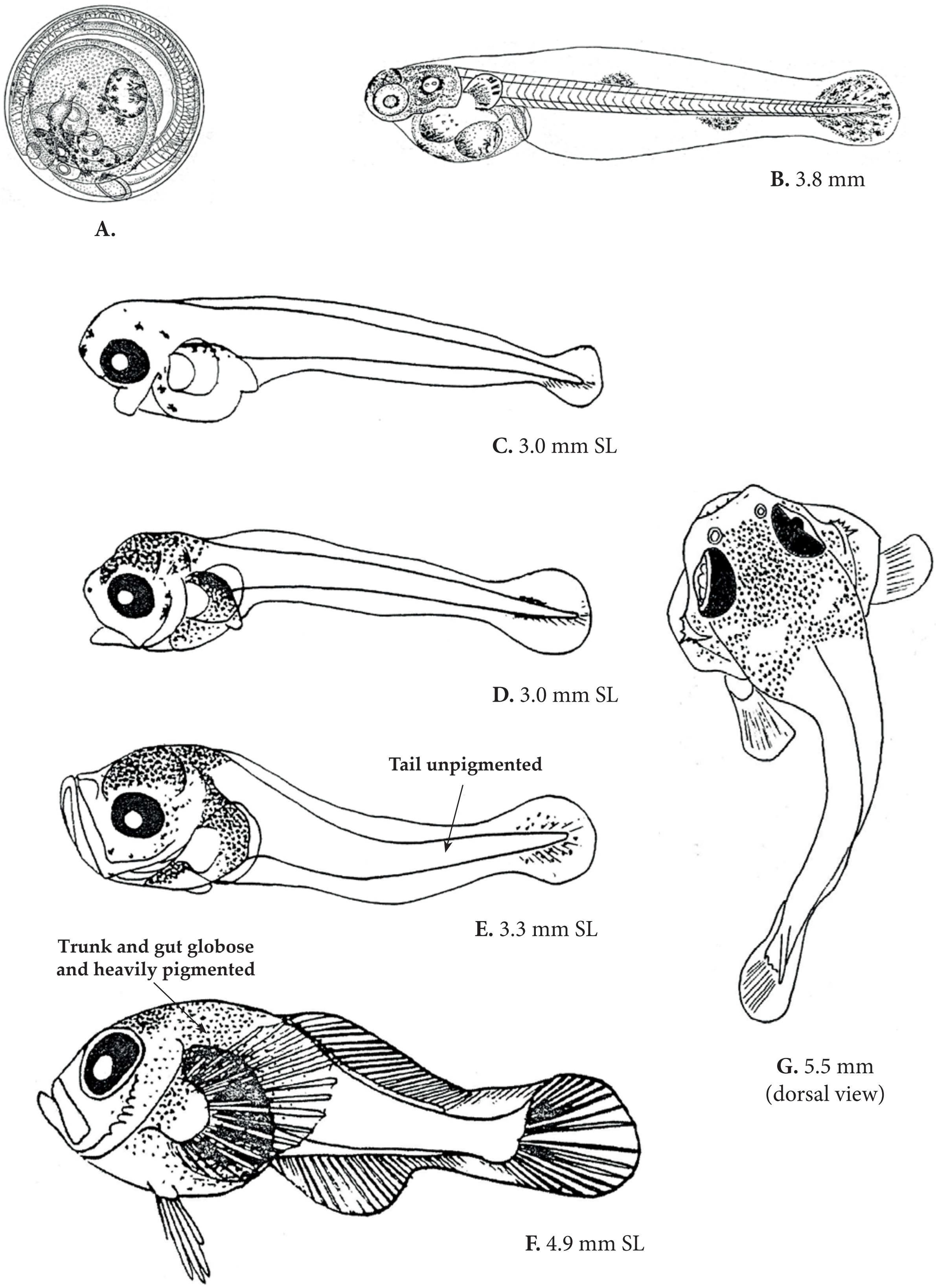
3.3 mm SL

4.6 mm SL



3.6 mm SL

Brama brama (Bonnaterre, 1788)



A.

B. 3.8 mm

C. 3.0 mm SL

D. 3.0 mm SL

E. 3.3 mm SL

F. 4.9 mm SL

G. 5.5 mm (dorsal view)

Literature: Fahay (2007), Froese and Pauly (2022), Haedrich (1986), Padoa (1956d), Richards (2006a), Sabatés (1988), Schmidt and Strubberg (1918)

Illustrations' sources: A, B: Padoa (1956d); **C-F:** Alemany (1997); **G:** Schmidt (1918)

GEMPYLIDAE

Diplospinus multistriatus Maul, 1948

Striped escolar - Escolier rayé

Habitat: oceanic, mesopelagic, between 100 and 1 000 m depth

Distribution: central waters of the Indian, Pacific and Atlantic oceans (absent from the Mediterranean Sea)

Spawning season: throughout the year

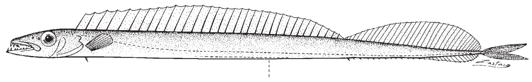
Meristic characters

Myomeres: 58-61

Vertebrae: 58-61

Dorsal fin: XXX-XXXV + 35-44

Anal fin: II + 28-35



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

Figs. A-F

Body: maximum depth through pectoral region, tapering to thin caudal peduncle; elongate in juveniles and adults; dorsal-fin spines develop serrations; pelvic fins with a very long and serrated spine and no rays

Head: large; mouth moderate, ventral; snout elongate and pointed, moderately concave; head length decreases with development; teeth directed forward, develop on lower jaw

Eye: round and relatively large

Gut: large and triangular, increases in size with development

Preanus length: increases from 37% SL in early larvae to 70% SL in juveniles

Air bladder: absent

Spination: supraocular crest with a few spines; 3 preopercular spines, with spine at angle serrate and relatively long; 1-2 opercular spines; 2 post-temporal spines

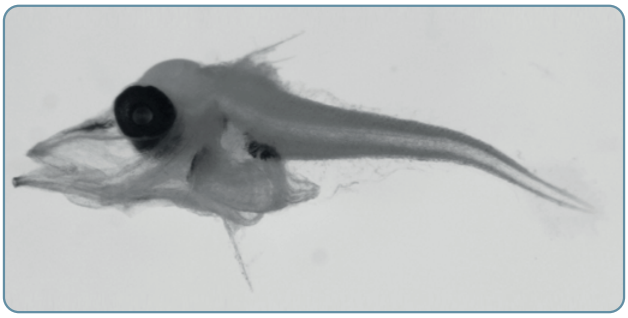
Pigmentation: early larvae, melanophores at tip of lower jaw, snout and forebrain; peritoneum pigmented; dorsum of head unpigmented; late larvae, melanophores on top of head; line of melanophores along dorsum of body and ventral margin of trunk; melanophores expand backward on lower jaw; scattered melanophores over gut; large melanophores on dorsal-fin membrane

Length at flexion: from about 8.0 mm to about 12.0-15.0 mm

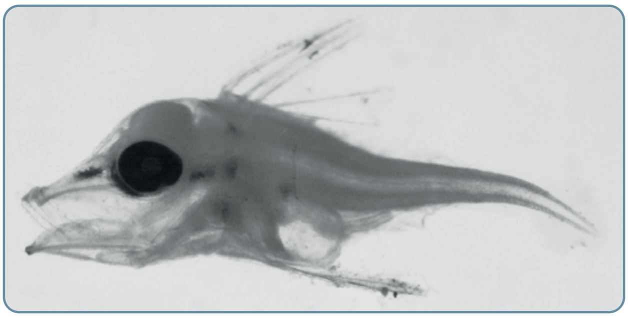
Length at transformation: about 21.0-32.0 mm, gradual

PHOTOS

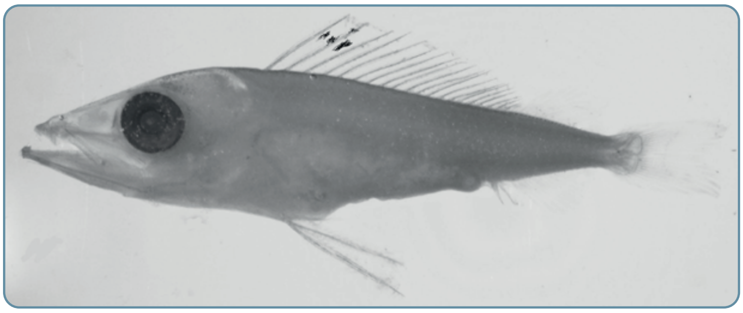
by J.M. Rodriguez



3.6 mm SL



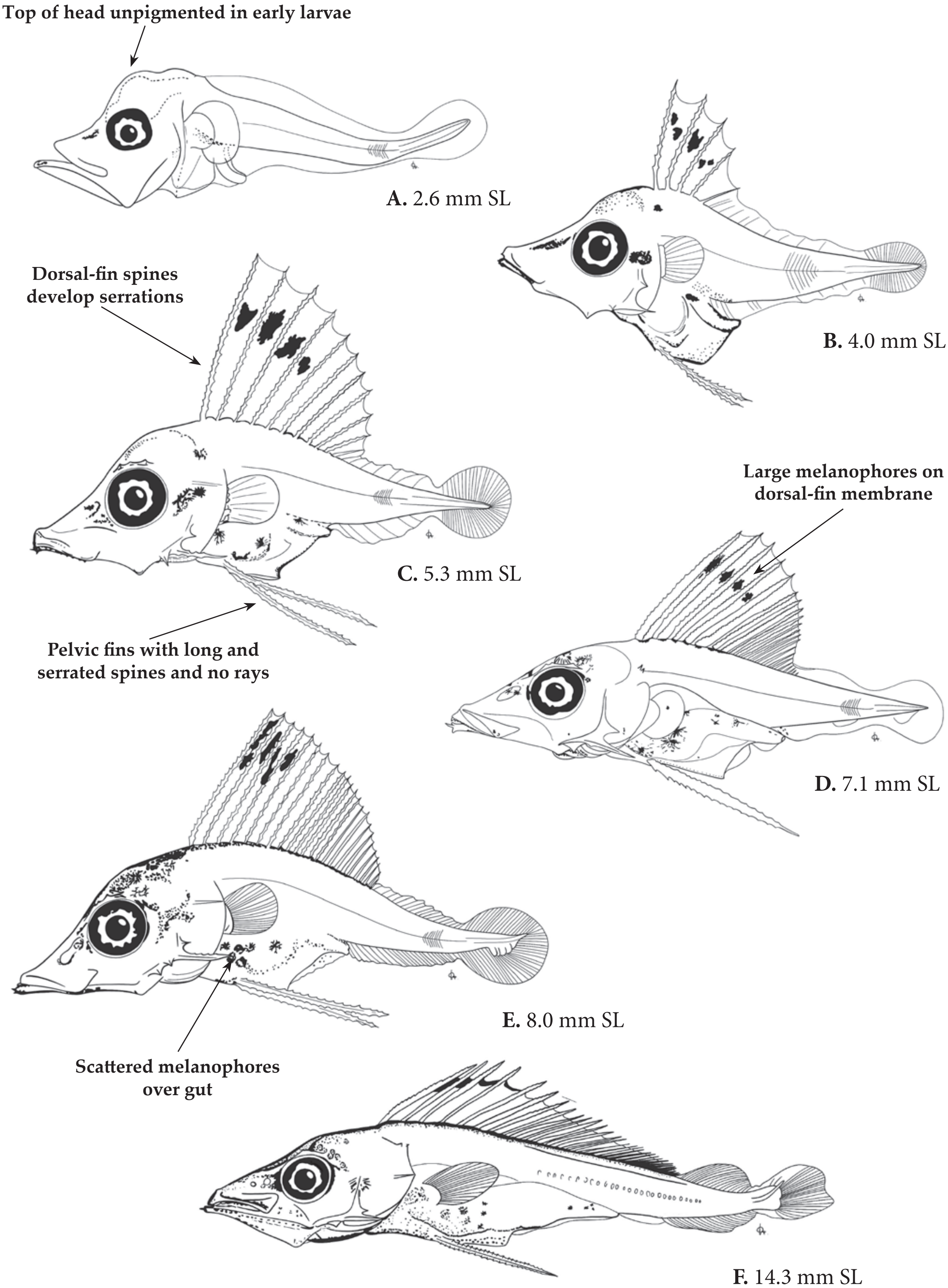
4.8 mm SL



11.6 mm SL

SCOMBRIFORMES

Diplospinus multistriatus Maul, 1948



Literature: Ambrose (1996a), Fahay (2007), Nakamura and Parin (1993), Richards (1989, 2006d)

Illustrations' sources: A-F: L. Rodríguez (**A, B:** redrawn from Ozawa, 1986b; **C:** redrawn from Richards, 1989; **D:** redrawn from Collette *et al.*, 1984; **E:** redrawn from Voss, 1954; **F:** redrawn **from** Nishikawa, 1987)

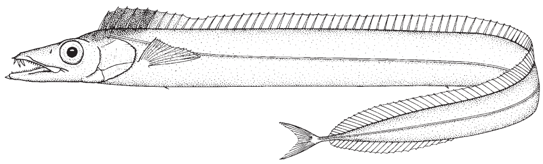
TRICHIURIDAE

Lepidopus caudatus (Euphrasen, 1788)

Silver scabbardfish - Sabre argenté

Habitat: neritic and upper slope, benthopelagic, between 42 and 620 m depth
Distribution: eastern Atlantic Ocean, from South Africa to France, and the Mediterranean Sea
Spawning season: February to April

Meristic characters
Myomeres: 105-114
Vertebrae: 105-114
Dorsal fin: IX + 90-107
Anal fin: II + 60-65



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 1.6-1.7 mm
Perivitelline space: small
Yolk: unsegmented; unpigmented
Oil globules: one; diam. 0.40 mm; pigmented
Colour: transparent

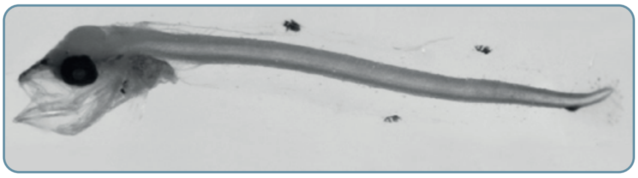
YOLK–SAC LARVAE — Fig. B

Hatch size: about 6.0 mm
Body: elongate and slender; head very small and rounded; a dorsal protuberance behind head
Yolk sac: ovoid, unpigmented
Oil globule location: at posterior edge of yolk sac
Anus: close behind yolk sac, reaches finfold border
Preanus length: about 25% SL
Pigmentation: some dorsal and ventral melanophores on tail end; 2 large dorsal melanophores with a ventral one in between; some melanophores on head

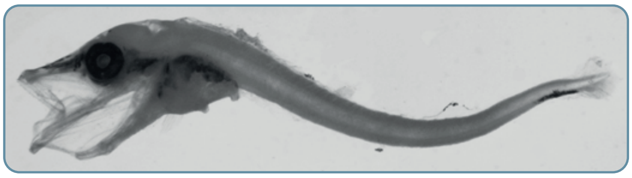
LARVAE — Figs. C-F

Body: very elongate and slender; first dorsal-fin spine highly developed in early larvae
Head: large; snout long and pointed (head duck-billed shaped)
Eye: round and relatively small
Gut: triangular
Preanus length: increases from 26% SL in early larvae to about 50% in flexion larvae
Air bladder: absent
Spination: none
Pigmentation: dorsal and ventral melanophores in yolk-sac larvae migrate to finfold; ventral caudal melanophores spread forward and dorsal melanophores disappear; melanophores on head, snout, and post–occipital region; peritoneum and lateral sides of gut pigmented; melanophores on dorsal–fin base extend backwards with development
Length at flexion: about 14.0 mm SL
Length at transformation: unknown

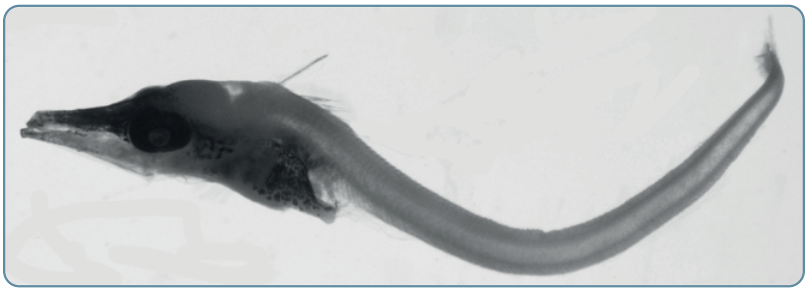
PHOTOS — by J.M. Rodriguez



7.0 mm SL



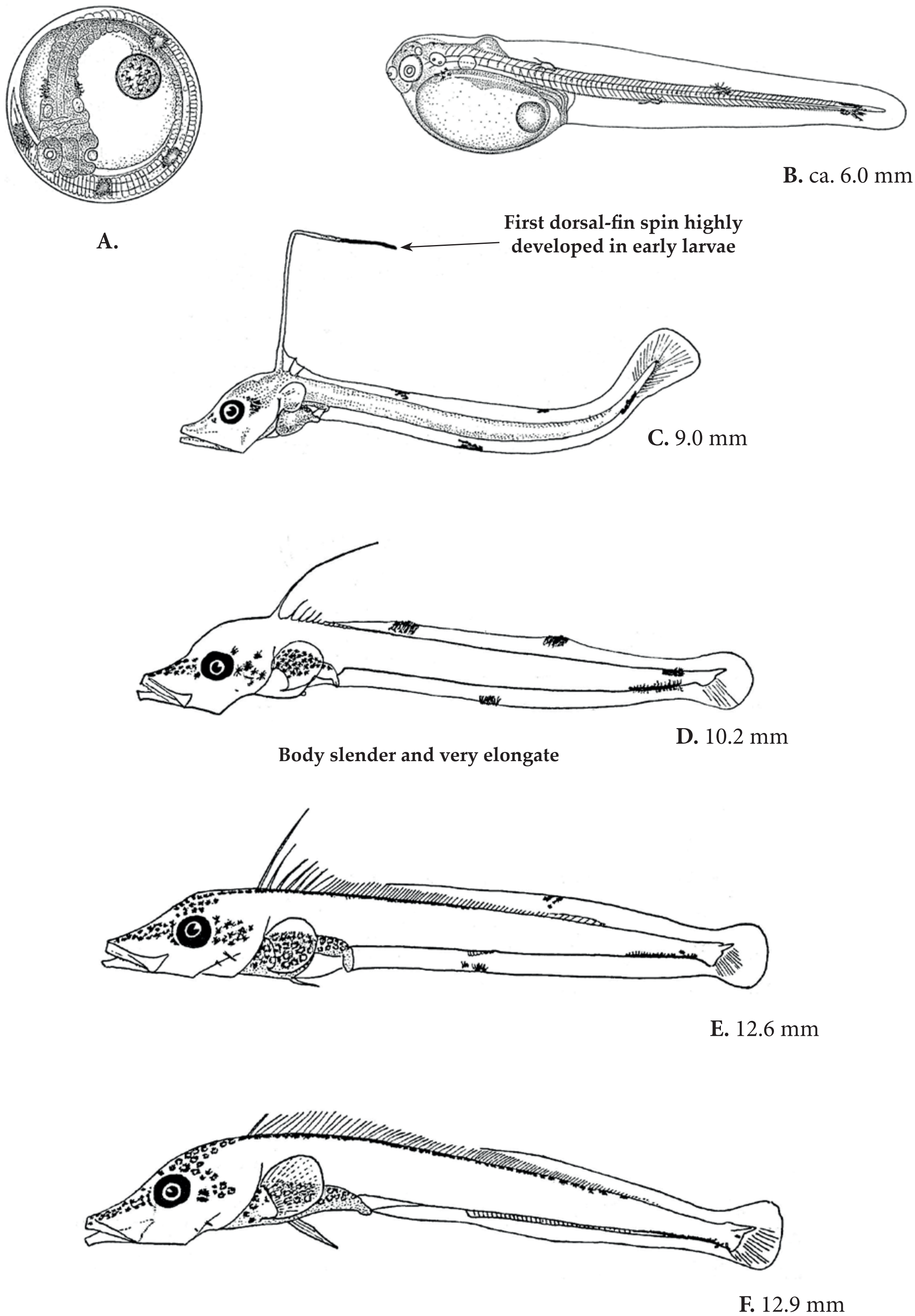
8.9 mm SL



9.9 mm SL

SCOMBRIFORMES

Lepidopus caudatus (Euphrasen, 1788)



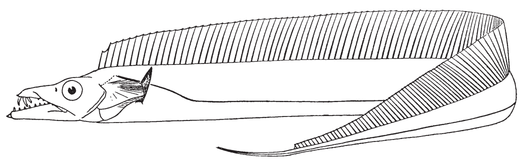
Literature: Froese and Pauly (2022), Olivar and Fortuño (1991), Padoa (1956q), Parin (1986), Schmidt and Strubberg (1918)

Illustrations' sources: A-F: Schmidt and Strubberg (1918)

Trichiurus lepturus Linnaeus, 1758 — Largehead hairtail - Poisson-sabre commun

Habitat: neritic, benthopelagic, to 350 m depth
Distribution: worldwide in tropical and temperate waters, including the Mediterranean Sea
Spawning season: July to August (Mediterranean Sea)

Meristic characters
Myomeres: 162-168
Vertebrae: 162-168
Dorsal fin: III + 120-140
Anal fin: II + 105-108



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

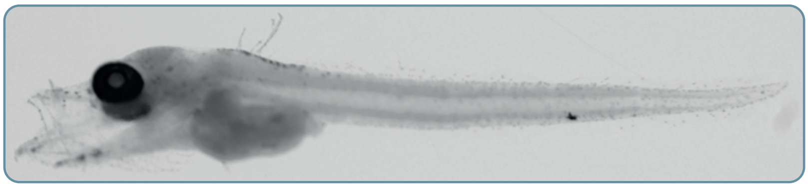
LARVAE

Figs. A-F

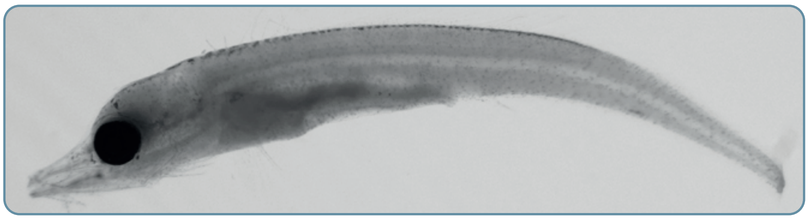
Body: very elongate and slender becomes laterally compressed with development; dorsal- and anal-fin spines serrated anteriorly; pelvic and caudal fins absent
Head: relatively large, increases in length with development and becomes moderately concave; mouth large, reaching anterior edge of eye; snout short and pointed in early larvae, increases in length with development; teeth in upper jaw develop early
Eye: relatively large and round
Gut: large and triangular, increases in size with development
Preanus length: increases from 31% SL to 55% SL in late larvae, then decreases to about 48% SL in juveniles
Air bladder: absent
Spination: a low supraocular crest forms in late larvae; several small preopercular spines on posterior edge and on lateral ridge
Pigmentation: early larvae, opposing clusters of melanophores on dorsal and ventral finfold edges, and scattered melanophores on top of head; late larvae, a series of melanophores forms on either side of dorsal midline, increasing in number backward with development; few melanophores may occur on sides of head and on lower jaw
Length at flexion: flexion does not occur
Length at transformation: unknown

PHOTOS

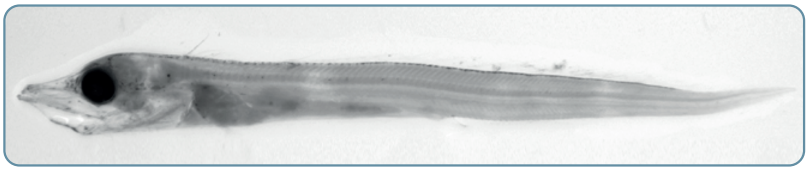
by S. Isari



4.1 mm SL

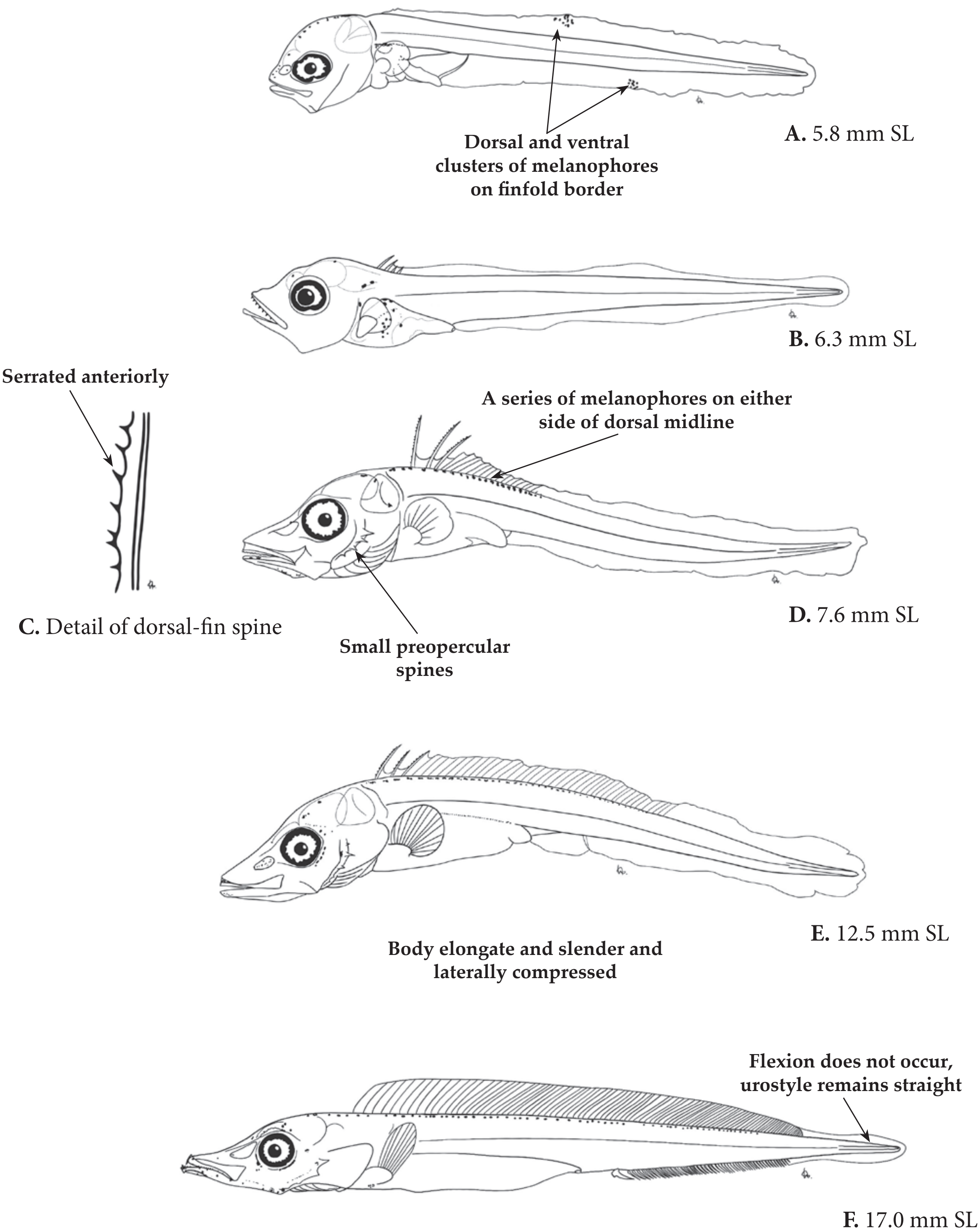


10.4 mm SL



20.0 mm SL

Trichiurus lepturus Linnaeus, 1758



Literature: Fahay (2007), Froese and Pauly (2022), Padoa (1956q), Parin (1986), Nakamura and Parin (1993), Richards (2006d)

Illustrations' sources: A-F: L. Rodríguez (**A, C, D, E:** redrawn from Okiyama, 1988; **B, F:** redrawn from Collette *et al.*, 1984)

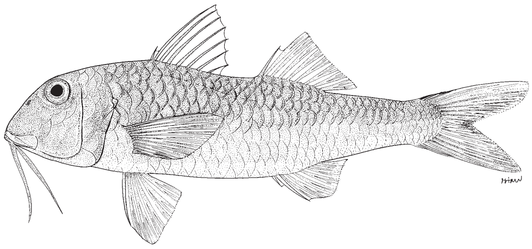
MULLIDAE

Mullus barbatus Linnaeus, 1758

Red mullet - Rouget de vase

Habitat: neritic, demersal, from 100 to about 300 m depth
Distribution: eastern Atlantic Ocean, from Senegal to the British Islands, and the Mediterranean Sea
Spawning season: April to August

Meristic characters
Myomeres: 24
Vertebrae: 24
1st dorsal fin: VII-VII
2nd dorsal fin: I + 7-8
Anal fin: II + 6



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

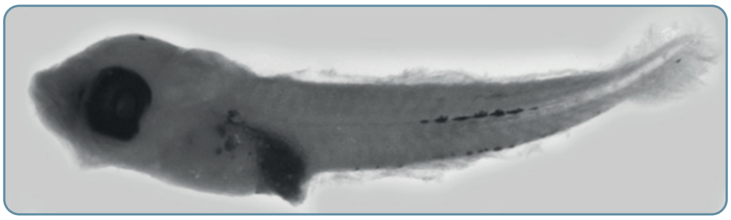
Figs. A-E

Body: elongate, laterally compressed
Head: moderate, rounded dorsally, with short snout
Eye: slightly oval and large
Gut: triangular
Preanus length: 30-40% SL in early larvae, increases slightly during development
Air bladder: absent
Spination: none

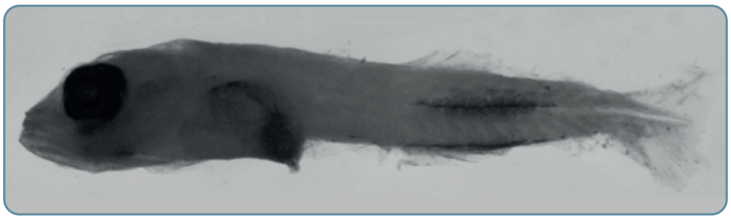
Pigmentation: increases during development; early larvae show an occipital melanophore, peritoneum strongly pigmented, a row of postanal ventral melanophores, a short row of mid–lateral melanophores on tail, and a single melanophore under urostyle; dorsum of tail unpigmented; late larvae show several melanophores over head and on dorsum of trunk and tail: gut, except its ventral side, pigmented
Length at flexion: 4.5-5.2 mm SL
Length at transformation: unknown

PHOTOS

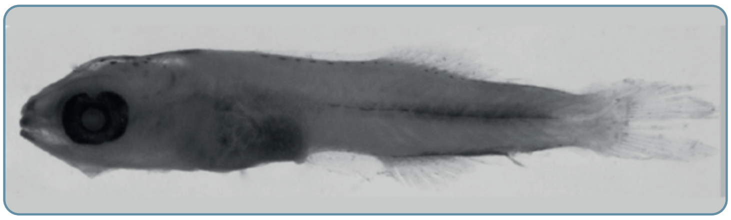
by J.M. Rodriguez



3.3 mm SL



4.3 mm SL

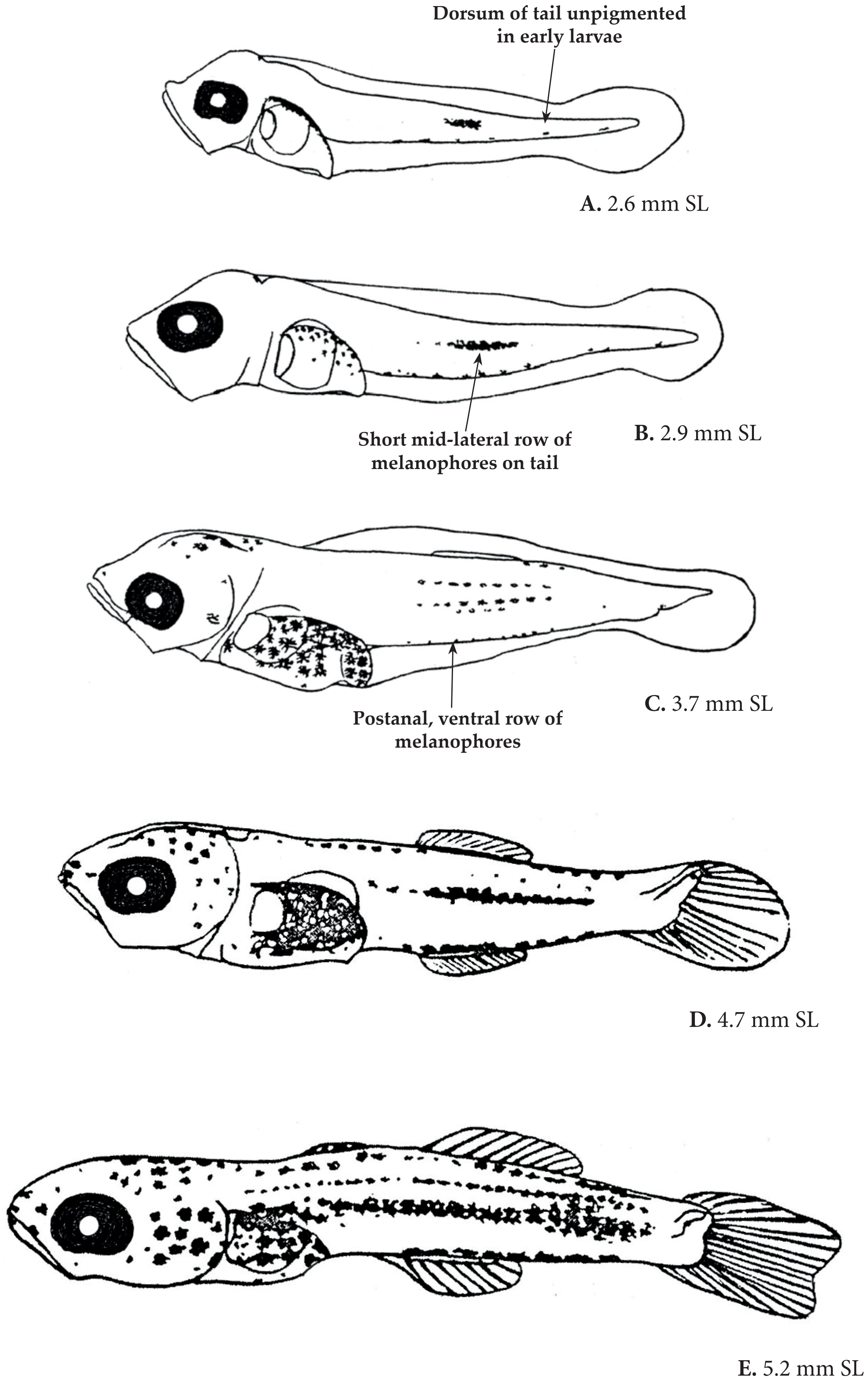


5.5 mm SL

8.3 mm SL

SYGNATHIFORMES

Mullus barbatus Linnaeus, 1758



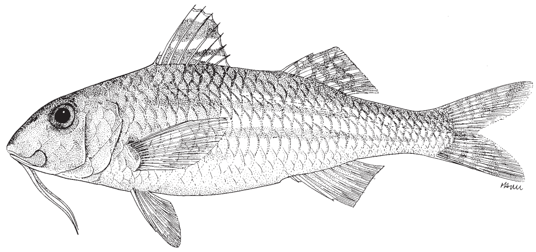
Literature: Alemany (1997), Froese and Pauly (2022), Hureau (1986a), Montalenti (1937b)

Illustrations' sources: A-E: Alemany (1997)

Mullus surmuletus Linnaeus, 1758 — Surmullet - Rouget de roche

Habitat: neritic, demersal, to 100 m depth
Distribution: eastern Atlantic Ocean, from Senegal to Norway, and the Mediterranean Sea
Spawning season: May to July

Meristic characters
Myomeres: 24
Vertebrae: 24
Dorsal fin: X + 13-15
Anal fin: III + 7-8



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.81-0.91 mm
Perivitelline space: small
Yolk: segmented; pigmented
Oil globules: one; diam. 0.23-0.25 mm; pigmented
Colour: transparent

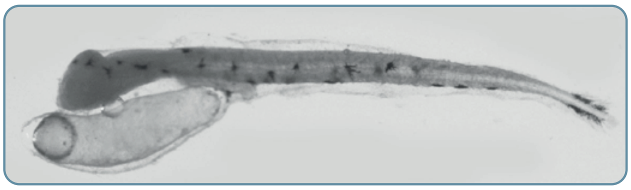
YOLK–SAC LARVAE — Fig. B

Hatch size: about 2.8 mm
Body: elongate and slender
Yolk sac: elongated, projected beyond snout
Oil globule location: at anterior edge of yolk sac
Anus: close behind yolk sac, reaches finfold border
Preanus length: about 30% SL
Pigmentation: melanophores scattered over body and on posterior margin of yolk sac; oil globule pigmented

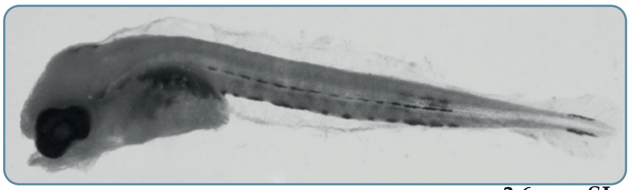
LARVAE — Figs. C-F

Body: elongate, laterally compressed
Head: relatively small and rounded dorsally; snout short
Eye: slightly oval and large
Gut: triangular
Preanus length: about 30% SL in early larvae, increases with development
Air bladder: absent
Spination: none
Pigmentation: at about 4.0 mm shows a ventral row of 10–12 postanal melanophores extending from anus to about 2/3 of tail; 2-3 melanophores over and below urostyle; mid–lateral line of melanophores (longer than in *M. barbatus*); peritoneum and lateral sides of gut strongly pigmented; late larvae develop dorsal and dorsolateral rows of melanophores
Length at flexion: 7.0-8.5 mm SL
Length at transformation: unknown

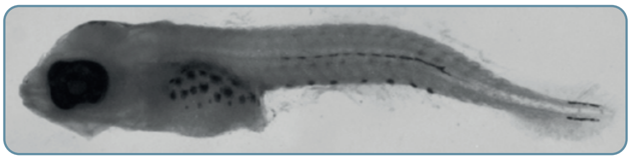
PHOTOS — by J.M. Rodriguez



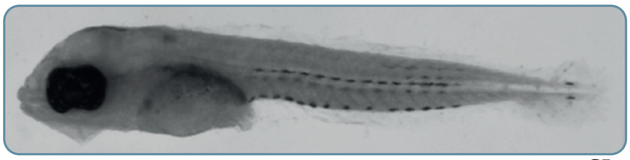
2.8 mm SL



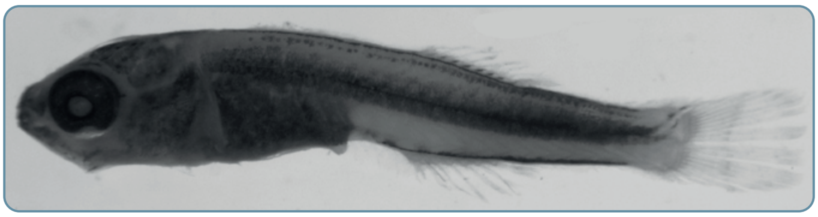
3.6 mm SL



4.4 mm SL

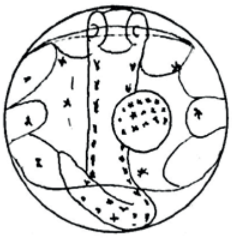


5.4 mm SL

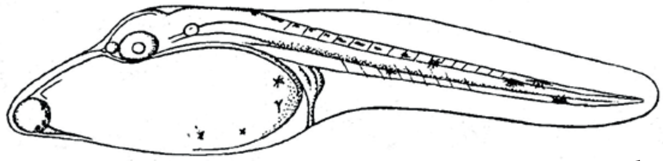


7.0 mm SL

Mullus surmuletus Linnaeus, 1758

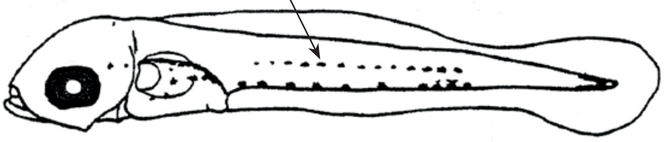


A.

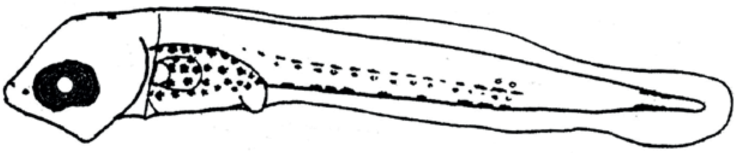


B. not sized

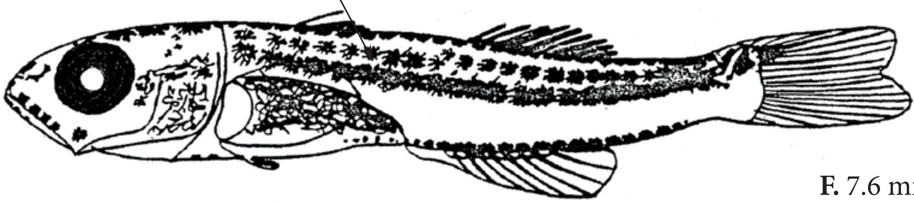
C. 2.3 mm SL



D. 3.1 mm SL



E. 3.6 mm SL



F. 7.6 mm SL

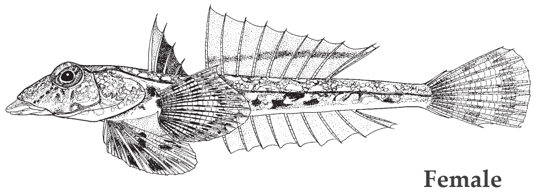
Literature: Hureau (1986a), Montalenti (1937b), Russell (1976)

Illustrations' sources: A, B: Montalenti (1937b); **C-F:** Alemany (1997)

Callionymus lyra Linnaeus, 1758 — Dragonet - Dragonet lyre

Habitat: neritic and upper shelf break, demersal, to about 200 m depth
Distribution: eastern Atlantic Ocean, from Mauritania to Norway, and the Mediterranean Sea
Spawning season: February to April (Mediterranean Sea)

Meristic characters
Myomeres: NA
Vertebrae: NA
1st dorsal fin: IV
2nd dorsal fin: 9
Anal fin: I + 9



Female

EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: sculptured with hexagonal structures in some species; diam. 0.66-0.97 mm
Perivitelline space: small
Yolk: segmented; pigmented
Oil globules: none
Colour: transparent

YOLK–SAC LARVAE — Fig. B

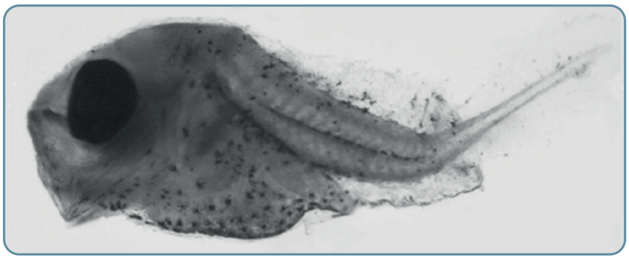
Hatch size: about 2.0 mm
Body: slender
Yolk sac: ovoid, relatively large
Anus: close behind yolk sac, does not reach finfold border in recently hatched larvae
Preanus length: < 50% SL
Pigmentation: melanophores scattered over body, finfold and yolk sac

LARVAE — Figs. C-I

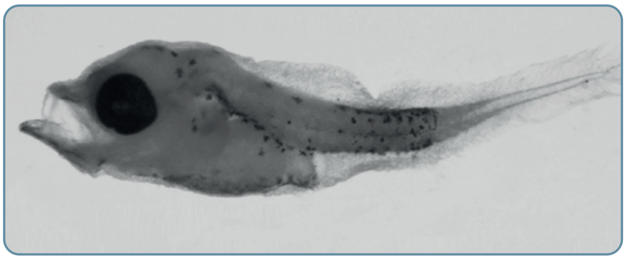
Body: short and tapering; urostyle long, strongly developed and curved up
Head: large and high
Eye: round and large
Gut: triangular and thick
Preanus length: about 50% SL
Air bladder: present
Spination: a preopercular spine bifurcated
Pigmentation: body, except caudal region, strongly pigmented
Length at flexion: unknown
Length at transformation: unknown

Four species of the genus *Callionymus*: *C. filamentosus* (ELS not described), *C. lyra*, *C. maculatus* and *C. reticulatus* live off the north African coast. The identification at the species level is only possible (although quite difficult) in larvae larger than 3.0 mm, when preopercular spines develop, and pelvic fins and pigmentation patterns become species–specific. Here we include the description of the early stages of *C. lyra* and illustrations of the other species because *Callionymus* larvae are very frequent in ichthyoplankton samples.

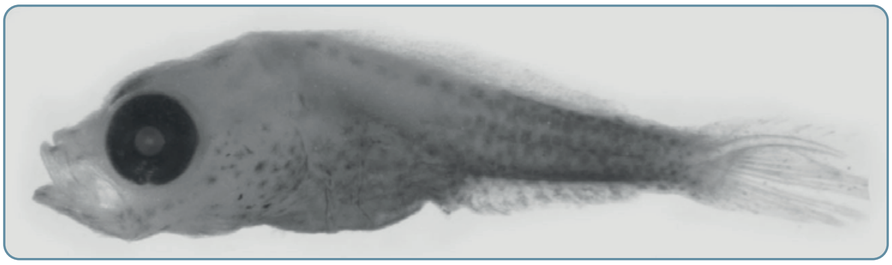
PHOTOS — by J.M. Rodriguez



***Callionymus* sp.** **2.5 mm SL**



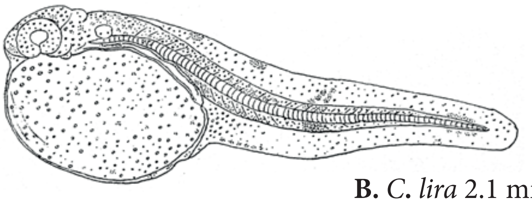
***Callionymus* sp.** **3.0 mm SL**



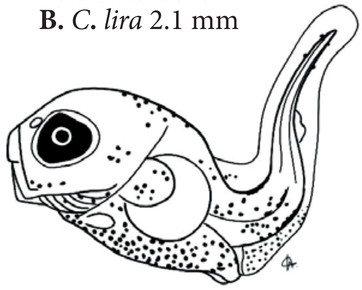
***Callionymus* sp.** **5.9 mm SL**

Callionymus lyra Linnaeus, 1758

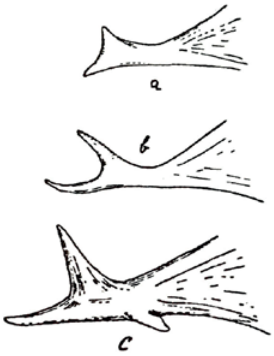
A. *C. lira*



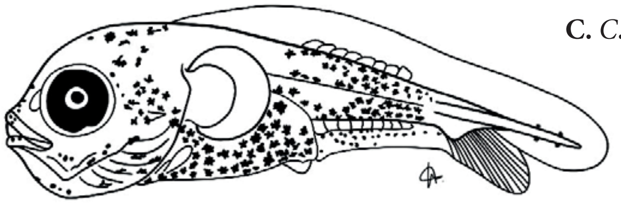
B. *C. lira* 2.1 mm



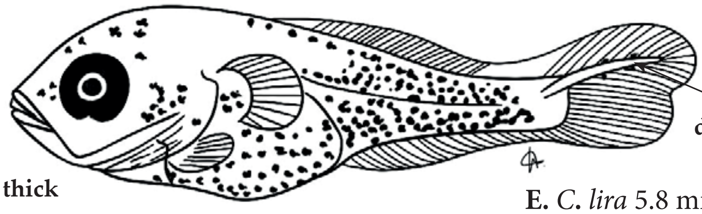
C. *C. lira* 3.2 mm TL



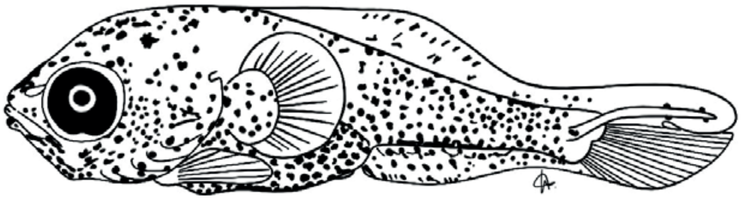
I. *C. lira* preopercular spines:
a. 5.8 mm, **b.** 7.0 mm, **c.** 8.3 mm



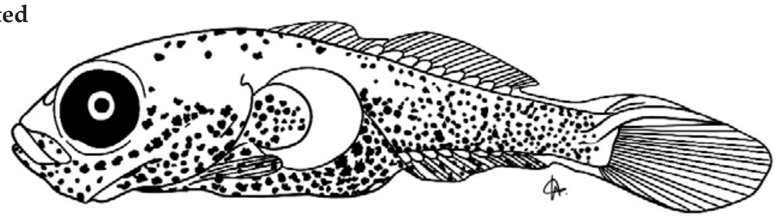
D. *C. lira* 4.9 mm TL



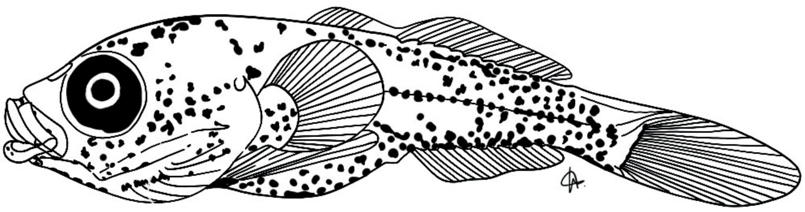
E. *C. lira* 5.8 mm TL



F. *C. lira* 6.5 mm TL



G. *C. maculatus* 6.6 mm TL



H. *C. reticulatus* 6.5 mm TL

Literature: Demir (1976), Fage (1918), Fricke (1986), Padoa (1956e), Russell (1976), Sabatés (1988)

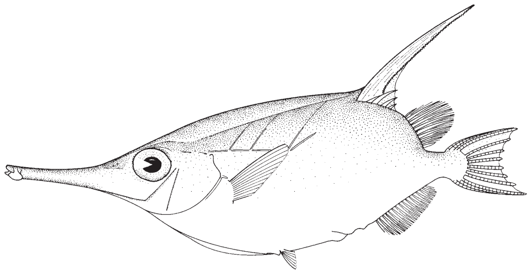
Illustrations' sources: A, B: Padoa (1956e); **C-H:** L. Rodríguez (**C, D, F-H:** redrawn from Demir, 1976; **E,** redrawn from Fage, 1918); **I:** Fage (1918)

CENTRISCIDAE

Macroramphosus scolopax (Linnaeus, 1758) — Longspine snipefish - Bécasse de mer

Habitat: neritic, demersal, between 50 and 150 m depth
Distribution: worldwide in tropical, subtropical and temperate waters
Spawning season: October to March

Meristic characters
Myomeres: 23
Vertebrae: 23
Dorsal fin: IV-VIII + 10-14
Anal fin: 19-21



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 1.0 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: one; diam. 0.2 mm; pigmented
Colour: transparent
Remark: eggs deposited in gelatinous mass

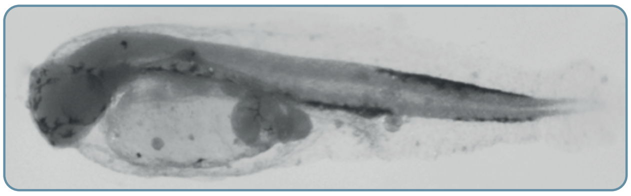
YOLK–SAC LARVAE — Fig. B

Hatch size: 2.8-3.0 mm TL
Body: relatively elongate and slender
Yolk sac: ovoid
Oil globule location: at posterior edge of yolk sac
Anus: detached from yolk sac, reaches finfold border
Preanus length: about 50% SL
Pigmentation: continuous line of melanophores along ventral surface of trunk and tail, from eye to caudal region; group of dorsal melanophores in postanal region; melanophores on top of head and snout; yolk sac, oil globule and finfold pigmented

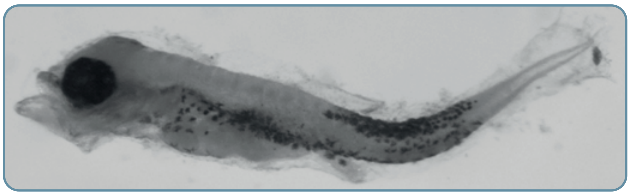
LARVAE — Figs. C-F

Body: relatively short and high in late larvae
Head: relatively small; snout short and pointed in early larvae, long and concave in late larvae, showing a 'duck-billed' profile
Eye: round and large
Gut: elongated and bulky
Preanus length: < 50% SL
Air bladder: present
Spination: supraorbital and occipital crests develop in larvae of 4.0–6.0 mm; spines on preopercle edge; spinous scales develop along lateral line in larvae of about 4.2 mm and cover entire body by 6.2 mm
Pigmentation: early larvae similar to yolk–sac larvae; late larvae show a lateral line of melanophores in postanal region; pigmentation increases during development spreading onto flanks, covering most of body, except caudal peduncle; melanophores on top of head
Length at flexion: 6.0 mm
Length at transformation: 13.0-15.0 mm

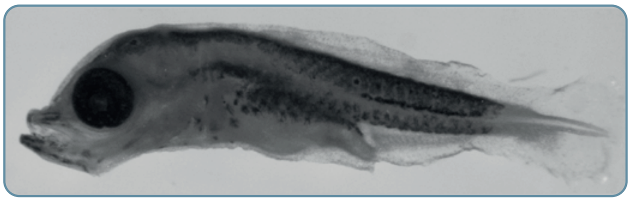
PHOTOS — by J.M. Rodriguez



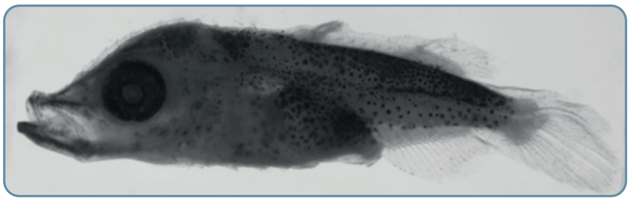
2.3 mm SL



2.8 mm SL



5.1 mm SL

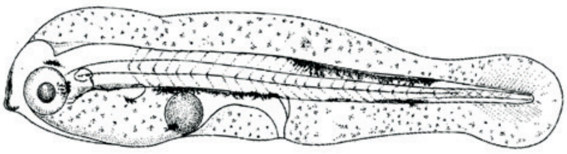


5.9 mm SL

SYGNATHIFORMES

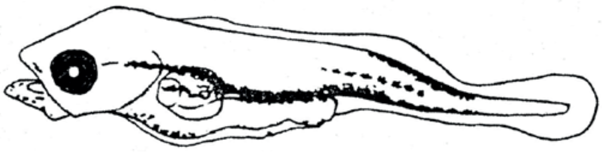
Macroramphosus scolopax (Linnaeus, 1758)

A.

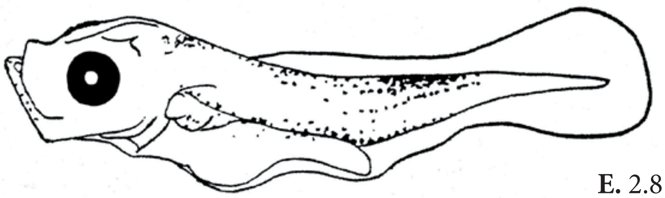


B. 3.0 mm TL

C. 1.8 mm SL



D. 2.5 mm SL



E. 2.8 mm SL

F. 4.8 mm TL

Literature: D'Ancona (1933b), Ehrich (1986), Fahay (2007), Froese and Pauly (2022), Sparta (1936)

Illustrations' sources: A, B, F: Fahay (2007); **C-E:** Alemany (1997)

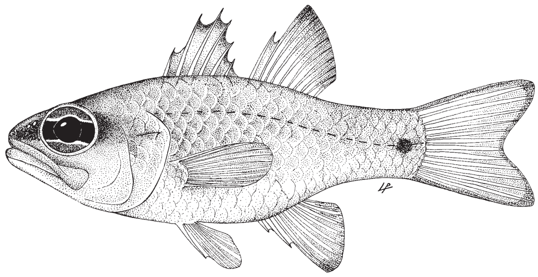
APOGONIDAE

Apogon imberbis (Linnaeus, 1758)

Cardinal fish – Coq

Habitat: neritic, demersal, to 200 m depth
Distribution: eastern Atlantic Ocean, from northern Angola to Morocco, and the Mediterranean Sea
Spawning season: June to September (Mediterranean Sea)

Meristic characters
Myomeres: 24
Vertebrae: 24
Dorsal fin: IX-X + 23-25
Anal fin: III + 22-24



EGGS — Fig. A

Habitat: pelagic
Shape: quasi spherical
Chorion: with filaments; diam. 0.77 mm
Perivitelline space: small
Yolk: segmented; unpigmented
Oil globules: one; diam. 0.23 mm; red pigmented in live eggs
Colour: transparent
Note: eggs are gathered in groups joined by filaments that start from a single point in the chorion

YOLK–SAC LARVAE — Fig. B

Hatch size: about 2.5 mm
Body: relatively elongate and slender
Yolk sac: spherical
Oil globule location: mid-dorsal region of yolk sac
Anus: detached from yolk sac, does not reach finfold border
Preanus length: about 67% SL
Pigmentation: body and yolk sac unpigmented; oil globule red colored in live individuals

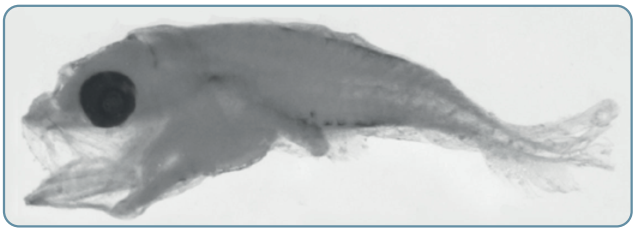
LARVAE — Figs. C-G

Body: relatively short and high; caudal peduncle long; 2 well developed dorsal fins in late larvae
Head: moderately large
Eye: round and large
Gut: triangular
Preanus length: 50% SL
Air bladder: present
Spination: a series of preopercular spines in larvae > 2.4 mm SL; at 6.5 mm, preoperculum with one long, thin spine in upper part, and 3 shorter, thin spines at bottom; supraorbital crest doubly serrated, weakly marked

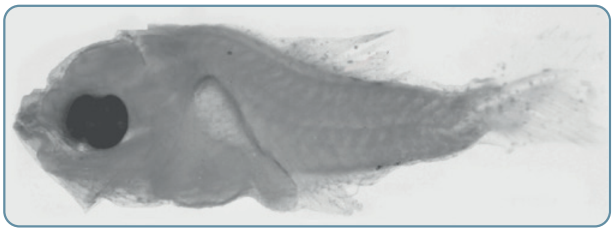
Pigmentation: ventral side of trunk and tail, from pectoral–fin base to mid–tail, pigmented; some melanophores over head and a pair under gut; a group of 1-5 dorsal melanophores over tail opposed to ventral ones in larvae < 5.0 mm; pigmentation diminishes during development; live or newly formalin-preserved specimens strongly red colored
Length at flexion: begins at 3.0 mm
Length at transformation: unknown

PHOTOS

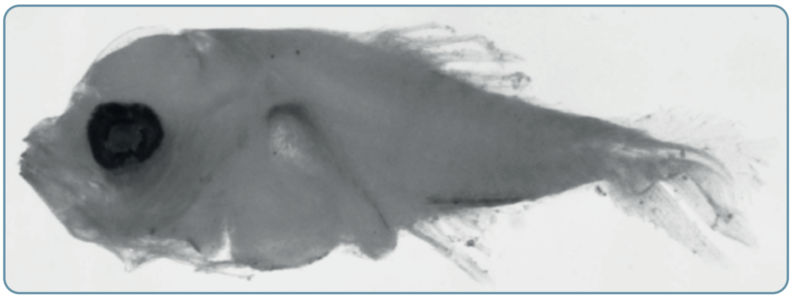
by J.M. Rodriguez



3.3 mm SL



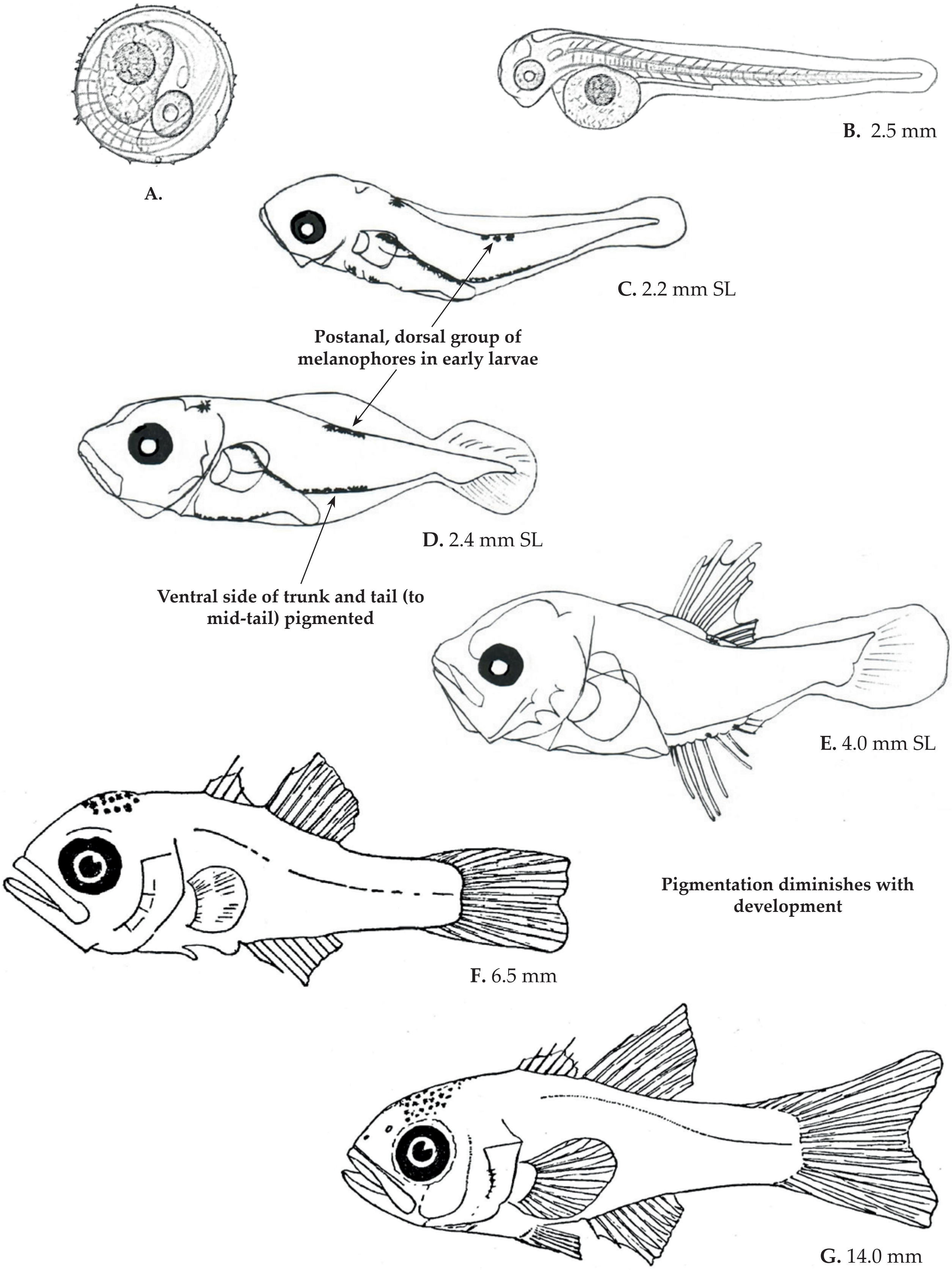
3.5 mm SL



3.7 mm SL

KURTIFORMES

Apogon imberbis (Linnaeus, 1758)



Literature: Alemany (1997); Bertolini (1933a), Froese and Pauly (2022), Tortonese (1986a)

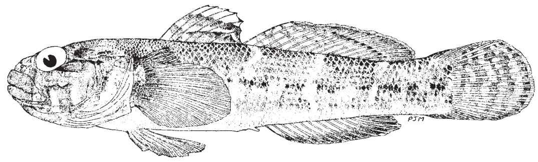
Illustrations' sources: A, B: Bertolini (1933a); **C-E:** Alemany (1997); **F, G:** Fage (1918)

GOBIIDAE

Gobius paganellus Linnaeus, 1758 — Rock goby – Gobie paganel

Habitat: neritic, demersal, from 0 to about 15 m depth
Distribution: eastern Atlantic Ocean, from Senegal to Scotland, and the Mediterranean Sea
Spawning season: January to June (Mediterranean Sea)

Meristic characters
Myomeres: 28
Vertebrae: 28
1st dorsal fin: V
2nd dorsal fin: I + 13-14
Anal fin: II + 11-12



EGGS — Fig. A

Habitat: demersal
Shape: fusiform with a pointed apex
Chorion: smooth; diam. 2.5 x 0.84 mm
Perivitelline space: small
Yolk: unsegmented; unpigmented
Oil globules: none
Colour: translucent

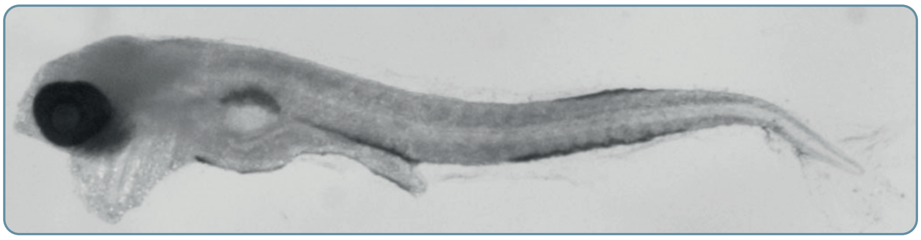
YOLK–SAC LARVAE — Fig. B

Hatch size: about 4.8 mm
Body: elongate; mouth open; air bladder apparent
Yolk sac: rounded and relatively small
Anus: detached from yolk sac, reaches finfold border
Preanus length: < 50% SL
Pigmentation: large, opposing dorsal and ventral melanophores at about mid–postanal region; a melanophore on terminal gut; no melanophores on head; air bladder and eye pigmented

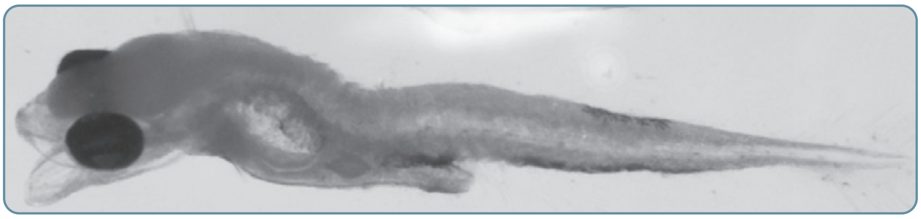
LARVAE — Figs. C-F

Body: relatively elongate and slender
Head: relatively small; mouth small, oblique
Eye: round
Gut: elongated
Preanus length: about 50% SL
Air bladder: prominent
Spination: none
Pigmentation: early larvae similar to yolk–sac larvae; larvae larger than 7.0 mm show melanophores on head and a row of postanal ventral melanophores, while postanal dorsal melanophore disappears in postflexion larvae; peritoneum and dorsum of air bladder pigmented; ventral side of trunk and gut pigmented; a melanophore over terminal gut
Length at flexion: unknown
Length at transformation: unknown

PHOTOS — by J.M. Rodriguez



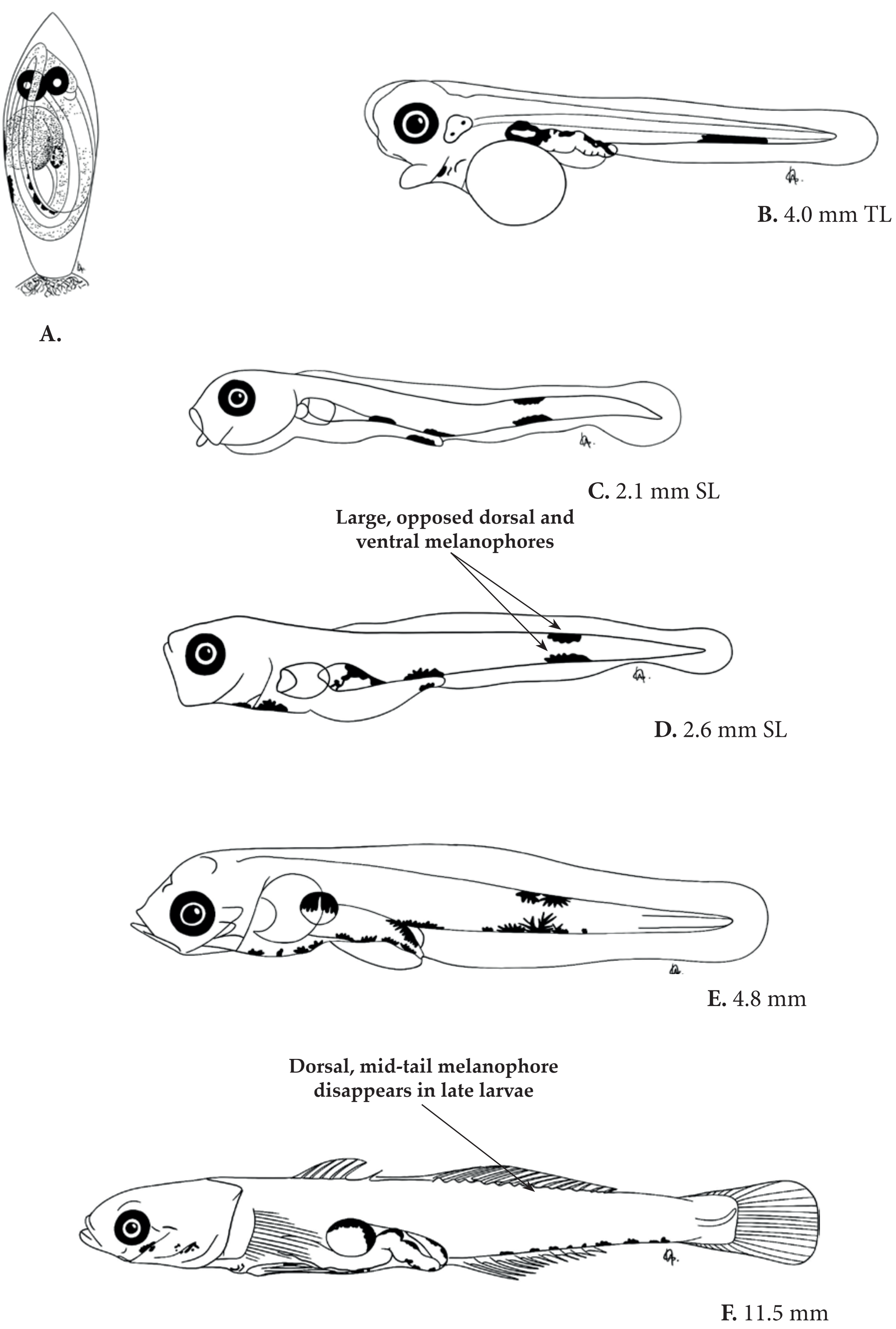
2.6 mm SL



3.2 mm SL

GOBIIFORMES

Gobius paganellus Linnaeus, 1758



Literature: Froese and Pauly (2022), Lebour (1919), Miller (1986), Padoa (1956i); Russell (1976)

Illustrations' sources: A-F: L. Rodríguez (**A, E:** redrawn from Padoa, 1956i; **B, F:** redrawn from Lebour 1919; **C, D:** redrawn from Alemany, 1997)

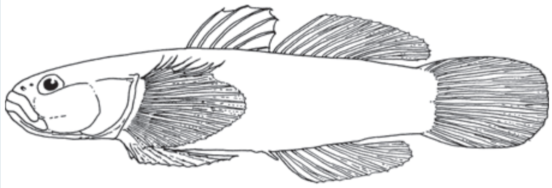
GOBIIDAE

Lebetus guilleti (Le Danois, 1913)

Guillet's goby

Habitat: neritic, demersal from 0 to about 30 m depth
Distribution: eastern Atlantic Ocean, from Morocco to Denmark, and the Mediterranean Sea
Spawning season: February to December (western Mediterranean Sea)

Meristic characters
Myomeres: 25-26
Vertebrae: 25-26
1st dorsal fin: VI
2nd dorsal fin: I + 7-9
Anal fin: I + 5-6



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

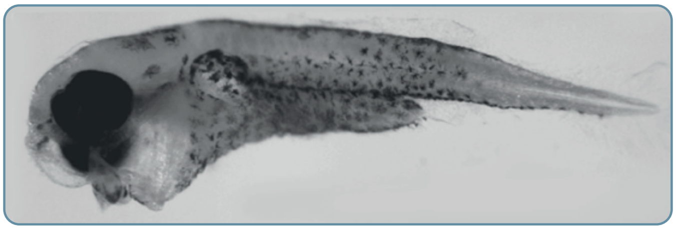
Figs. A-E

Body: short and robust; pelvic fins large from early larvae on
Head: small to moderate; forehead rounded; mouth small and oblique
Eye: round and large
Gut: elongated, sack shaped; anus protruding
Preanus length: about 67% SL
Air bladder: prominent

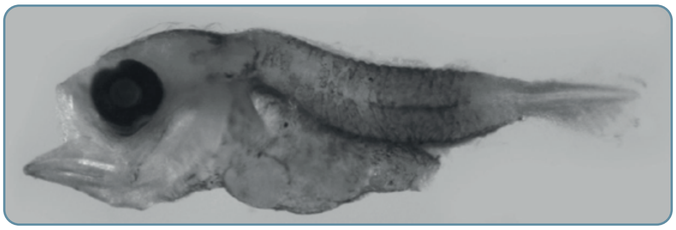
Spination: none
Pigmentation: body, except caudal region, covered with melanophores; well–marked rows of melanophores on lateral side of body and on ventral tail region, from anus to base of caudal fin; air bladder pigmented
Length at flexion: 5.0-7.0 mm SL
Length at transformation: unknown

PHOTOS

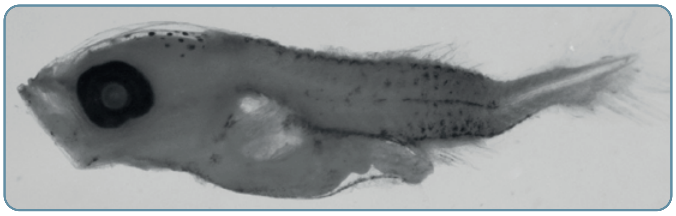
by J.M. Rodriguez



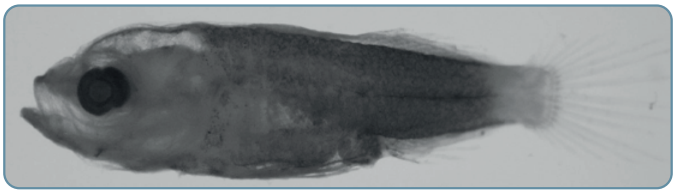
2.2 mm SL



2.8 mm SL



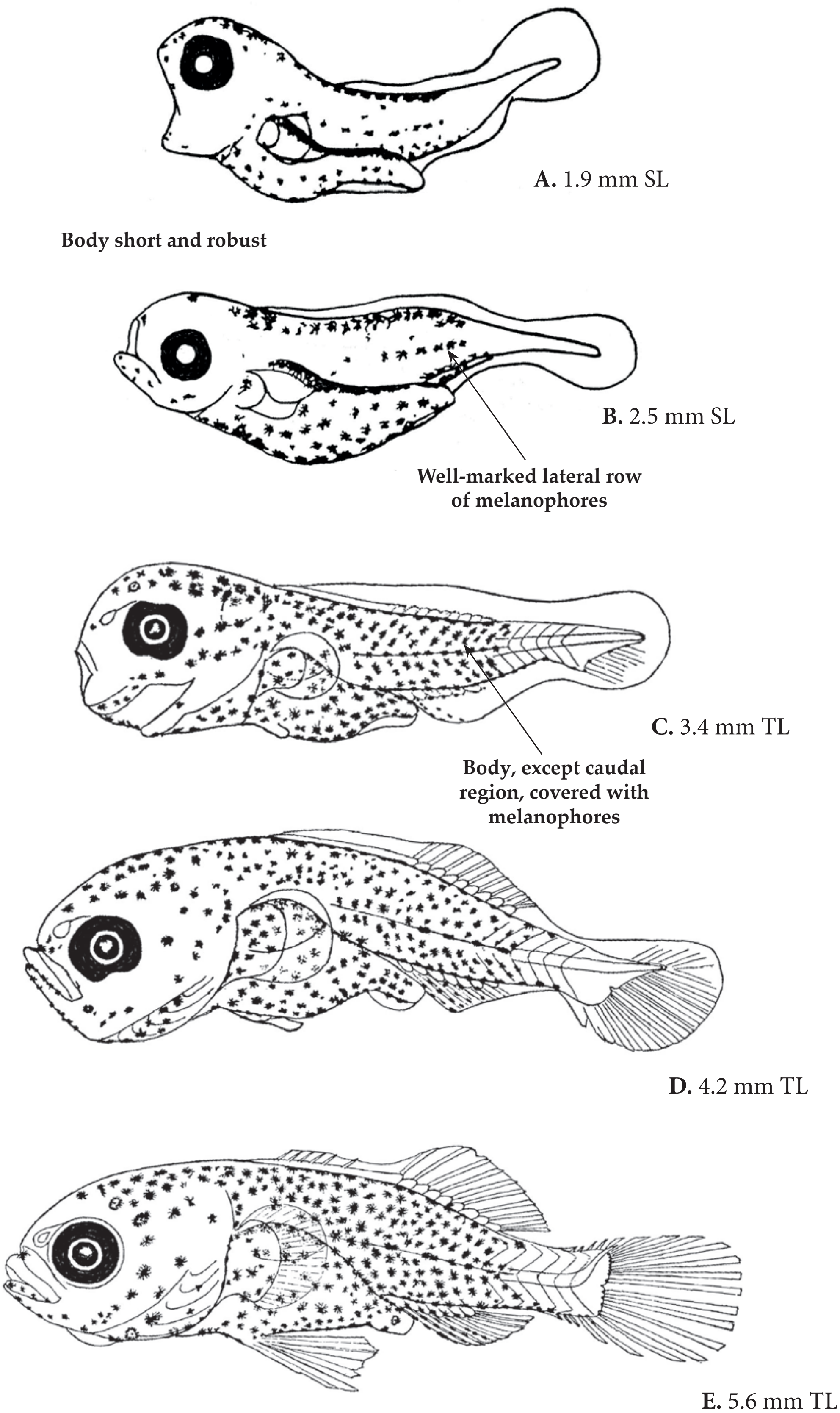
3.5 mm SL



4.5 mm SL

GOBIIFORMES

Lebetus guilleti (Le Danois, 1913)



Literature: Alemany (1997), Demir and Russell (1971), Froese and Pauly (2022)

Illustrations' sources: A, B: Alemany (1997); **C-E:** Demir and Russell (1971)

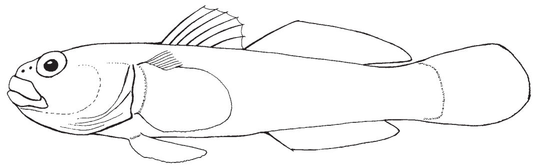
GOBIIDAE

Pomatoschistus microps (Krøyer, 1838)

Common goby - Gobie commun

Habitat: neritic, demersal, inshore, between 0 and 12 m depth
Distribution: eastern Atlantic Ocean, from Mauritania to Norway, and the Mediterranean Sea
Spawning season: February to September

Meristic characters
Myomeres: 31
Vertebrae: 31
1st dorsal fin: VI
2nd dorsal fin: I + 8-9
Anal fin: I+8-9



EGGS — Fig. A

Habitat: demersal
Shape: pear–shaped, with rounded apex
Chorion: smooth; size 1.0–0.7 x 0.65–0.8 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: many; diam. to 0.08 mm
Colour: translucent

YOLK–SAC LARVAE — Fig. B

Hatch size: about 3.0 mm
Body: elongate; mouth open; air bladder apparent
Yolk sac: rounded and relatively small
Anus: detached from yolk sac, reaches finfold border
Preanus length: about 50% SL
Pigmentation: row of melanophores along ventral side of trunk and tail; yolk sac and ventral side of gut strongly pigmented; large branched melanophore on dorsal mid–tail region; air bladder and eyes pigmented

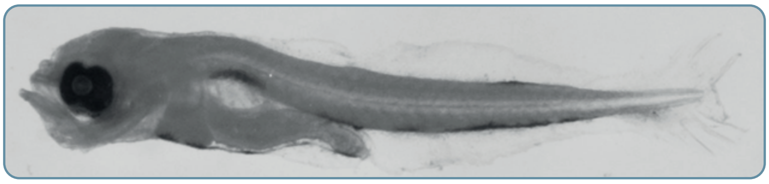
LARVAE — Figs. C-F

Body: relatively elongate and slender
Head: relatively small; mouth small, oblique
Eye: round
Gut: elongated
Preanus length: about 50% SL
Air bladder: prominent
Spination: none

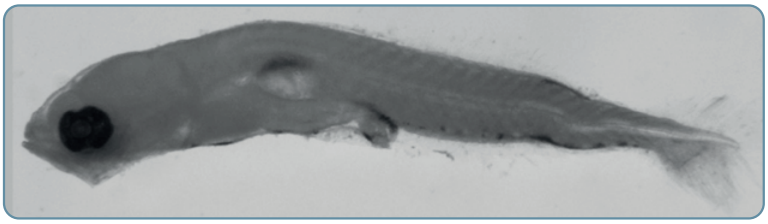
Pigmentation: a row of postanal ventral melanophores with a large one, ramified, at about mid-tail; a large branched melanophore on dorsal mid–tail region, opposite to ventral one; about 4 melanophores on ventral side of gut; a melanophore over anus; air bladder pigmented
Length at flexion: unknown
Length at transformation: unknown

PHOTOS

by J.M. Rodriguez



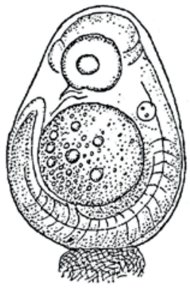
3.2 mm SL



4.0 mm SL

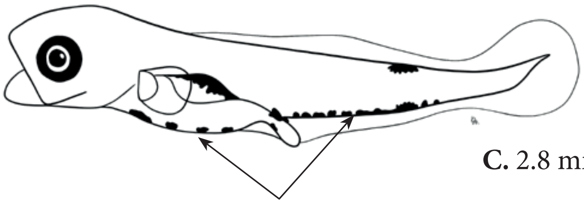
GOBIIFORMES

Pomatoschistus microps (Krøyer, 1838)



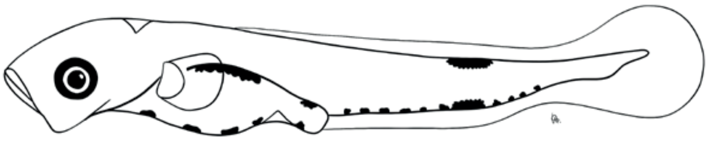
A.

B. 3.0 mm



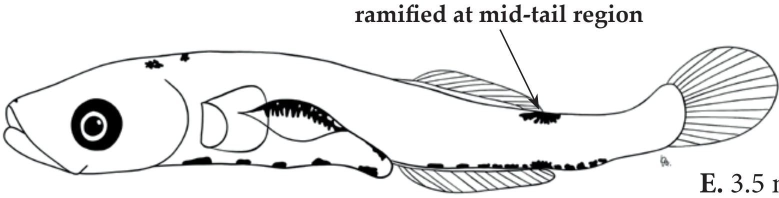
C. 2.8 mm SL

Continuous row of melanophores along ventral side of body

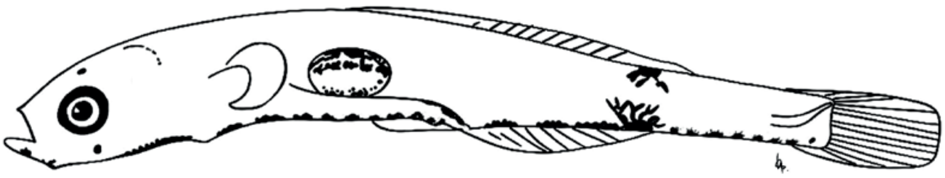


D. 3.3 mm SL

A dorsal melanophore strongly ramified at mid-tail region



E. 3.5 mm SL



F. 8.0 mm

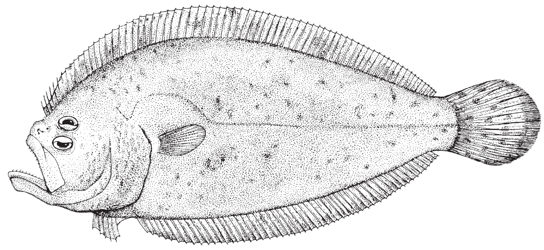
Literature: Miller (1986), Padoa (1956i), Russell (1976), Sabatés (1988)

Illustrations' sources: A: Padoa, (1956b); **B-F:** L. Rodríguez (**B, F:** redrawn from Padoa, 1956b; **C-E:** redrawn from Alemany, 1997)

Arnoglossus laterna (Walbaum, 1792) Mediterranean scaldfish - Arnoglosse de Méditerranée

Habitat: neritic, demersal, between 10 and 200 m depth
Distribution: eastern Atlantic Ocean, from Angola to Norway, and the Mediterranean Sea
Spawning season: April to August (North Sea and the Mediterranean Sea)

Meristic characters
Myomeres: NA
Vertebrae: NA
Dorsal fin: 81-93
Anal fin: 75-82



EGGS Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.60-0.76 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: one; diam. 0.11-0.15 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE Fig. B

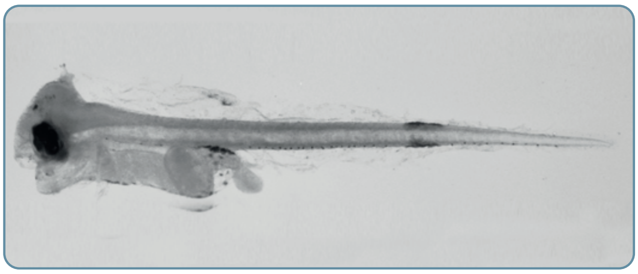
Hatch size: about 2.5 mm
Body: elongate and slender
Yolk sac: ovoid, elongated
Oil globule location: at posterior edge of yolk sac
Anus: close behind yolk sac, reaches finfold border
Preanus length: < 50% SL
Pigmentation: melanophores on head and dorsal anterior region of body; two opposite bars of melanophores a about mid-tail; dorsal primordial fin, yolk sac and oil globule pigmented; caudal region unpigmented

LARVAE Figs. C-F

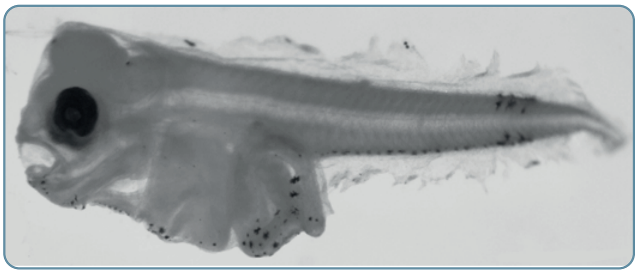
Body: initially elongate, becomes deeper, mainly through abdominal region, and laterally compressed with development; a tentacle over head develops from primordial fin (disappears at transformation)
Head: moderately large with a snub nose; mouth small
Eye: round and relatively small
Gut: tightly coiled, extends beyond ventral margin of body
Preanus length: decreases with development from about 47% SL to 40% SL
Air bladder: present from about 4.5 mm

Spination: aggregates of simple spines on anal-fin base and over liver; 5-6 spines near base of tentacle
Pigmentation: two rows of ventral melanophores, one on each side of body, from anus to caudal end; two opposite bars of melanophores at about mid-tail; melanophores along abdominal ventral contour of body, along lower jaw and over terminal gut; air bladder pigmented; primordial-fin border pigmented in early larvae
Length at flexion: unknown
Length at transformation: about 18.0 mm (North Sea)

PHOTOS by J.M. Rodriguez



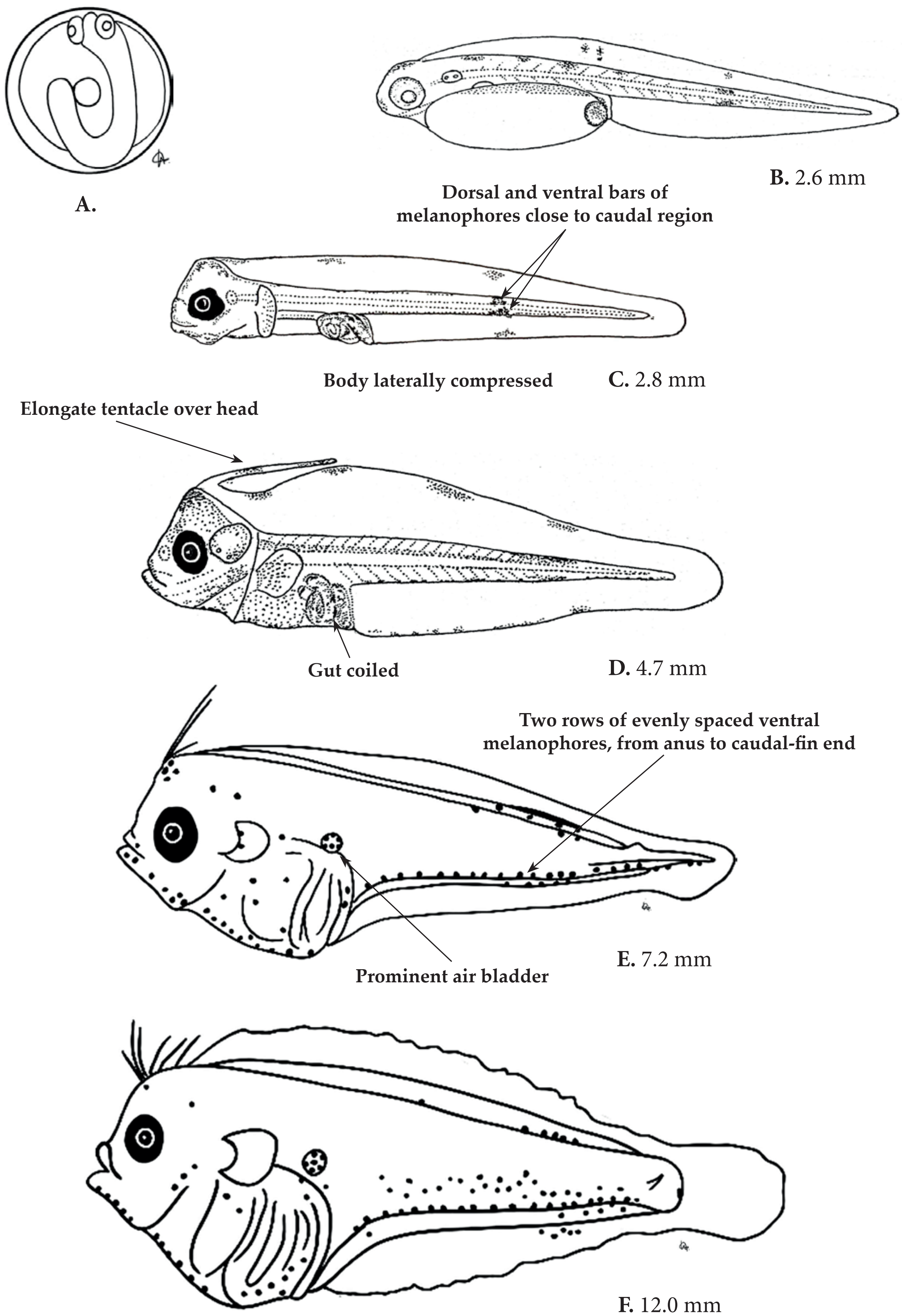
3.0 mm SL



5.0 mm SL

7.0 mm SL

Arnoglossus laterna (Walbaum, 1792)



Literature: Froese and Pauly (2022), Padoa (1956c), Russell (1976)

Illustrations' sources: A, E, F: L. Rodríguez (redrawn from Russell, 1976); **B-D:** Padoa (1956c)

BOTHIDAE

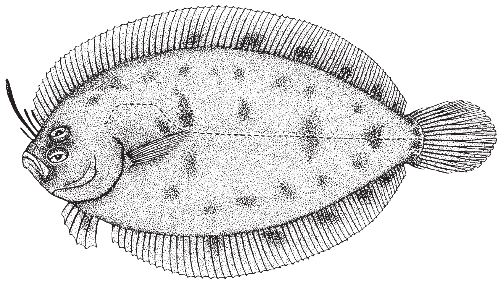
PLEURONECTIFORMES

Arnoglossus thori Kyle, 1913

Thor's scaldfish - Arnoglosse tacheté

Habitat: neritic, demersal, between 15 and 100 m depth
Distribution: eastern Atlantic, from Sierra Leone to Ireland, and the Mediterranean Sea
Spawning season: April to July

Meristic characters
Myomeres: NA
Vertebrae: NA
Dorsal fin: 84-92
Anal fin: 63-69



EGGS

Undescribed

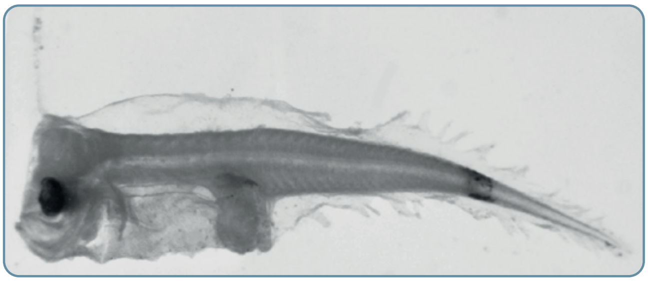
YOLK–SAC LARVAE Fig. A

Hatch size: about 2.3 mm
Body: elongate and slender
Yolk sac: ovoid, very elongated
Oil globule location: at posterior edge of yolk sac
Anus: close behind yolk sac, reaches finfold border
Preanus length: < 50% SL
Pigmentation: two opposite accumulations of melanophores on postanal region that spread onto primordial fin, one at about mid-tail and another at caudal region; melanophores on head and on dorsal anterior region of body; oil globule pigmented

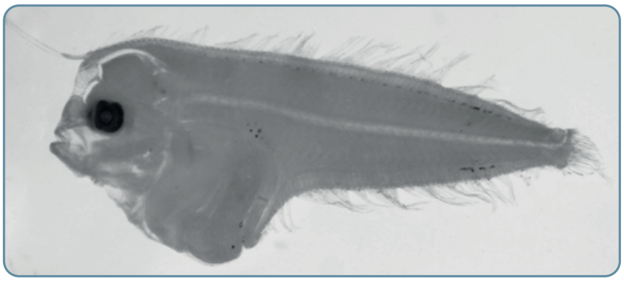
LARVAE Figs. B-F

Body: initially elongate, becomes deeper, mainly through abdominal region and laterally compressed with development; 1-2 tentacles develop over head from primordial fin and disappear at transformation
Head: moderately large, with a snub nose; mouth small
Eye: relatively small and round
Gut: tightly coiled, extends beyond ventral margin of body
Preanus length: about 43% SL
Air bladder: present since early larvae
Spination: aggregates of spined plates over abdominal region, aligned along liver; some spines at base of tentacle/s
Pigmentation: early larvae, a bar of melanophores behind mid-tail; a melanophore under urostyle; a patch of pigment over coiled region of gut; late larvae, tail bar pigment reduced to a group of melanophores over dorsal fin and an opposite group over anal fin, a short ventral line, and a row of melanophores develops along anal fin and dorsal-fin base, respectively; some melanophores over gut loop; air bladder pigmented
Length at flexion: completed at 14.5 mm SL
Length at transformation: 21.0-25.0 mm SL

PHOTOS by J.M. Rodriguez

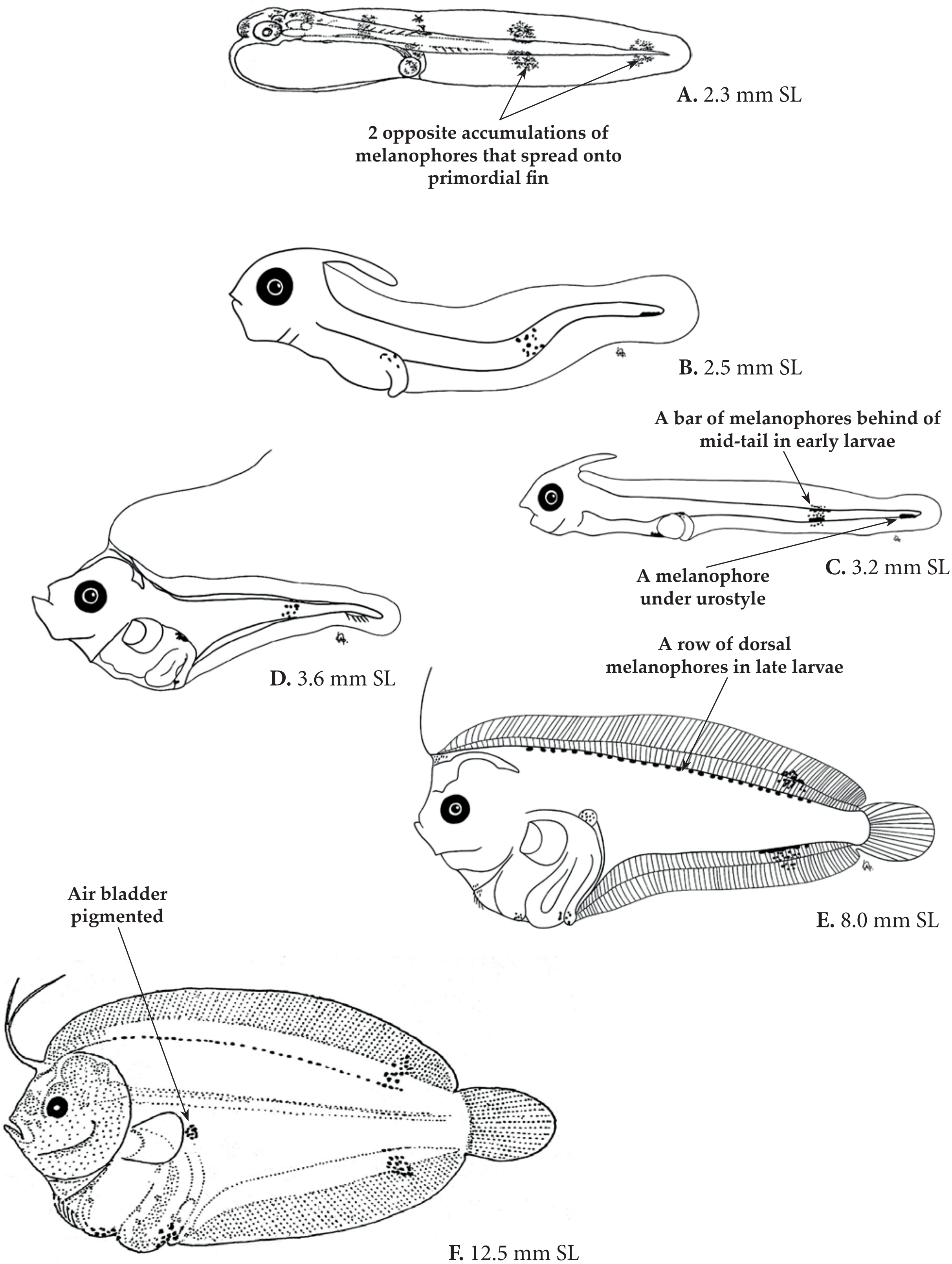


5.9 mm SL



8.1 mm SL

Arnoglossus thori Kyle, 1913



Literature: Aldebert *et al.* (1990), Alemany (1997), Nielsen (1986a), Padoa (1956c), Russell (1976), Sabatés (1988)

Illustrations' sources: A, F: Padoa (1956c); **B-E:** L. Rodríguez (redrawn from Alemany, 1997)

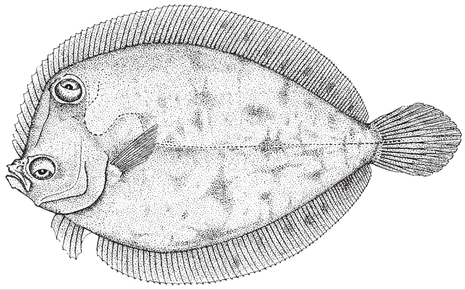
BOTHIDAE

Bothus podas (Delaroche, 1809)

Wide-eyed flounder - Rombou podas

Habitat: neritic, demersal, between 15 and 400 m depth
Distribution: eastern Atlantic Ocean, from Angola to Portugal, and the Mediterranean Sea
Spawning season: May to August (Mediterranean Sea)

Meristic characters
Myomeres: NA
Vertebrae: NA
Dorsal fin: 85-95
Anal fin: 63-73



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

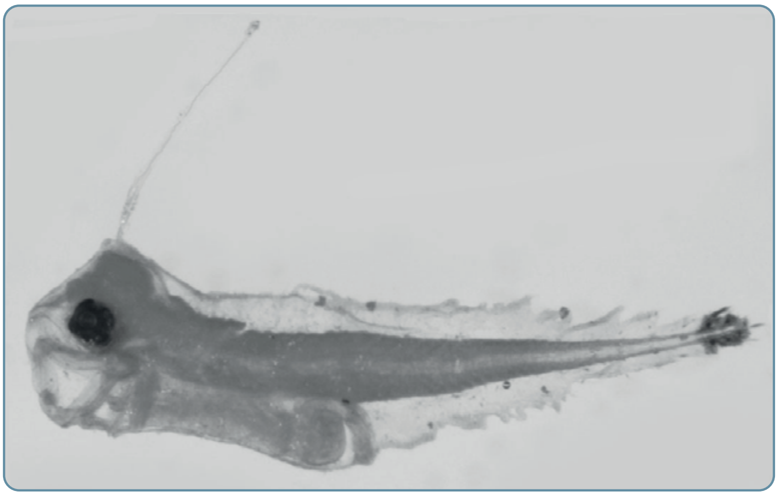
LARVAE

Figs. A-D

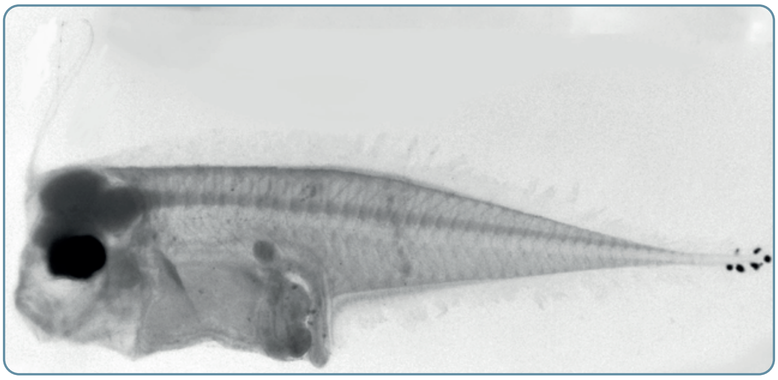
Body: initially elongate, becomes deeper, mainly through abdominal region, and laterally compressed with development, acquiring a blunt profile; a tentacle over head, develops from first dorsal-fin ray (disappears at transformation)
Head: moderately large; snout flattened; mouth small and almost vertical
Eye: round and small
Gut: tightly coiled, extends beyond ventral margin of body
Preanus length: about 40% SL
Air bladder: present
Spination: none
Pigmentation: groups of large melanophores on dorsal and ventral side of urostyle; rest of body, unpigmented
Length at flexion: begins at about 7.0 mm
Length at transformation: unknown

PHOTOS

by J.M. Rodriguez



3.9 mm SL



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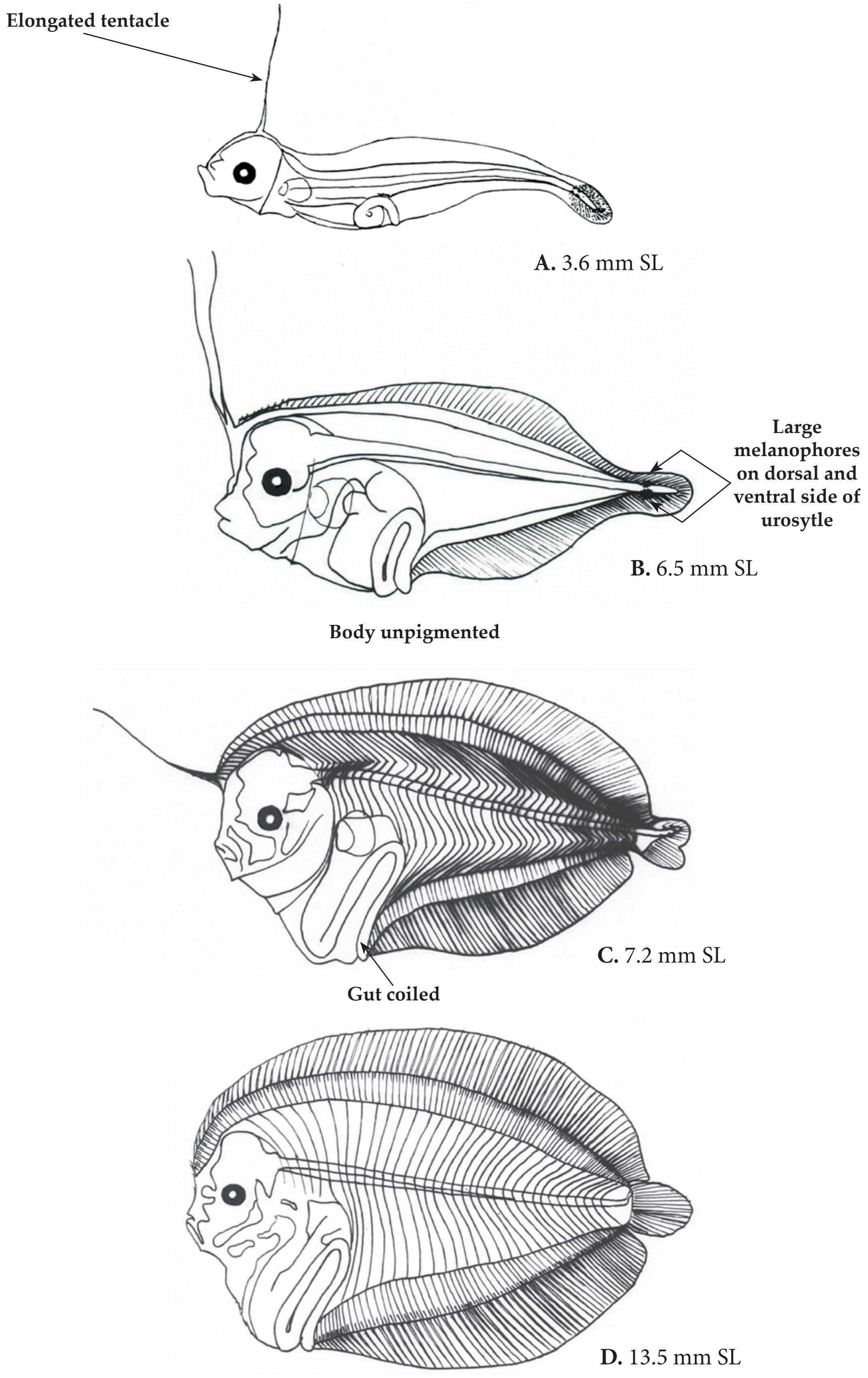
PLEURONECTIFORMES

Bothus podas (Delaroche, 1809)



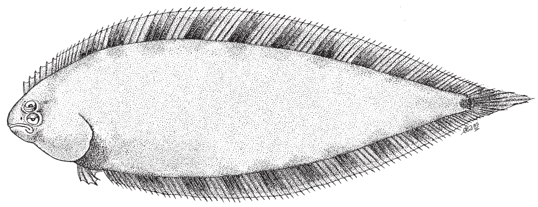
Literature: Alemany (1997), Froese and Pauly (2022), Padoa (1956c)

Illustrations' sources: A-D: Alemany (1997)

Symphurus nigrescens Rafinesque, 1810 — Tonguesole - Plagusie sombre

Habitat: neritic and slope, demersal, between 20 and 1 140 m depth
Distribution: eastern Atlantic Ocean, from Angola to Portugal, and the Mediterranean Sea
Spawning season: January to May (Mediterranean Sea)

Meristic characters
Myomeres: 48
Vertebrae: 48
Dorsal fin: 83-94
Anal fin: 71-78



EGGS

Undescribed

YOLK–SAC LARVAE

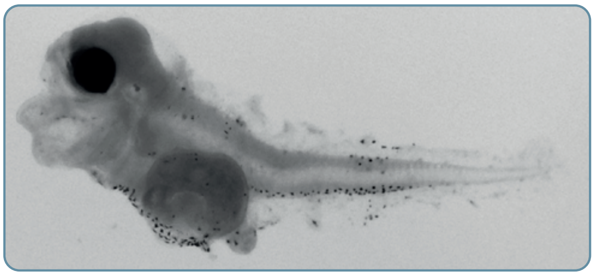
Undescribed

LARVAE — Figs. A-C

Body: relatively short with deep abdominal region; laterally compressed from early larvae; first 4 dorsal-fin rays considerably enlarged (these rays enlarge in a sequential order, from anterior to posterior); pectoral fins large
Head: large; snout rounded; mouth small and oblique
Eye: round and small
Gut: coiled, largely protruding; finger–shaped prolongation of gut at posterior ventral side of gut loop; anus moderately protruding
Preanus length: < 50% SL
Air bladder: present

Spination: none
Pigmentation: melanophores on ventral side of gut, on gut prolongation and over anus; a group of ventral melanophores on anterior tail and 2 isolated melanophores on ventral caudal region; opposing dorsal and ventral groups of melanophores at about mid–tail; groups of small melanophores along ventral tail region in later larvae; air bladder pigmented
Length at flexion: unknown
Length at transformation: unknown

PHOTOS — by J.M. Rodriguez



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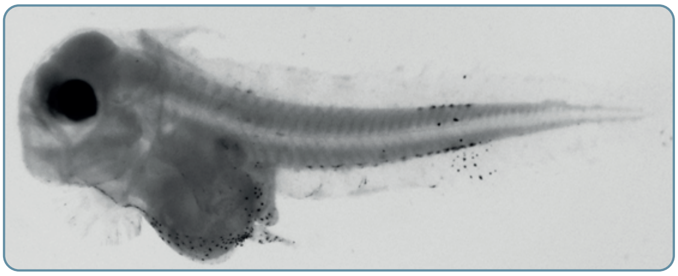

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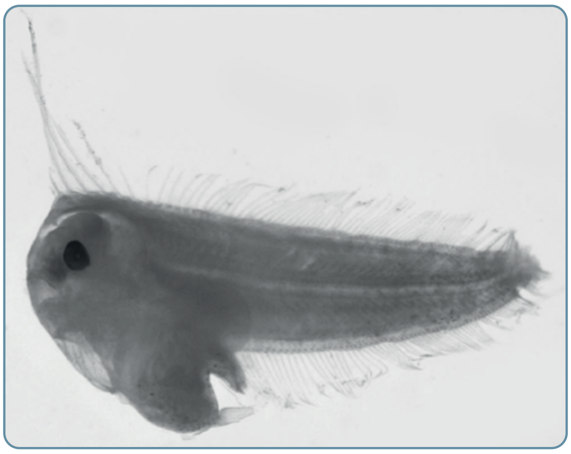
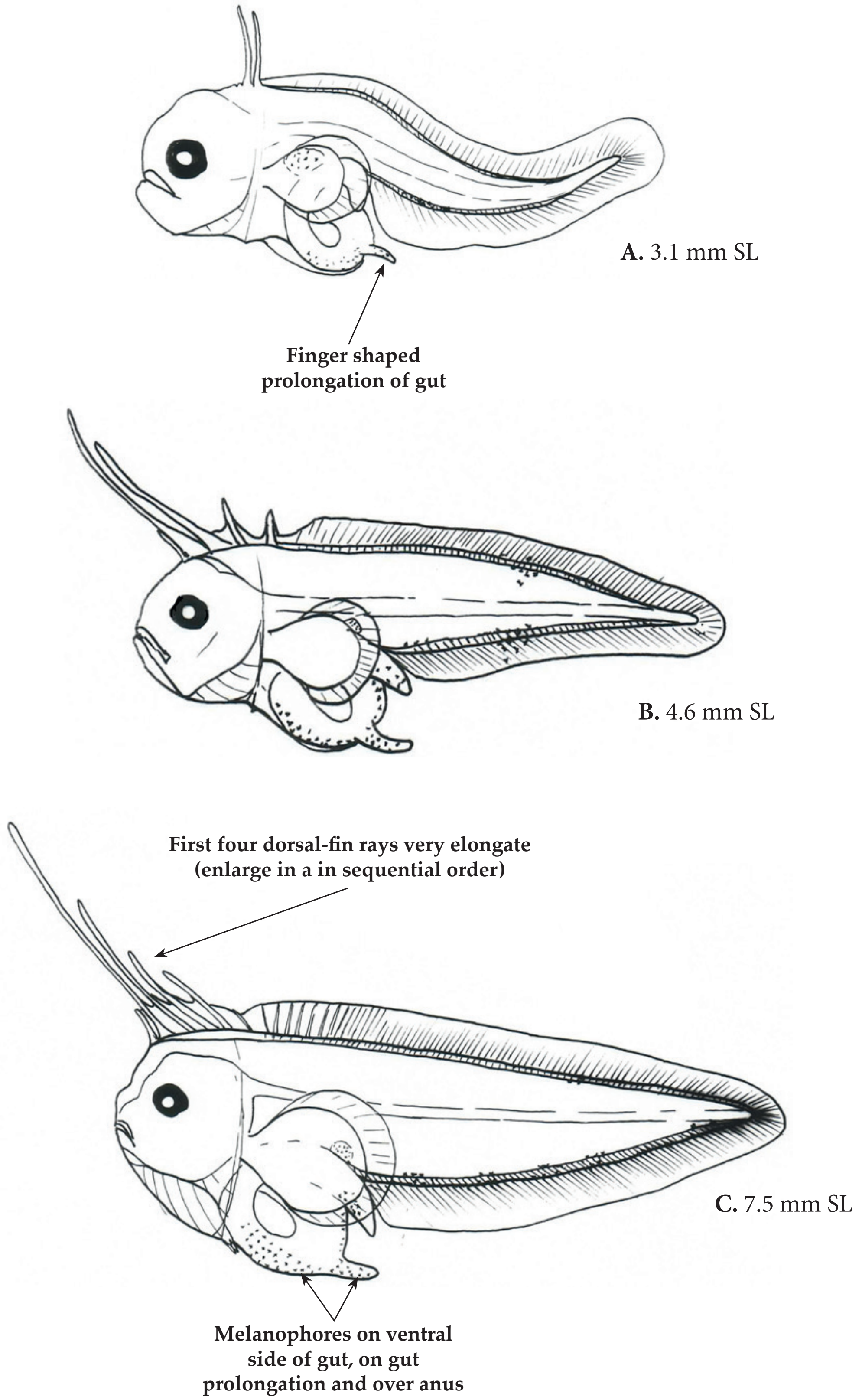


6.0 mm SL

Symphurus nigrescens Rafinesque, 1810



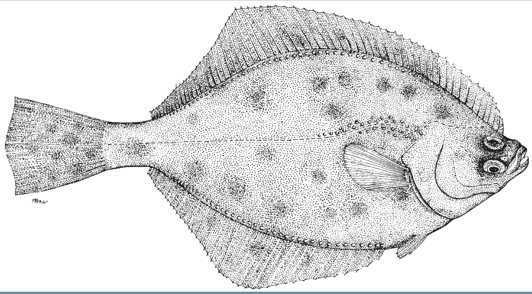
Literature: Alemany (1997), Padoa (1956h), Quero *et al.* (1986a)

Illustrations' sources: A-C: Alemany (1997)

Platichthys flesus (Linnaeus, 1758) — European flounder – Flet d'Europe

Habitat: neritic, demersal, between 1 and 100 m depth
Distribution: eastern Atlantic Ocean, from Morocco to Norway, and the Mediterranean Sea
Spawning season: February to June

Meristic characters
Myomeres: NA
Vertebrae: NA
Dorsal fin: 52-67
Anal fin: 36-46



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.80-1.13 mm
Perivitelline space: small
Yolk: unsegmented; unpigmented
Oil globules: none
Colour: transparent

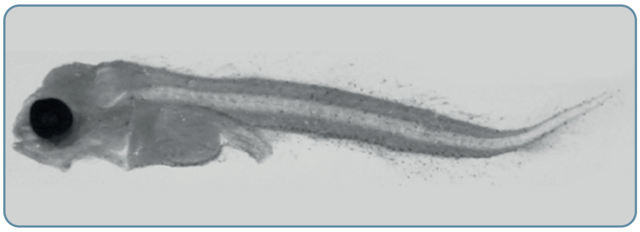
YOLK–SAC LARVAE — Fig. B

Hatch size: about 2.3-3.3 mm
Body: relatively elongate and slender
Yolk sac: ovoid, relatively large
Anus: close behind yolk sac, reaches finfold border
Preanus length: about 42% SL
Pigmentation: primordial fin unpigmented in early larvae; a group of melanophores at about midway along postanal region, spreading out dorsally and ventrally onto primordial fin through development; melanophores scattered on body; caudal region unpigmented

LARVAE — Figs. C-F

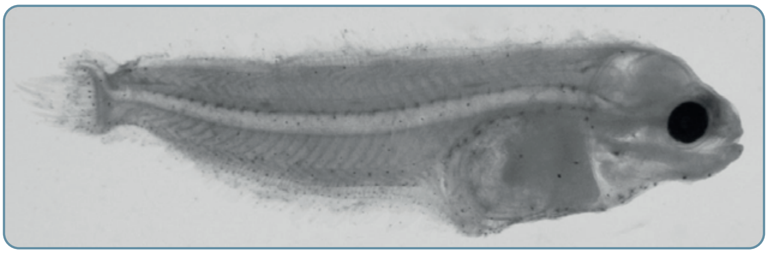
Body: elongate and slender in early larvae, becomes more robust and laterally compressed with development
Head: relatively small; snout rounded
Eye: round and small; reaches dorsal ridge at about 10 mm
Gut: coiled
Preanus length: about 42% SL
Air bladder: absent
Spination: none
Pigmentation: many scattered melanophores along ventral sides of body, spreading out over anal and caudal fin where melanophores tend to be aligned with fin rays; caudal region unpigmented in early larvae
Length at flexion: unknown
Length at transformation: completed at about 10.0-11.0 mm

PHOTOS — by J.M. Rodriguez



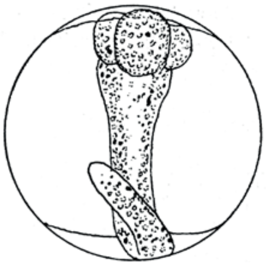
4.3 mm SL

5.6 mm SL



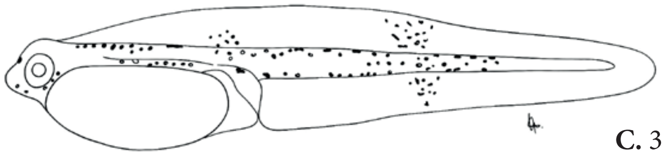
7.3 mm SL

Platichthys flesus (Linnaeus, 1758)

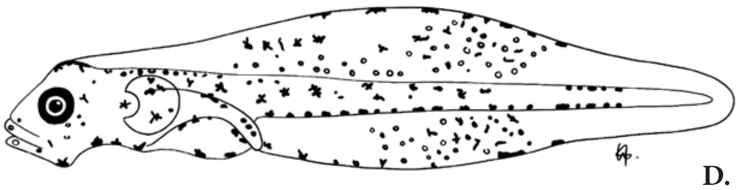


A.

B. 2.8 mm



C. 3.5 mm

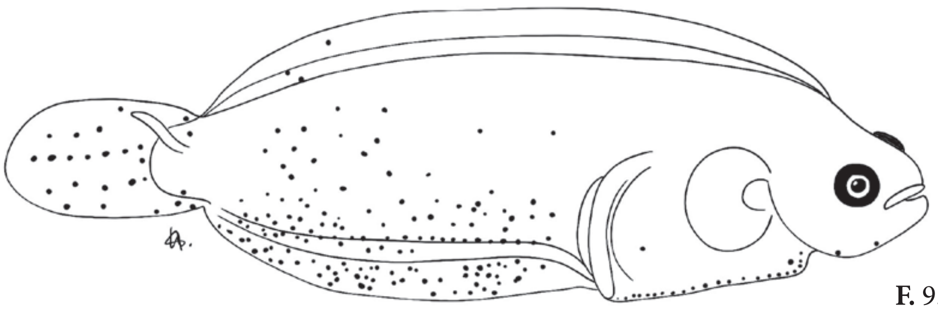


D. 3.8 mm

Body elongate and
slender in early larvae

E. 7.0 mm

Scattered melanophores along ventral sides of
body spreading out over anal and caudal fins



F. 9.5 mm

Literature: Froese and Pauly (2016), Nielsen (1986c), Padoa (1956l), Russell (1976)

Illustrations' sources: A: Padoa (1956t); **B-F:** L. Rodríguez (**B:** redrawn from Padoa, 1956t; **C-F:** redrawn from Russell, 1976)

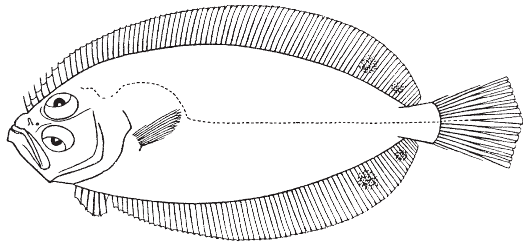
SCOPHTHALMIDAE

Lepidorhombus boscii (Risso, 1810)

Four-spot megrim - Cardine à quatre taches

Habitat: neritic and upper slope, demersal, between 7 and 800 m depth
Distribution: eastern Atlantic Ocean, from Cape Bojador to the British Isles, and the Mediterranean Sea
Spawning season: March to June

Meristic characters
Myomeres: 41
Vertebrae: 41
Dorsal fin: 82-89
Anal fin: 65-71



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

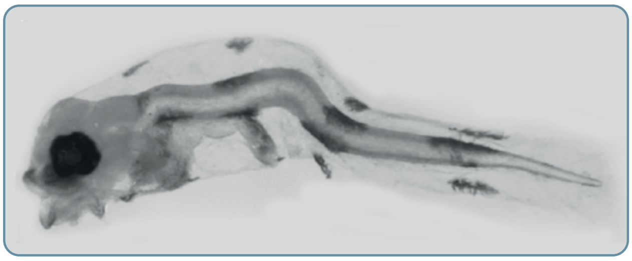
LARVAE

Figs. A-E

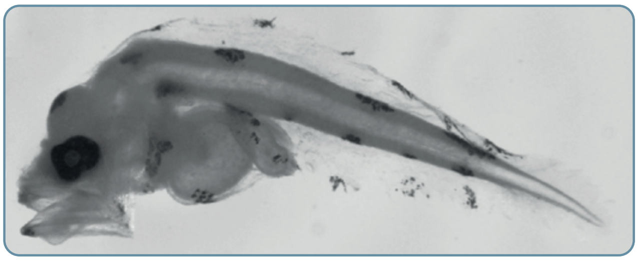
Body: relatively elongate and slender in early larvae, becomes considerably deep, especially through abdominal region, and laterally compressed with development
Head: relatively small; mouth becomes almost vertical with development; mouth protractile in late larvae
Eye: round and relatively small, begins migrating to left side of body when larva is about 8.9 mm long
Gut: spherical, coiled, extends beyond ventral margin of body
Preanus length: increases with development from 20.2% SL in early larvae to 44.2% in late larvae
Air bladder: present
Spination: two rows of preopercular spines (larger spines in posterior row) visible in 5.0 mm larvae; a spine appears on post-temporal region, behind eye, at 6.0 mm
Pigmentation: 4 groups of melanophores evenly arranged along dorsal side of body, and 3 (2 in early larvae) postanal ventral melanophores extending to finfold and later to dorsal and anal fins; gut, head, frontal region, tips of upper and lower jaws and air bladder pigmented; melanophores on dorsal and ventral surface of gut and on cleithral symphysis; pelvic fins pigmented
Length at flexion: 6.0-9.8 mm SL
Length at transformation: unknown

PHOTOS

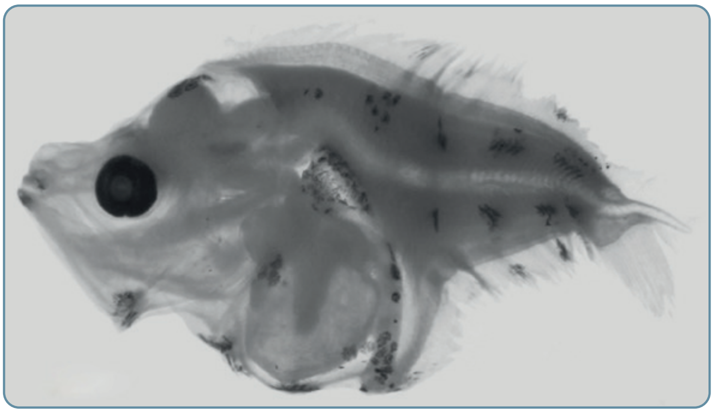
by J.M. Rodriguez



3.2 mm SL



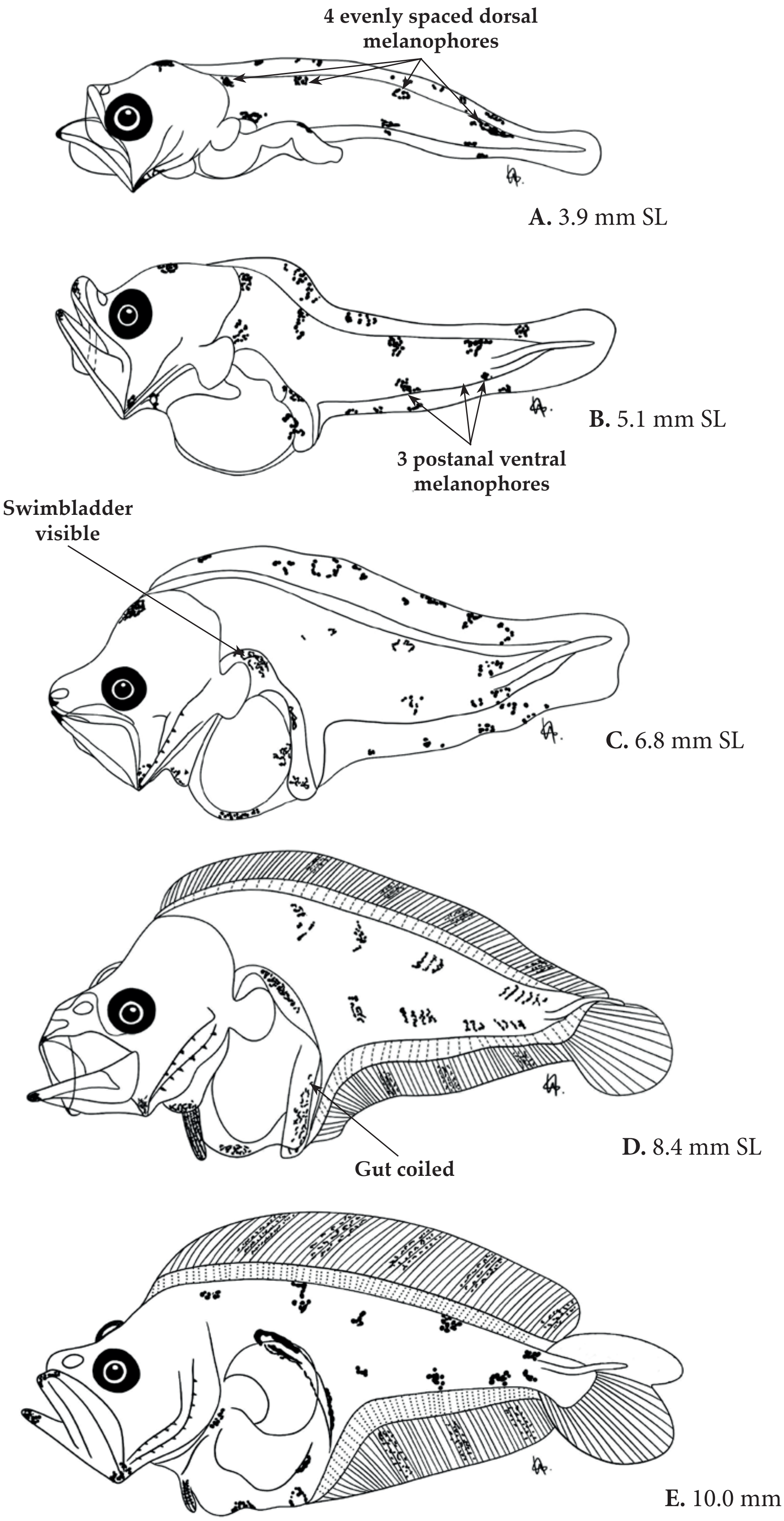
5.2 mm SL



6.9 mm SL

PLEURONECTIFORMES

Lepidorhombus boscii (Risso, 1810)



Literature: Froese and Pauly (2022), Nielsen (1986d), Padoa (1956c), Russell (1976), Sabatés (1991)

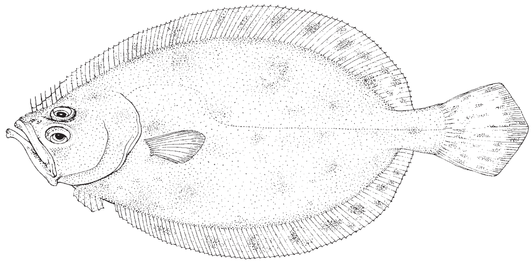
Illustrations' sources: A-E: L. Rodríguez (**A-D:** redrawn from Sabatés, 1991; **E:** redrawn from Padoa, 1956c)

SCOPHTHALMIDAE

Lepidorhombus whiffiagonis (Walbaum, 1792) — Megrim – Cardine franche

Habitat: neritic and upper slope, demersal, between 100 and 700 m depth
Distribution: eastern Atlantic Ocean, from Cape Bojador to Iceland, and the western Mediterranean Sea
Spawning season: March to June

Meristic characters
Myomeres: 42
Vertebrae: 42
Dorsal fin: 85-94
Anal fin: 64-74



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 1.02-1.22 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: one; diam. 0.25-0.30 mm; pigmented
Colour: transparent

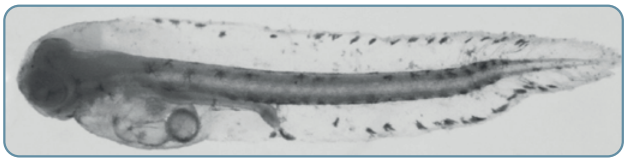
YOLK–SAC LARVAE — Fig. B

Hatch size: about 4.05 mm
Body: elongated
Yolk sac: large, ovoid
Oil globule location: at posterior edge of yolk sac
Anus: slightly detached from yolk sac, reaches finfold border
Preanus length: about 45% SL
Pigmentation: a few melanophores on head; trunk and tail, except caudal region, covered with uniformly scattered melanophores; dorsal and ventral margins of finfold, except caudal region, pigmented; oil globule pigmented

LARVAE — Figs. C-F

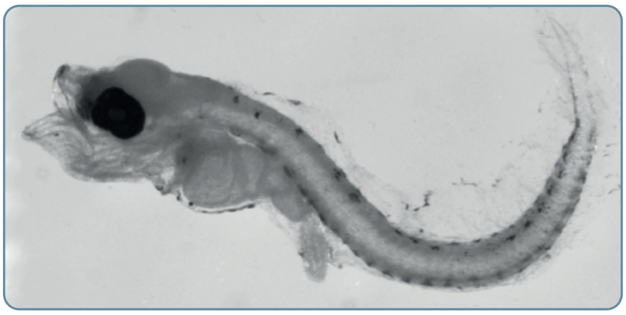
Body: relatively elongate and slender in early larvae, becomes deep, especially through abdominal region, and laterally compressed with development
Head: relatively small; mouth oblique and relatively large; snout pointed in early larvae becomes concave throughout development
Eye: round and small; asymmetry begins in larvae 12.7 mm long
Gut: spherical, coiled, extends beyond ventral margin of body
Preanus length: about 50% SL
Air bladder: absent
Spination: 2 large otocystic spines on each side of head
Pigmentation: melanophores evenly scattered over dorsal and anal fins; two parallel rows of large melanophores along dorsal (from head) and ventral (from anus) contours of body; peritoneum and ventral side of gut pigmented; some melanophores on head and on upper and lower jaws
Length at flexion: < 11.7 mm
Length at transformation: unknown

PHOTOS — by J.M. Rodriguez

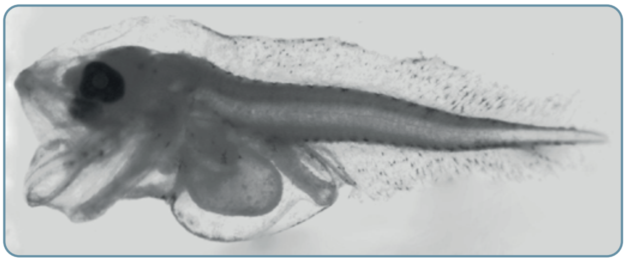


3.8 mm SL

3.7 mm SL (dorsal view)



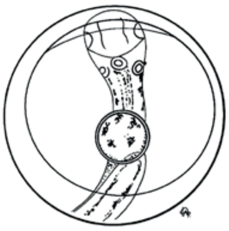
4.6 mm SL



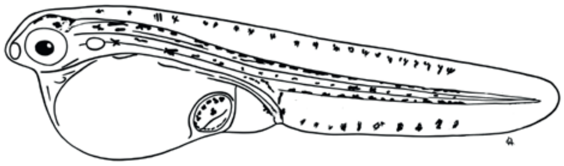
5.1 mm SL

PLEURONECTIFORMES

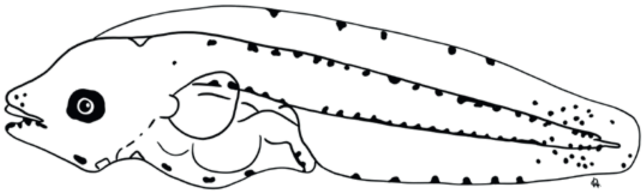
Lepidorhombus whiffiagonis (Walbaum, 1792)



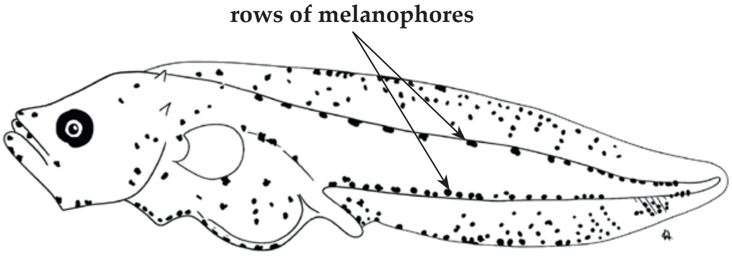
A.



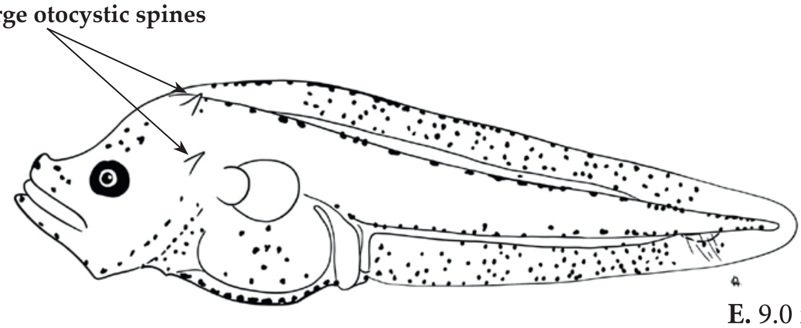
B. 4.0 mm



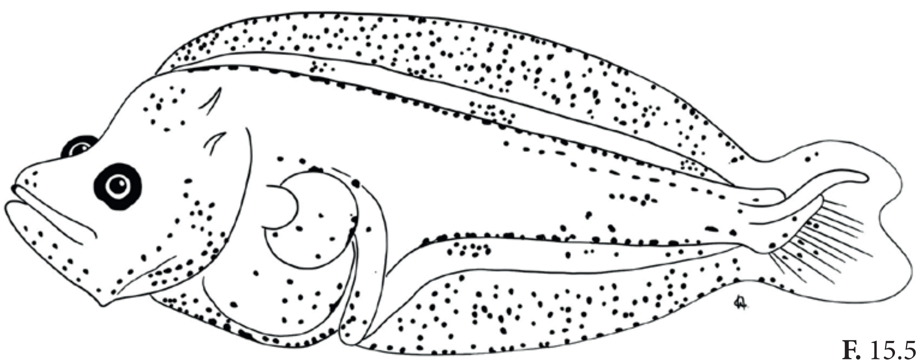
C. 4.5 mm



D. 7.5 mm



E. 9.0 mm



F. 15.5 mm

Literature: Froese and Pauly (2022), Padoa (1956c), Russell (1976), Munk and Nielsen (2005)

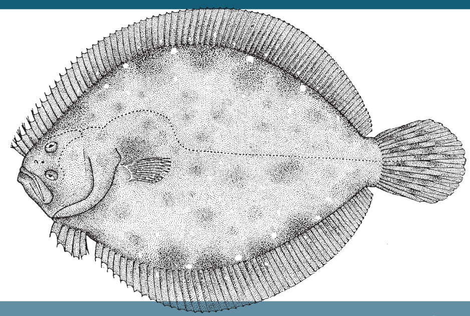
Illustrations' sources: A-F: L. Rodríguez (**A, B:** redrawn from Padoa, 1956c; **C-F:** redrawn from Russell, 1976)

SCOPHTHALMIDAE

Scophthalmus rhombus (Linnaeus, 1758) — Brill - Barbue

Habitat: neritic, demersal, between 5 and 50 m depth
Distribution: eastern Atlantic Ocean, from Morocco to Iceland, and the Mediterranean Sea
Spawning season: March to August (Mediterranean Sea)

Meristic characters
Myomeres: 25-36
Vertebrae: 35-36
Dorsal fin: 74-80
Anal fin: 55-62



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 1.24-1.50 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: one; diam. 0.16-0.25 mm; pigmented
Colour: transparent

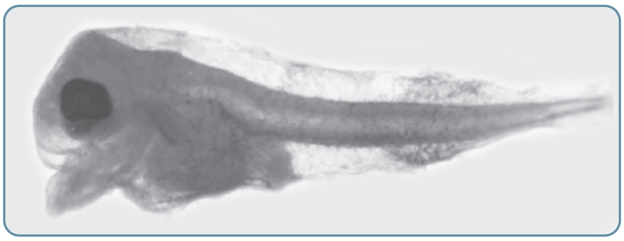
YOLK–SAC LARVAE — Fig. B

Hatch size: about 3.8 mm TL
Body: elongated and slender
Yolk sac: ovoid, pigmented
Oil globule location: at ventral, posterior edge of yolk sac
Anus: close behind yolk sac, reaches finfold border
Preanus length: about 50% SL
Pigmentation: body (except caudal region) and yolk sac pigmented; melanophores extend onto finfold to form a wide postanal bar and a dorsal patch above gut

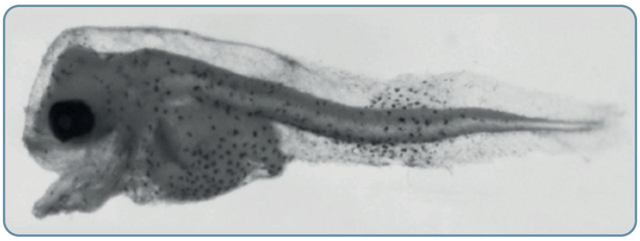
LARVAE — Figs. C-F

Body: relatively elongate and slender in early larvae, becomes considerably deep, especially in gut region, laterally compressed and ovoid with development
Head: moderately large
Eye: round, begins migration to left side of body in larvae of about 8.9 mm
Gut: spherical, coiled, extends beyond ventral margin of body
Preanus length: about 50% SL
Air bladder: present, disappears after metamorphosis
Spination: opercular spines and a ridge above eye from larvae 6.0 mm long
Pigmentation: body covered with melanophores (caudal region free of pigment in early larvae); body pigment extends onto dorsal and anal fins forming almost regular bands in later larvae
Length at flexion: unknown
Length at transformation: unknown

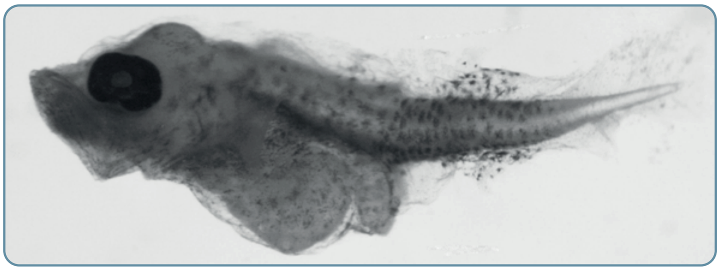
PHOTOS — by J.M. Rodriguez



2.8 mm SL



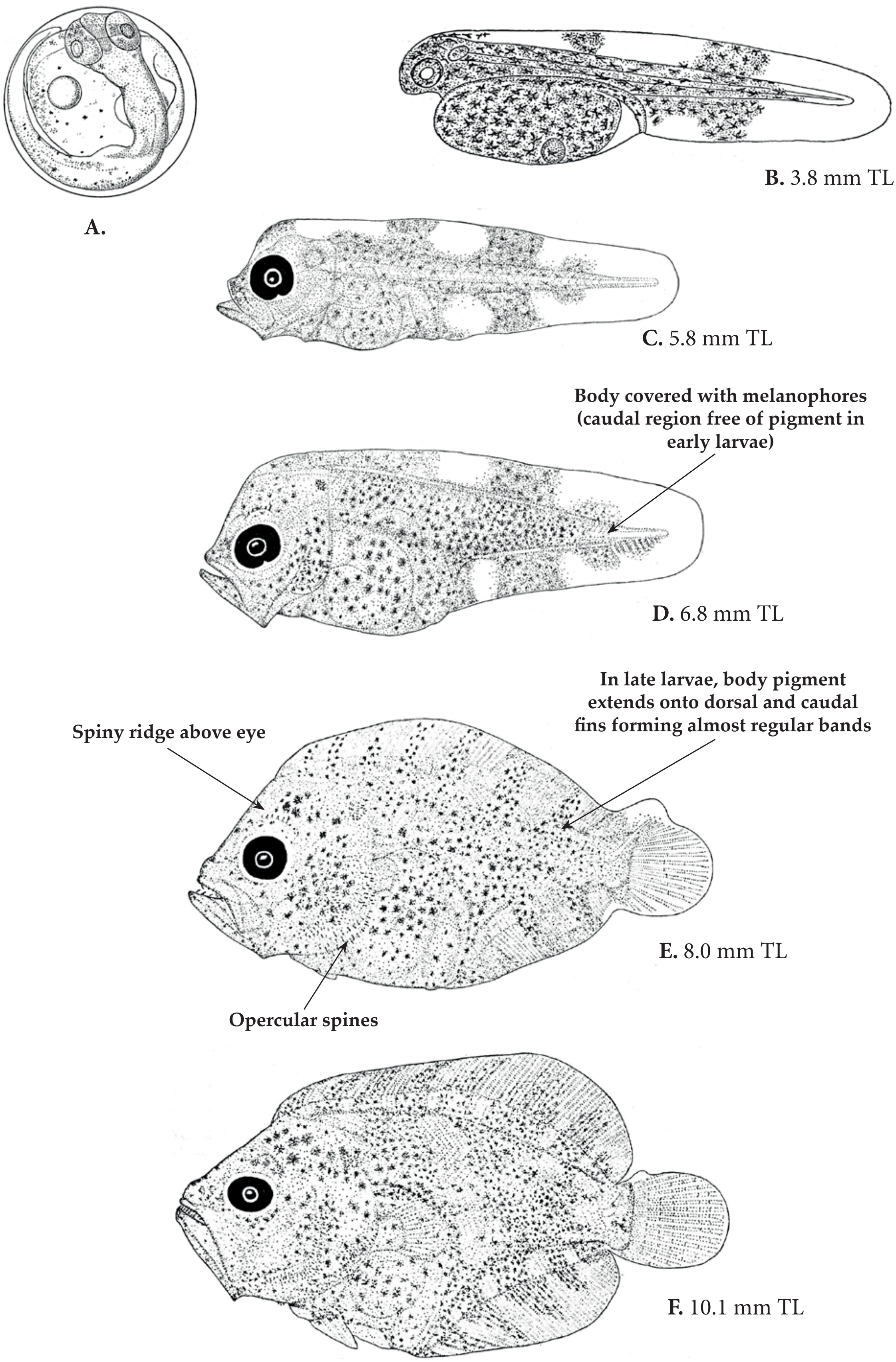
3.1 mm SL



4.1 mm SL

PLEURONECTIFORMES

Scophthalmus rhombus (Linnaeus, 1758)



Literature: Froese and Pauly (2022), Jones (1972), Padoa (1956c), Russell (1976)

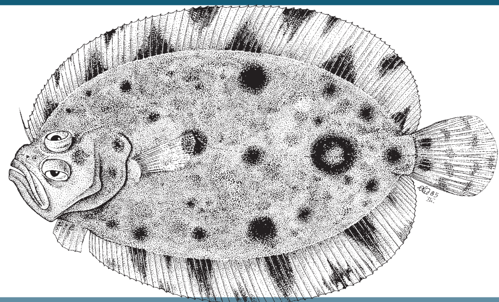
Illustrations' sources: A, B: Padoa (1956c); **C-F:** Jones (1972)

Zeugopterus regius (Bonnaterre, 1788)

Eckström's topknot

Habitat: neritic, demersal, between 0 and 180 m depth
Distribution: eastern Atlantic Ocean, from Morocco to the British Isles, and the Mediterranean Sea
Spawning season: May to August (British Isles)

Meristic characters
Myomeres: NA
Vertebrae: NA
Dorsal fin: 77
Anal fin: 66



EGGS

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.90-0.99 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: one; diam. 0.16-0.18 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE Fig. A

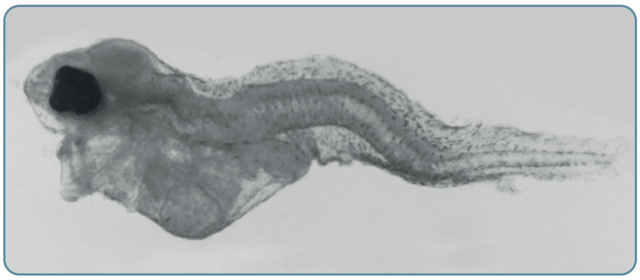
Hatch size: about 2.4 mm
Body: elongate and slender
Yolk sac: ovoid
Oil globule location: ventral, posterior in yolk sac
Anus: detached from yolk sac, reaches finfold border
Preanus length: > 50% SL
Pigmentation: body, yolk sac and finfold covered with small melanophores; oil globule pigmented

LARVAE Figs. B-E

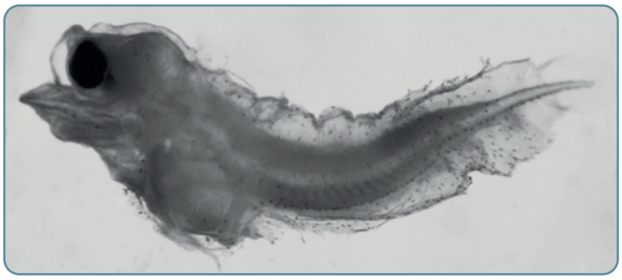
Body: relatively elongate and slender in early larvae, becomes relatively deep, especially in gut area, laterally compressed and ovoid with development
Head: relatively large; mouth relatively elongated in early larvae becomes almost vertical with development
Eye: round and relatively small;
Gut: triangular, coiled, extends beyond ventral margin of body
Preanus length: about 50% SL
Air bladder: absent
Spination: 2 large otocystic spines on each side of head
Pigmentation: body and fins covered with many small, uniformly distributed melanophores
Length at flexion: urostyle turned up at 8.0 mm
Length at transformation: unknown

PHOTOS

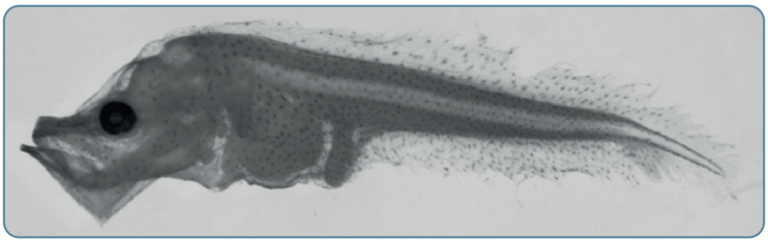
by J.M. Rodriguez



3.3 mm SL

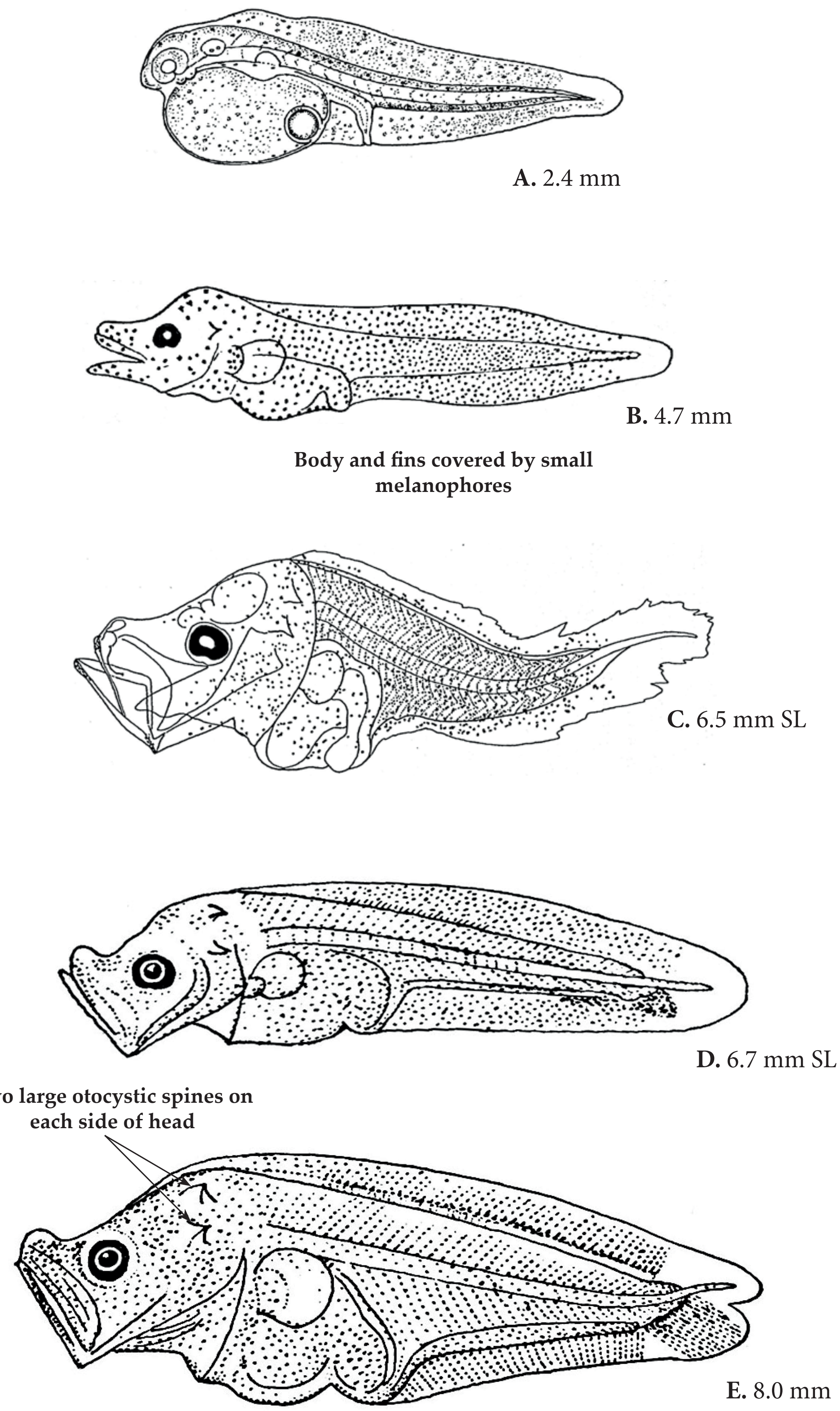


4.7 mm SL



6.7 mm SL

Zeugopterus regius (Bonnaterre, 1788)



Literature: Froese and Pauly (2022), Padoa (1956c), Russell (1976)

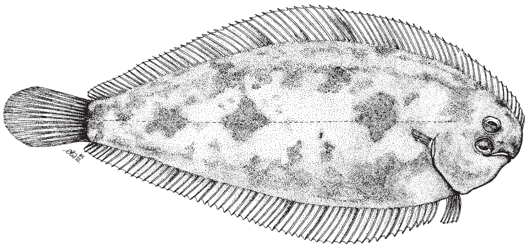
Illustrations' sources: A, D, E: Padoa (1956c); **B:** modified from Russell (1976); **C:** Sabatés (1988)

SOLEIDAE

Buglossidium luteum (Risso, 1810) — Solenette - Petite sole jaune

Habitat: neritic, upper slope, demersal, between 5 and 450 m depth
Distribution: eastern Atlantic Ocean, from Angola to Scotland, and the Mediterranean Sea
Spawning season: March to June (Bay of Biscay)

Meristic characters
Myomeres: 36-38
Vertebrae: 36-38
Dorsal fin: 65-78
Anal fin: 49-63



EGGS — Fig. A

Habitat: pelagic,
Shape: spherical
Chorion: smooth; diam. 0.64-0.94 mm
Perivitelline space: small
Yolk: segmented; pigmented
Oil globules: 12-15; unpigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

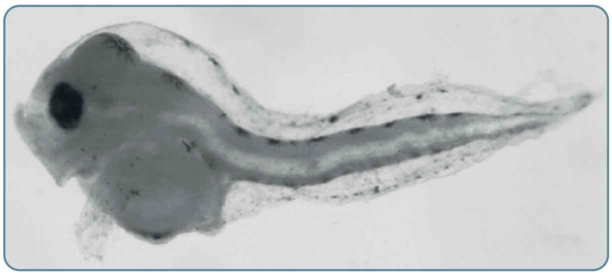
Hatch size: about 2.0 mm
Body: slender
Yolk sac: large, ovoid
Oil globule location: regularly distributed over yolk sac
Anus: close behind yolk sac, does not reach finfold border
Preanus length: about 42% SL
Pigmentation: melanophores irregularly distributed over body in recently hatched larvae; late yolk-sac larvae have 4 spots on dorsal and 1-2 on ventral body margins; some melanophores on primordial fin margins; yolk sac pigmented

LARVAE — Figs. C-F

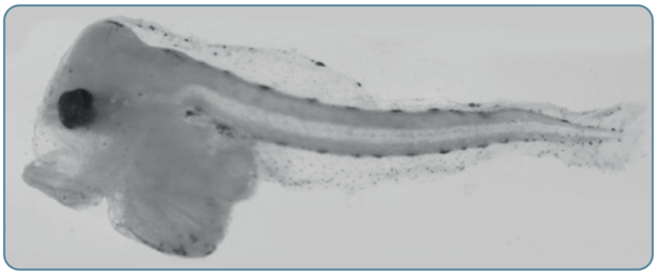
Body: initially elongated becomes short and laterally compressed with development
Head: moderately large; snout rounded
Eye: round; asymmetry begins at about 6.0 mm SL, almost completed at 8.0 mm SL
Gut: coiled, extends quite beyond ventral margin of body
Preanus length: < 50% SL
Air bladder: prominent

Spination: none
Pigmentation: evenly spaced melanophores along dorsal (9–13) and ventral (8–11) body contours; top of head, ventral abdominal region, air bladder and pectoral fins pigmented
Length at flexion: unknown
Length at transformation: probably completed at about 10.0 mm

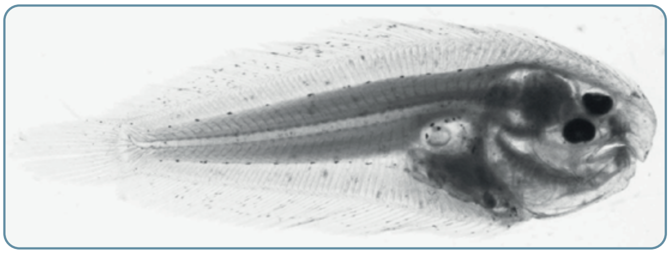
PHOTOS — by J.M. Rodriguez



2.7 mm SL



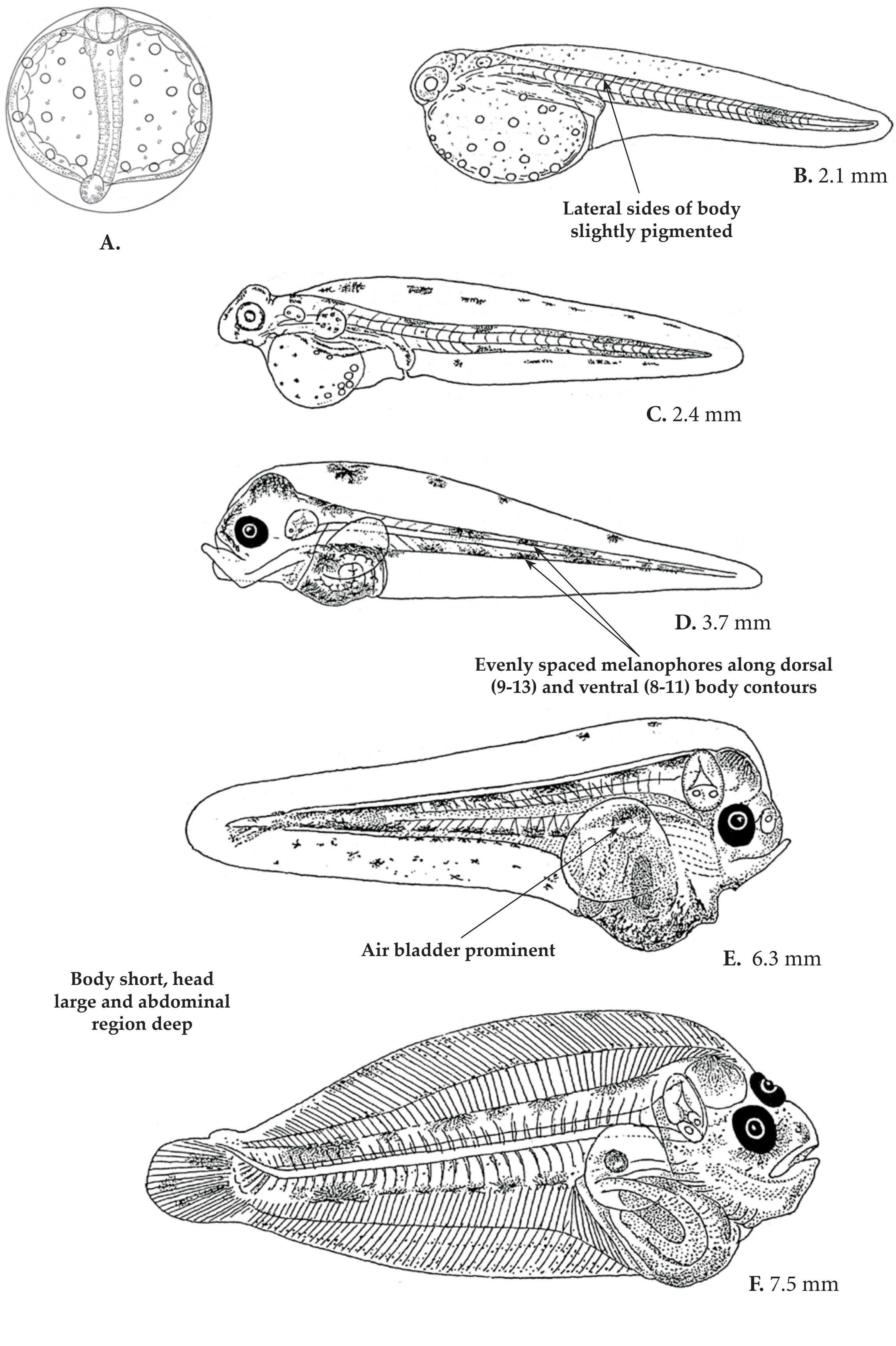
3.5 mm SL



7.4 mm SL

PLEURONECTIFORMES

Buglossidium luteum (Risso, 1810)



Literature: Munk and Nielsen (2005), Padoa (1956o), Quero *et al.* (1986b), Russell (1976)

Illustrations' sources: A-F: Padoa (1956o)

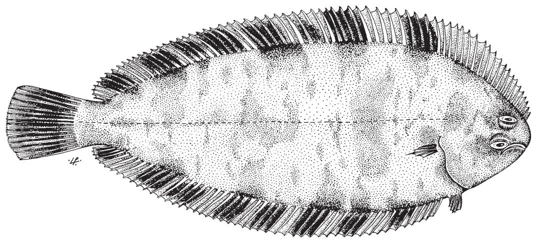
SOLEIDAE

Microchirus variegatus (Donovan, 1808)

Thickback sole - Sole-pedrix commune

Habitat: neritic and slope, demersal, between 80 and 400 m depth
Distribution: eastern Atlantic Ocean, from Senegal to the British Isles, and the Mediterranean Sea
Spawning season: Spring (Mediterranean Sea)

Meristic characters
Myomeres: 36-40
Vertebrae: 36-40
Dorsal fin: 63-80
Anal fin: 47-64



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 1.16-1.42 mm
Perivitelline space: small
Yolk: segmented; pigmented
Oil globules: 30-50 of different sizes; unpigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

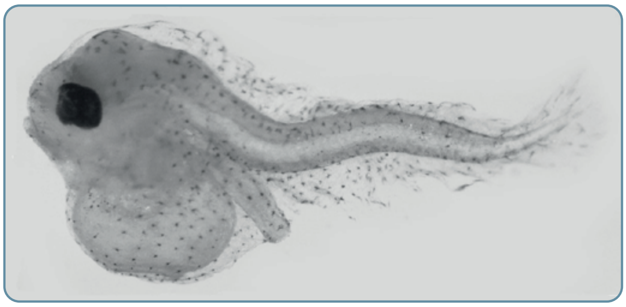
Hatch size: about 2.5 mm
Body: relatively elongate and slender
Yolk sac: large, rounded
Oil globule location: regularly distributed over yolk sac
Anus: close behind yolk sac, reaches finfold border
Preanus length: < 50% SL
Pigmentation: body, primordial fin and yolk sac covered with small, stellate melanophores; rows of stellate melanophores along dorsal and ventral margins of primordial fin

LARVAE — Figs. C-F

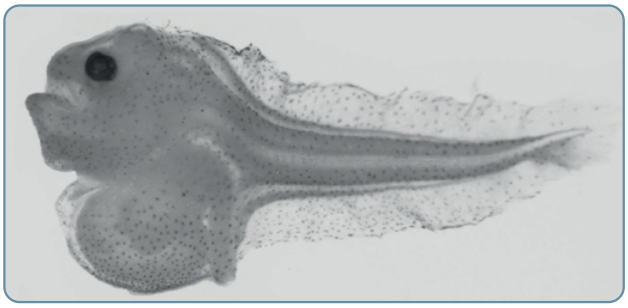
Body: short with a prominent head and deep abdominal region
Head: moderately large and rounded; mouth small and oblique
Eye: round and small
Gut: spherical, tightly coiled, extends far beyond ventral margin of body
Preanus length: about 50% SL
Air bladder: absent
Spination: none
Pigmentation: body and fins covered with small stellate or simple rather evenly spaced melanophores; dorsal (about 70) and ventral (about 50) rows of relatively large melanophores along body contours, these melanophores are larger and tend to merge and form continuous rows in late larvae
Length at flexion: unknown
Length at transformation: 9.0-12.0 mm

PHOTOS

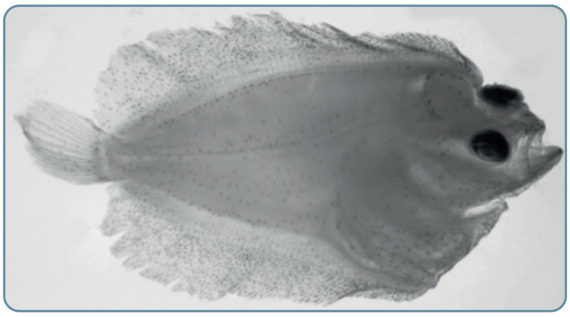
by J.M. Rodriguez



3.0 mm SL



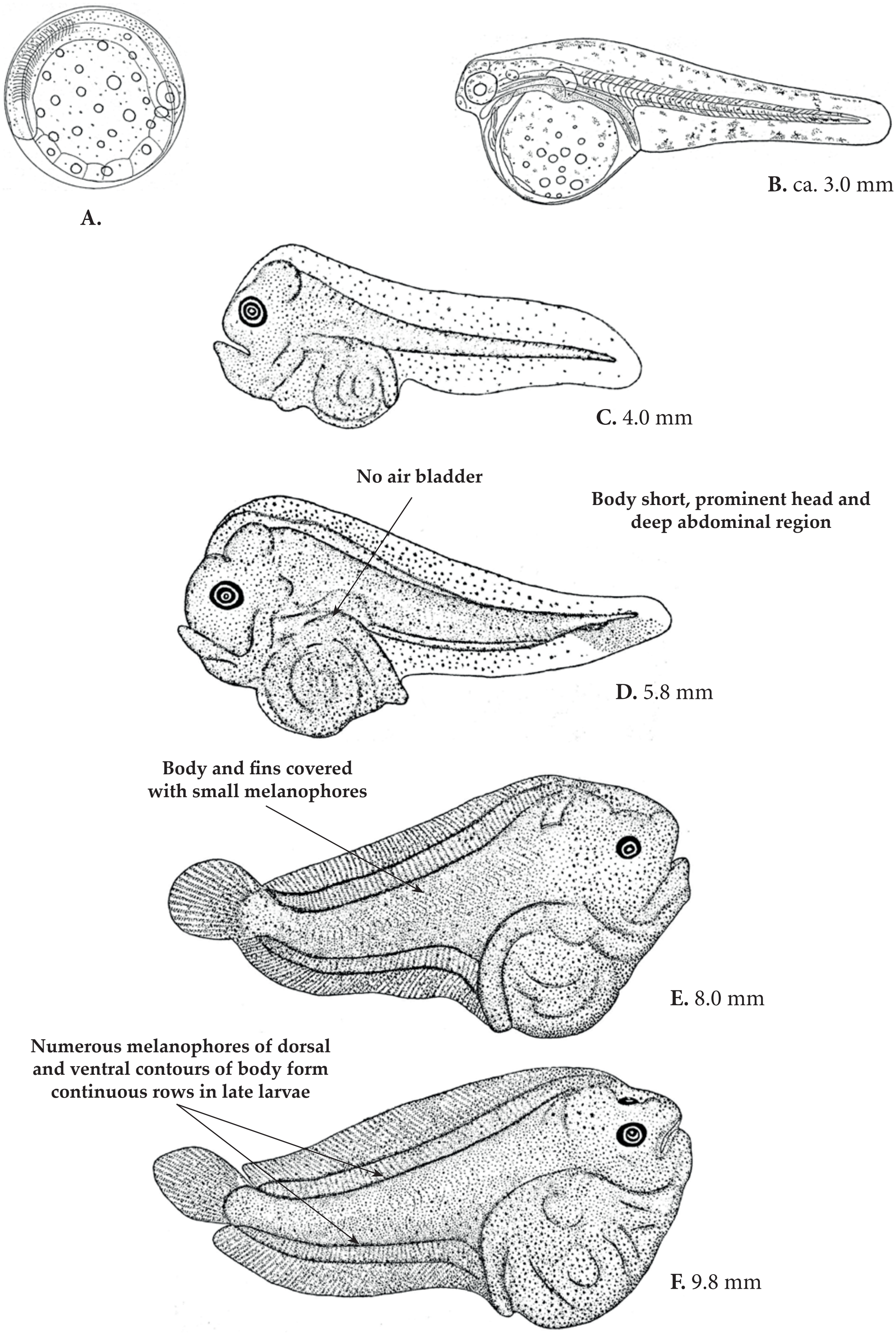
5.1 mm SL



7.5 mm SL

PLEURONECTIFORMES

Microchirus variegatus (Donovan, 1808)



Literature: Nichols (1976), (Padoa (1956o), Quero *et al.* (1986b), Russell (1976)

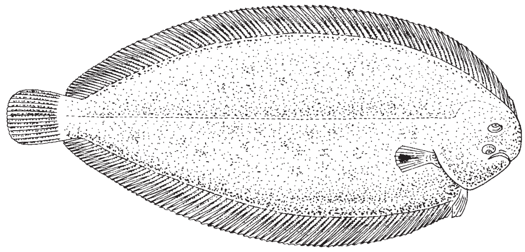
Illustrations' sources: A, B: Padoa (1956o); **C-F:** Nichols (1976)

Pegusa lascaris (Risso, 1810)

Sand sole - Sole-pole

Habitat: neritic and upper slope, demersal, between 0 and 350 m depth
Distribution: eastern Atlantic Ocean, from South Africa to the North Sea, and the Mediterranean Sea
Spawning season: May to September (Atlantic Iberian peninsula)

Meristic characters
Myomeres: 45-47
Vertebrae: 45-47
Dorsal fin: 70-90
Anal fin: 58-75



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 1.28-1.38 mm
Perivitelline space: small
Yolk: segmented; may be slightly pigmented
Oil globules: up to 50 or more
Colour: transparent

YOLK–SAC LARVAE — Fig. B

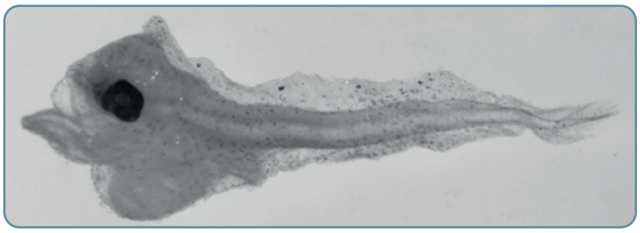
Hatch size: < 4.0 mm
Body: relatively elongate and slender; dorsal finfold extends well over head (larva with a hooded appearance); air bladder visible in late yolk-sac larvae
Yolk sac: ovoid
Oil globules location: some in small groups, some scattered over yolk sac
Anus: slightly detached from yolk sac, reaches finfold border
Preanus length: < 50% SL
Pigmentation: irregularly scattered melanophores over head, body and finfold in early yolk-sac larvae; melanophores aggregated over body and finfold forming a postanal band in late yolk-sac larvae; scattered melanophores on yolk sac

LARVAE — Figs. C-F

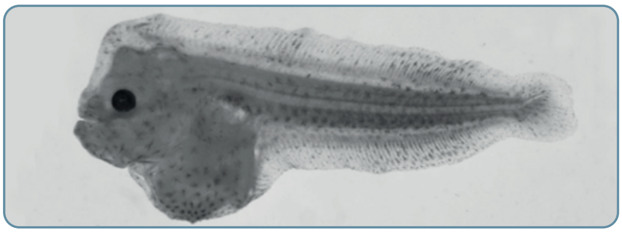
Body: relatively short with deep abdominal region; laterally compressed; dorsal finfold extends well over head (larva with a hooded appearance) in early larvae
Head: moderately large; mouth small; lower jaw protruding
Eye: round and small
Gut: spherical, coiled, extends far beyond ventral margin of body
Preanus length: about 45% SL
Air bladder: prominent since early larvae
Spination: none
Pigmentation: similar to yolk–sac larvae in early larvae; melanophores form an anterior band on dorsal fin, above anus in late larvae; pigmentation increases through development; air bladder pigmented
Length at flexion: begins at about 7.5 mm
Length at transformation: unknown

PHOTOS

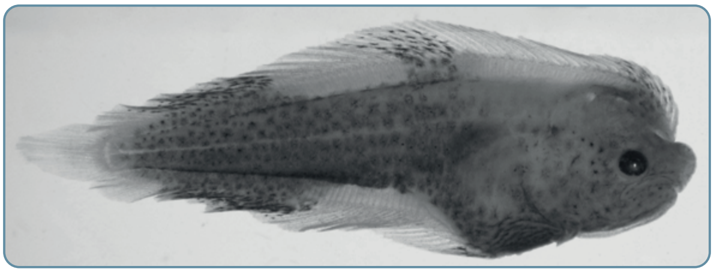
by J.M. Rodriguez



not sized

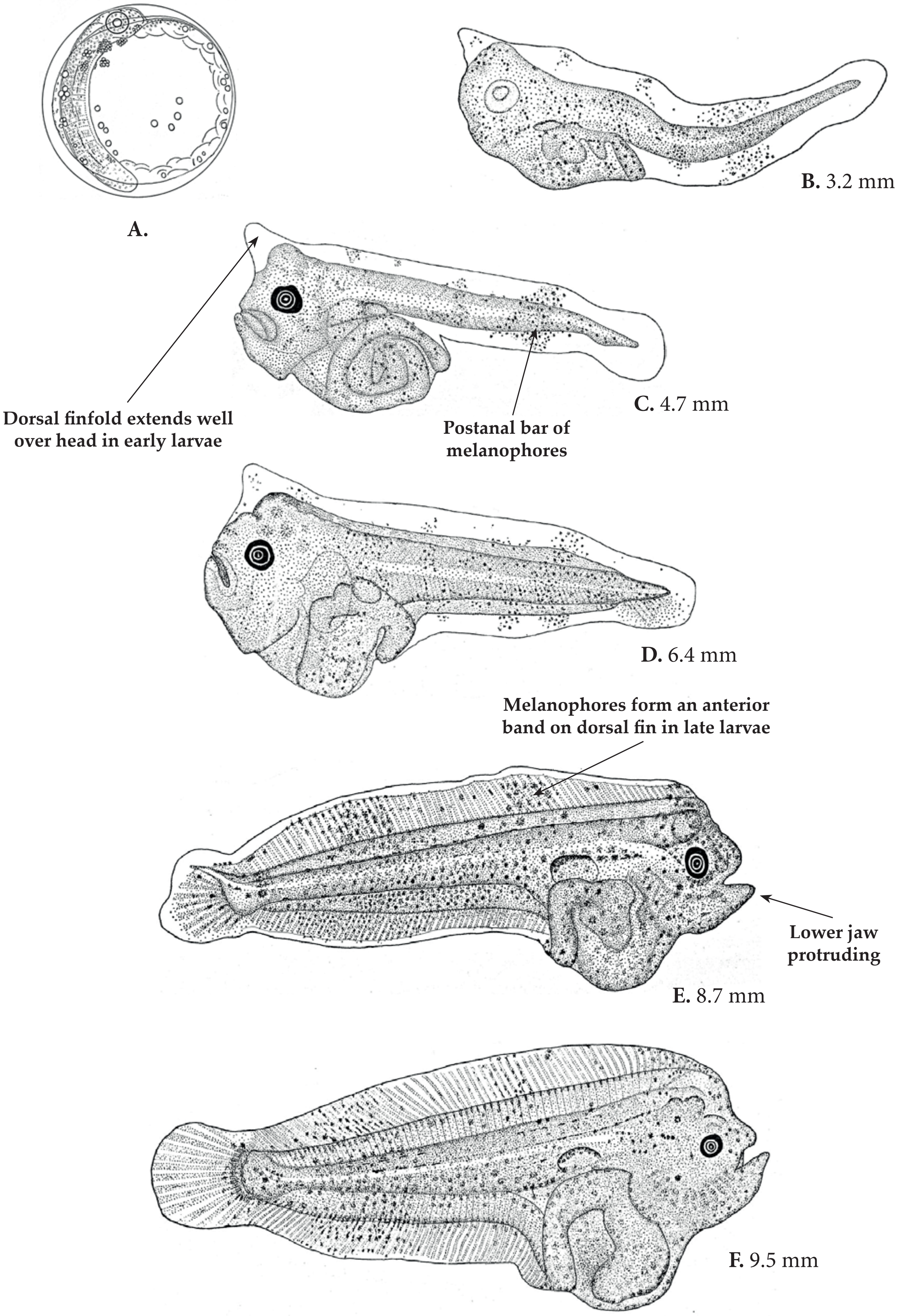


7.1 mm SL



8.8 mm SL

Pegusa lascaris (Risso, 1810)



Literature: Froese and Pauly (2022), Nichols (1976), Padoa (1956o), Quero *et al.* (1986b), Russell (1976)

Illustrations' sources: A: Padoa (1956o); **B-F:** Nichols (1976)

SOLEIDAE

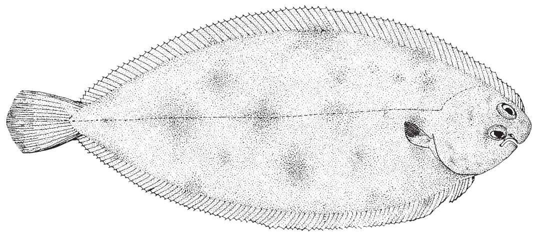
PLEURONECTIFORMES

Solea solea (Linnaeus, 1758)

Common sole - Sole commu

Habitat: neritic, demersal, between 0 and 150 m depth
Distribution: eastern Atlantic Ocean, from Senegal to the North Sea, and the Mediterranean Sea
Spawning season: January to April (Mediterranean Sea)

Meristic characters
Myomeres: 46-52
Vertebrae: 46-52
Dorsal fin: 69-97
Anal fin: 53-79



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.95-1.58 mm
Perivitelline space: small
Yolk: segmented; pigmented
Oil globules: many, small, aggregated in clusters; unpigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

Hatch size: 2.5-3.8 mm
Body: relatively elongate and slender
Yolk sac: spherical and large
Oil globule location: in clusters on dorsal and posterior periphery of yolk sac
Anus: slightly detached from yolk sac, reaches finfold border
Preanus length: 50% SL
Pigmentation: body (except caudal region), primordial fin and yolk sac covered with small branched melanophores; rows of melanophores along dorsal body contour (9-14), extending from head to caudal region and along ventral body contour (4-12), extending from abdominal region to caudal region

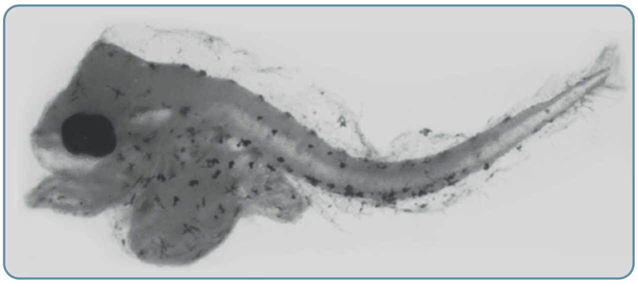
LARVAE — Figs. C-F

Body: short with deep abdominal region
Head: moderately large
Eye: round and small
Gut: spherical, coiled, extends far beyond ventral margin of body
Preanus length: about 50% SL
Air bladder: visible in larvae > 4.0 mm SL
Spination: none

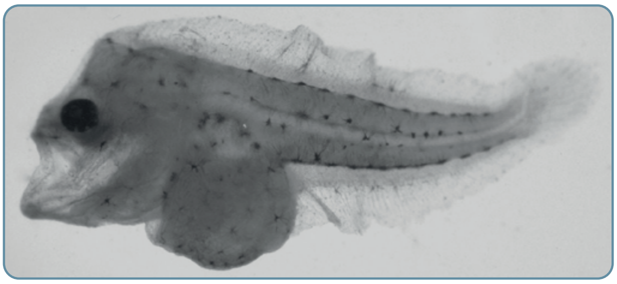
Pigmentation: similar to yolk–sac larvae in early larvae; body covered with large stellate melanophores; dorsal and ventral rows of melanophores almost forming an unbroken line of pigment in late larvae
Length at flexion: unknown
Length at transformation: 7.0-9.5 mm

PHOTOS

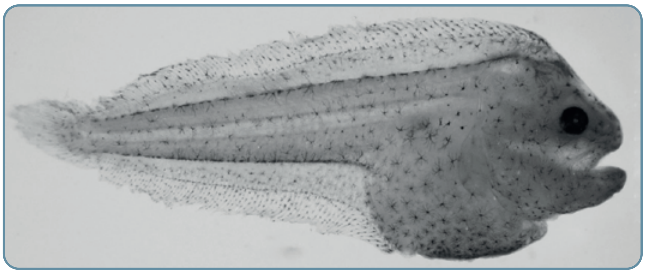
by J.M. Rodriguez



3.6 mm SL



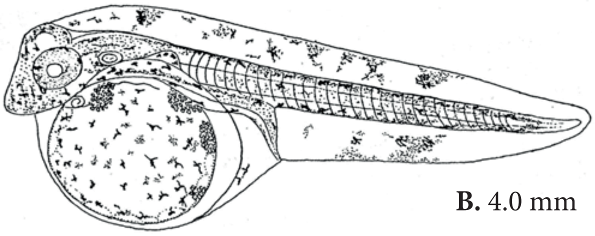
4.5 mm SL



7.3 mm SL

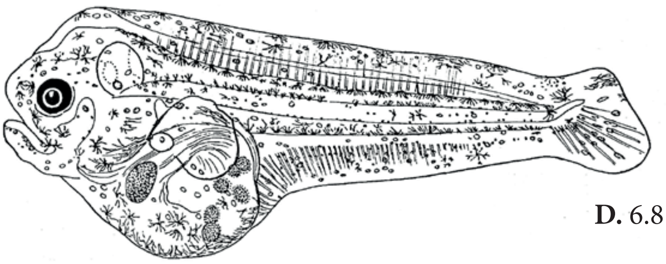
Solea solea (Linnaeus, 1758)

A.



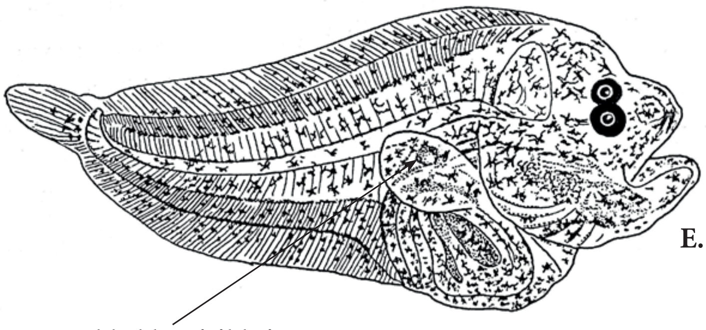
B. 4.0 mm

C. 4.2 mm



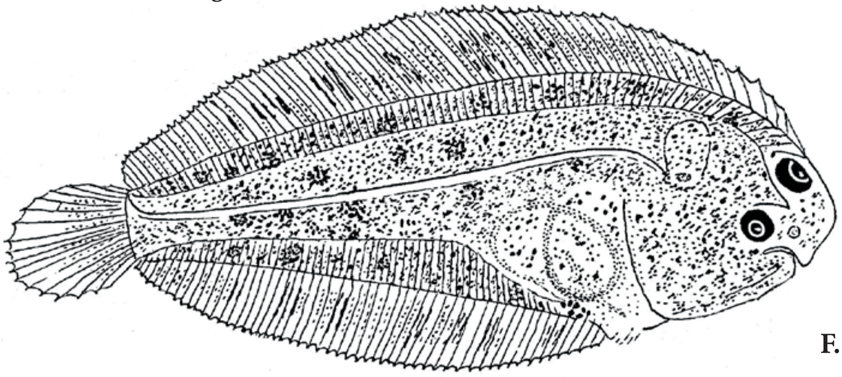
D. 6.8 mm

Body covered with large stellate melanophores



E. 7.5 mm

Gas bladder visible in larvae longer than 6-7 mm



F. 13.0 mm

Literature: Nichols (1976), Padoa (1956o), Quero *et al.* (1986b), Russell (1976)

Illustrations' sources: A-F: Padoa (1956o)

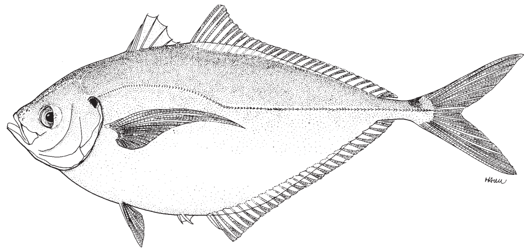
CARANGIDAE

Chloroscombrus chrysurus (Linnaeus, 1766)

Atlantic bumper - Sepater

Habitat: neritic, benthopelagic, between 0 and 110 m depth
Distribution: Atlantic Ocean (some records from the Mediterranean Sea). Eastern Atlantic, from Angola to Spain
Spawning season: probably summer (Gulf of Mexico)

Meristic characters
Myomeres: 24
Vertebrae: 24
1st dorsal fin: VIII
2nd dorsal fin: I + 25-28
1st anal fin: II
2nd anal fin: I + 25-28



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

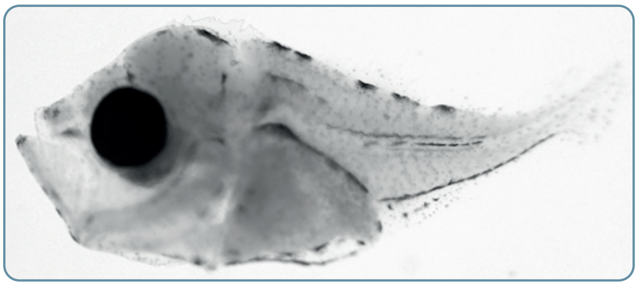
Figs. A-G

Body: moderately deep
Head: moderately large, snout moderately pointed; mouth oblique reaches anterior part of eye
Eye: round and relatively large
Gut: triangular
Preanus length: > 50% SL
Air bladder: present
Spination: supraoccipital crest appears at 1.8 mm SL; preopercular spines present, with a prominent spine at preopercle angle; a small supraocular spine on a weak ridge; tiny post-temporal and supracleithral spines

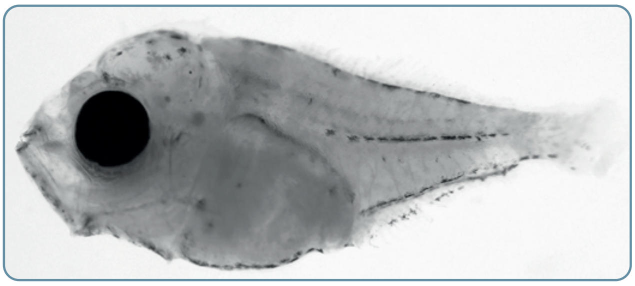
Pigmentation: early larvae, 3-4 dorsal melanophores over trunk; a melanophore on top of head; tips of jaws, peritoneum and dorsal surface of air bladder pigmented; a melanophore at angle of lower jaw; melanophores anterior to cleithral symphysis and on ventral surface of gut; row of postanal ventral melanophores; short series of melanophores on lateral midline (absent in very early larvae); late larvae, pigmentation increases with development extending over most of body; ventrolateral melanophores aligned with myosepta
Length at flexion: 4.0-5.0 mm SL
Length at transformation: 10.0-15.0 mm SL

PHOTOS

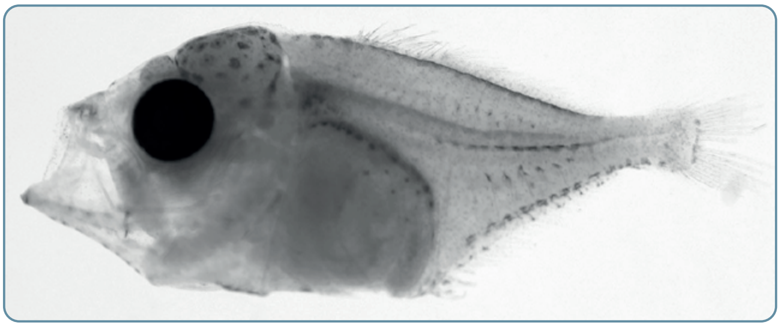
by S. Isari



3.2 mm SL



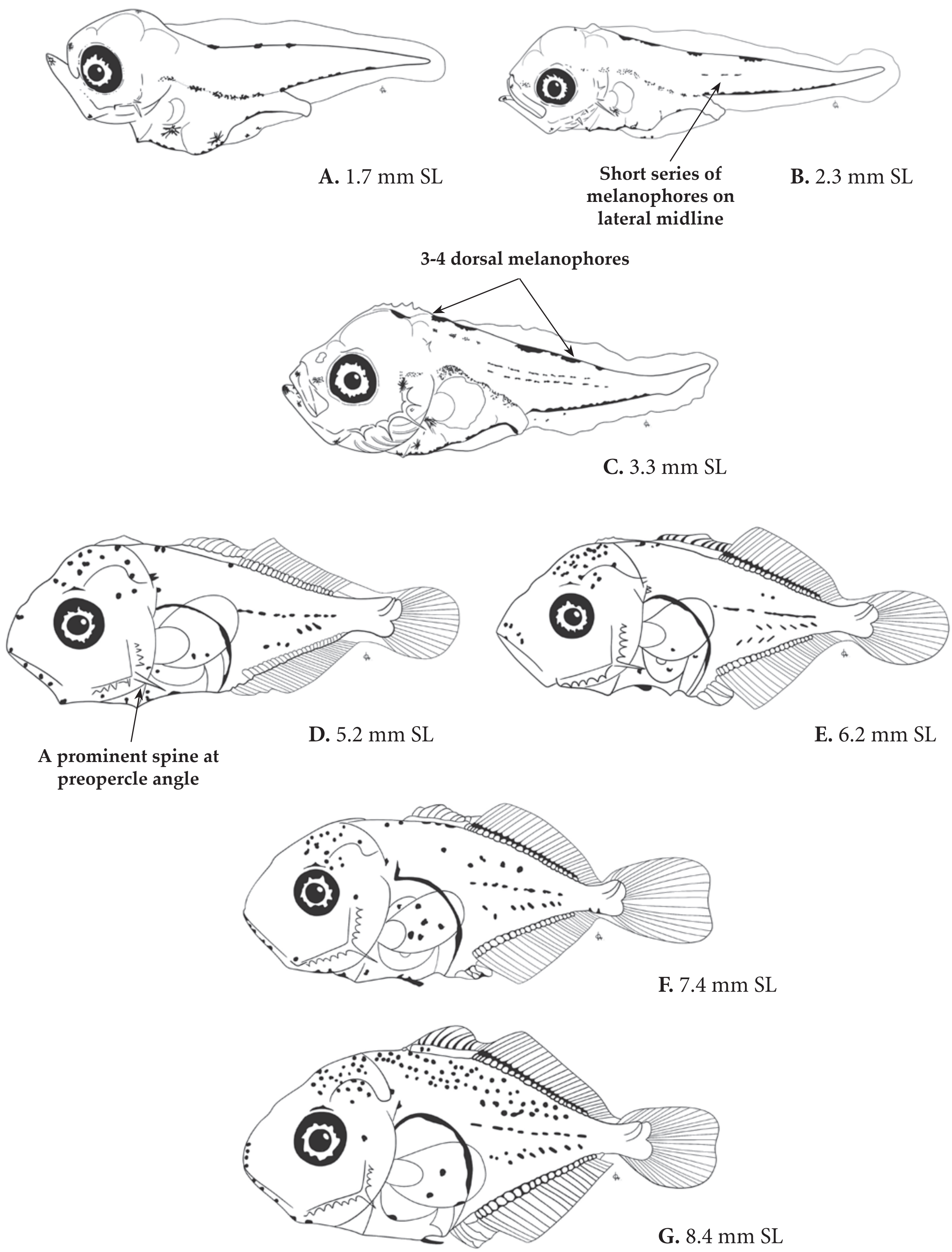
4.9 mm SL



7.1 mm SL

CARANGIFORMES

Chloroscombrus chrysurus (Linnaeus, 1766)



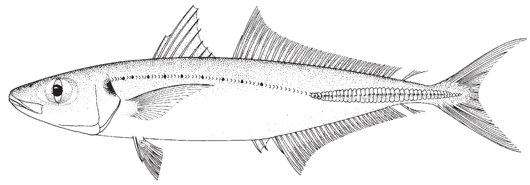
Literature: Aboussouan (1968), Fahay (2007), Laroche *et al.* (2006), Sanchez-Ramirez and Flores Coto (1993), Smith-Vaniz *et al.* (1990)

Illustrations' sources: A-G: L. Rodríguez (**A-C:** redrawn from Laroche *et al.*, 2006; **D-G:** redrawn from Sánchez-Ramírez and Flores-Coto, 1993)

Decapterus punctatus Cuvier, 1829 — Round scad - Comète quiaquia

Habitat: neritic, benthopelagic, between 0 and 100 m depth
Distribution: Atlantic Ocean. Eastern Atlantic, from South Africa to Morocco (unconfirmed records from the Mediterranean Sea)
Spawning season: year-round (western Atlantic Ocean)

Meristic characters
Myomeres: 25
Vertebrae: 25
1st dorsal fin: VIII
2nd dorsal fin: I + 30-34
1st anal fin: II
2nd anal fin: I + 26-29



EGGS

Undescribed

YOLK–SAC LARVAE

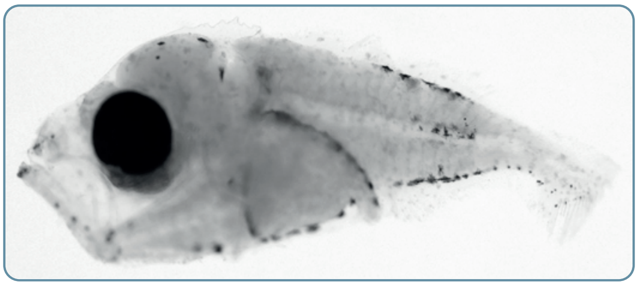
Undescribed

LARVAE — Figs. A-E

Body: deep in early larvae, becomes shallower with development
Head: large, deep, and relatively pointed; snout relatively concave in early larvae, becomes straight with development; mouth oblique
Eye: round and large, increases in relative size with development
Gut: triangular
Preanus length: around 50% SL
Air bladder: absent

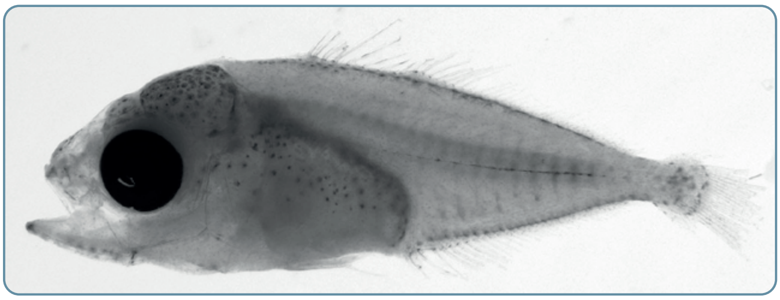
Spination: an orbital and a prominent supraoccipital crest; preopercular spines present, with a long spine at preopercle angle
Pigmentation: light pigmentation over most of body until late postflexion; a few melanophores on top of head and jaws, infrequently on snout and cheeks; parallel rows of melanophores along bases of dorsal and anal fins; row of melanophores along midline of tail; peritoneum pigmented
Length at flexion: 4.0-6.0 mm SL
Length at transformation: about 9.0-15.0 mm SL

PHOTOS — by S. Isari



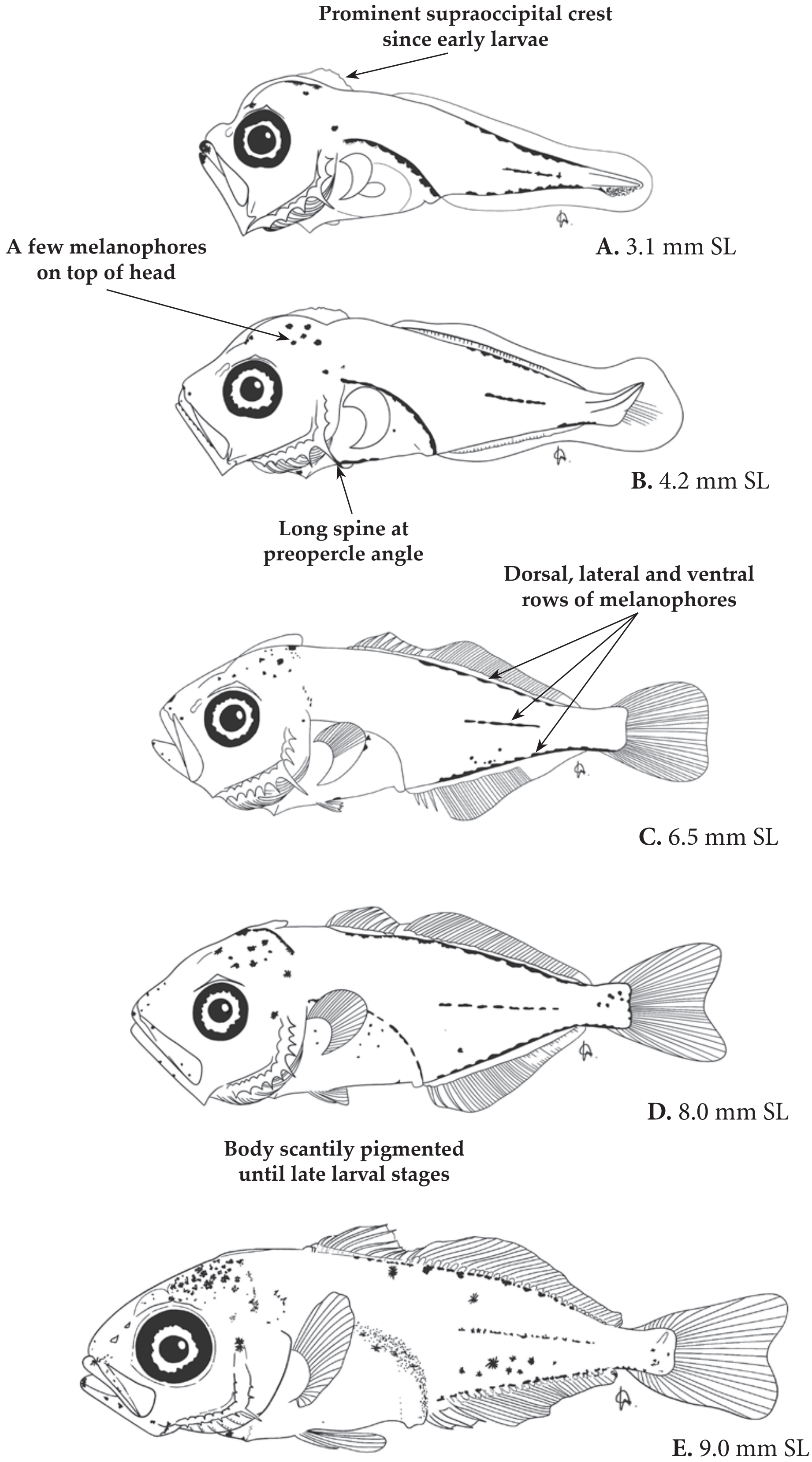
3.8 mm SL

6.2 mm SL



10.8 mm SL

Decapterus punctatus Cuvier, 1829



Literature: Aprieto (1974), Fahay (2007), Laroche *et al.* (2006), Olivar and Fortuño (1991), Sánchez-Ramírez and Flores-Coto, (1993), Smith–Vaniz (1986), Smith-Vaniz *et al.* (1990)

Illustrations' sources: A-E: L. Rodríguez (**A-D:** redrawn from Aprieto, 1974; **E:** redrawn from Laroche *et al.*, 2006)

CARANGIDAE

Selene setapinnis (Mitchill, 1815)

Atlantic moonfish - Musso atlantique

Habitat: neritic, inshore, between 0 and 50 m depth

Distribution: western Atlantic Ocean. Replaced by *S. dorsalis** in the Eastern Atlantic Ocean, from South Africa to Morocco

Spawning season: unknown

Meristic characters

Myomeres: 24

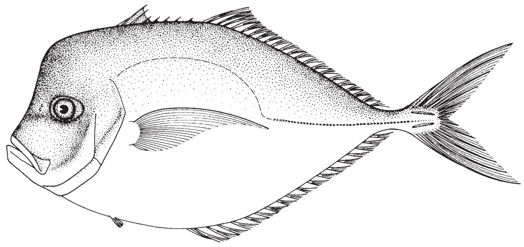
Vertebrae: 24

1st dorsal fin: VIII

2nd dorsal fin: I + 21-24

1st anal fin: II

2nd anal fin: I + 16-19



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

Figs. A-F

Body: moderately deep during preflexion stage, increases with development to 72.4% SL in postflexion stage; dorsal-fin spines and pelvic fin very long

Head: moderately large, stout, rounded, increases in length with development; snout relatively concave in early larvae; mouth small and oblique

Eye: round and relatively small

Gut: triangular

Preanus length: decreases from about 51-57% SL in preflexion larvae to 49.6% SL in postflexion larvae

Air bladder: present

Spination: supraoccipital crest precocious and small, disappears in larvae ≥ 5.25 mm SL; low supraocular ridge with a simple spine; 5-11 preopercular spines, with spine at angle slightly longer; single, small post-temporal spine; single, small supracleithral spine present in larvae ≥ 4.0 mm SL

Pigmentation: relatively scant in all larval stages; early larvae, head generally unpigmented; a postanal, ventral row of melanophores, which disappears in late larvae; pigment on dorso-lateral part of body consists of scattered spots on nape and under first and second dorsal fins; peritoneum and air bladder pigmented; pelvic fins and first dorsal-fin membrane pigmented from 3.4 mm SL; first dorsal-fin rays pigmented by 4.25 mm SL

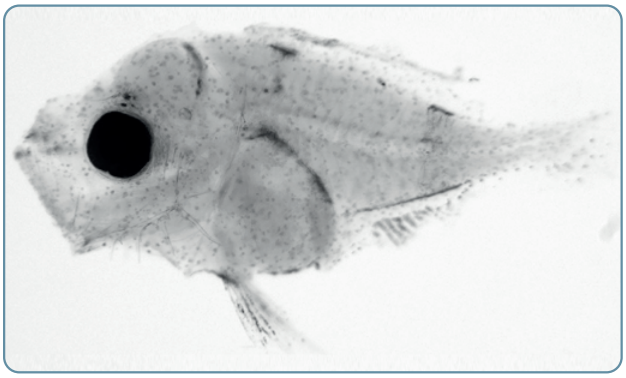
Length at flexion: about 4.3-6.3 mm SL

Length at transformation: about 11.0 mm SL

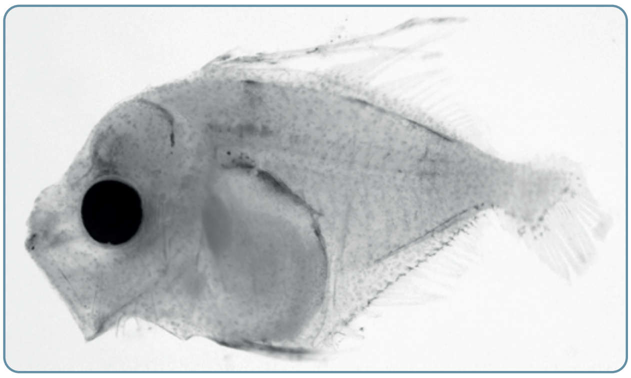
**S. setapinnis* was cited for Mauritania by Maigret and Ly (1986). *S. setapinnis* and *S. dorsalis* have not been adequately studied and may prove to be conspecific (Maigret and Ly, 1986).

PHOTOS

by S. Isari



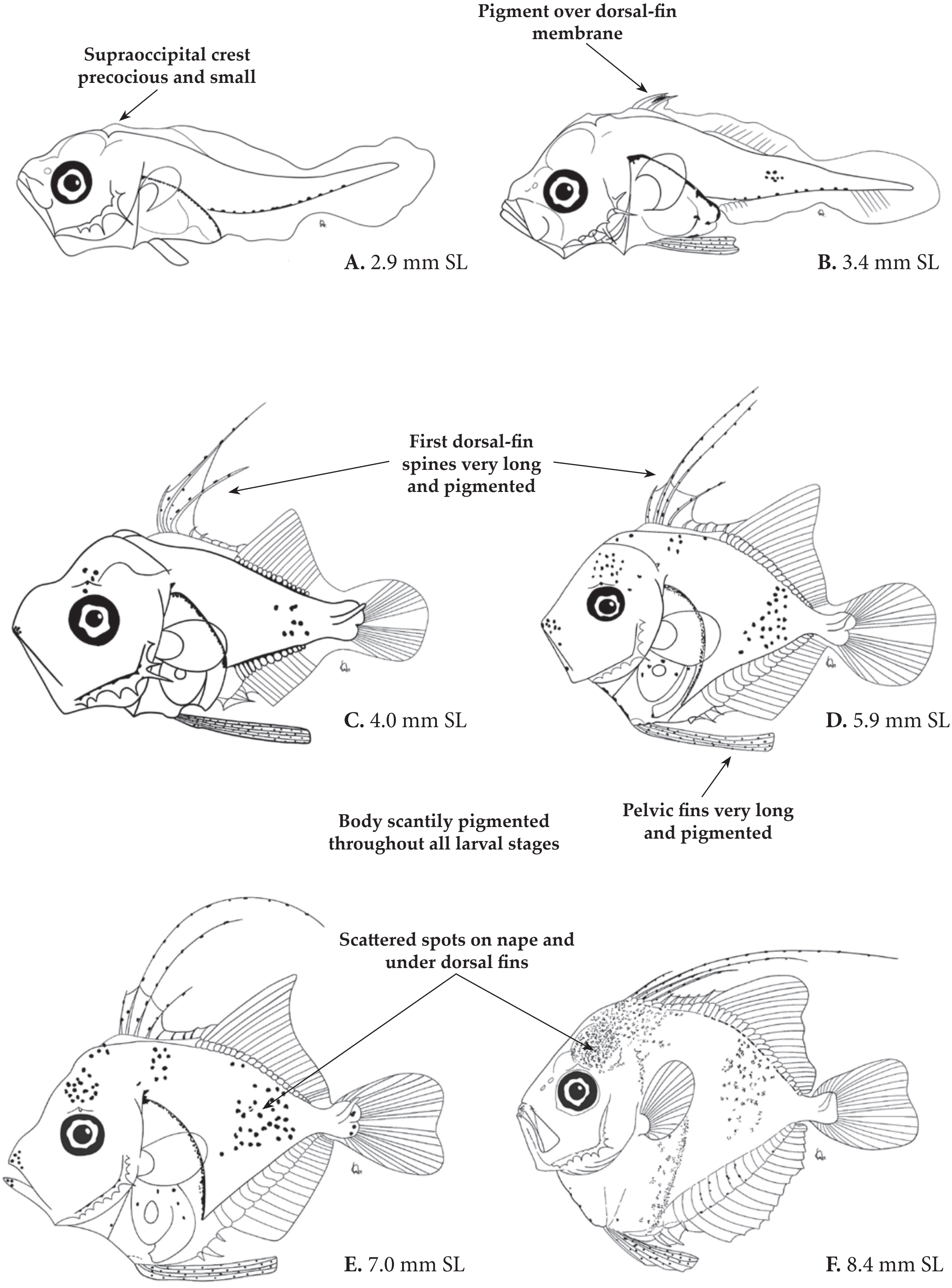
3.9 mm SL



4.7 mm SL

CARANGIFORMES

Selene setapinnis (Mitchill, 1815)



Literature: Aboussouan (1975), Fahay (2007), Froese and Pauly (2022), Katsuragawa (1997), Laroche *et al.* (2006), Sánchez-Ramírez and Flores-Coto, (1993)

Illustrations' sources: A-F: L. Rodríguez (**A, B:** redrawn from Katsuragawa, 1997; **C-E:** redrawn from Sanchez-Ramirez and Flores-Coto, 1993; **F:** redrawn from Laroche *et al.*, 2006)

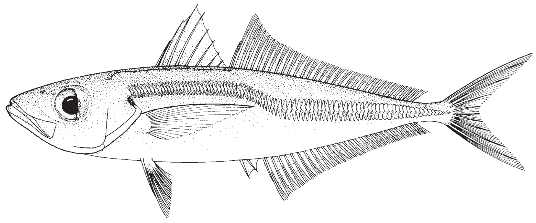
CARANGIDAE

Trachurus mediterraneus (Steindachner, 1868)

Mediterranean horse mackerel
Chinchard à queue jaune

Habitat: neritic and upper slope, benthopelagic, between 40 and 500 m depth
Distribution: eastern Atlantic Ocean, from Mauritania to the Bay of Biscay, and the Mediterranean Sea
Spawning season: spring and summer

Meristic characters
Myomeres: 24
Vertebrae: 24
1st dorsal fin: VIII
2nd dorsal fin: I + 29-35
1st anal fin: II
2nd anal fin: I + 26-39



EGGS

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 1.00-1.04 mm
Perivitelline space: small
Yolk: segmented; unpigmented
Oil globules: one; diam. 0.24 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. A

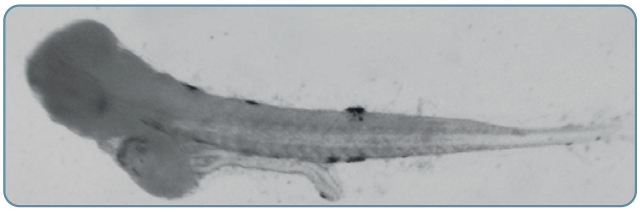
Hatch size: may be about 2.0 mm
Body: relatively slender
Yolk sac: large, ovoid, projected a little beyond snout
Oil globule location: at anterior end of yolk sac
Anus: detached from yolk sac, reaches finfold border
Preanus length: around 50% SL
Pigmentation: 3-4 dorsal, preanal melanophores, some along ventral profile of trunk and tail; oil globule pigmented; finfold unpigmented

LARVAE — Figs. B-F

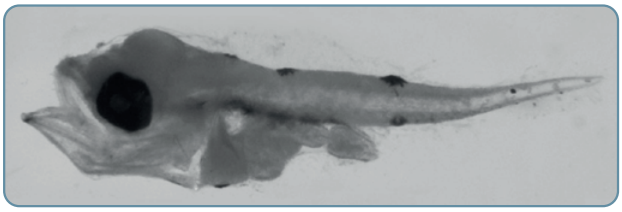
Body: relatively slender in early larvae, gradually deepens and tapers to relatively narrow caudal peduncle; very similar to *Trachurus trachurus* (differences between the two species mainly lie on pigmentation patterns)
Head: large, moderately pointed; mouth oblique
Eye: round and relatively large
Gut: triangular
Preanus length: about 50% SL
Air bladder: present
Spination: an occipital crest and two series of preopercular spines
Pigmentation: 3-4 large preanal, dorsal melanophores; peritoneal region pigmented; a melanophore over terminal gut; a postanal row of dotted melanophores; during development, melanophores appear over lateral body walls, over head, dorsum of tail, under gut and lower jaw; air bladder pigmented
Length at flexion: almost completed at 4.8 mm SL
Length at transformation: unknown

PHOTOS

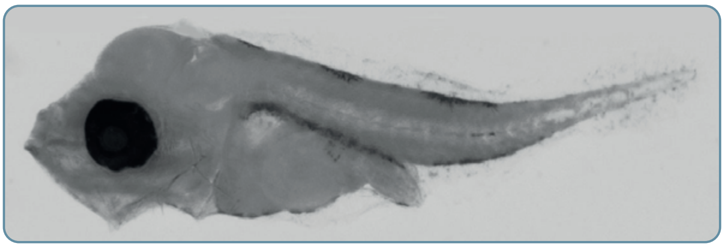
by J.M. Rodriguez



2.0 mm SL



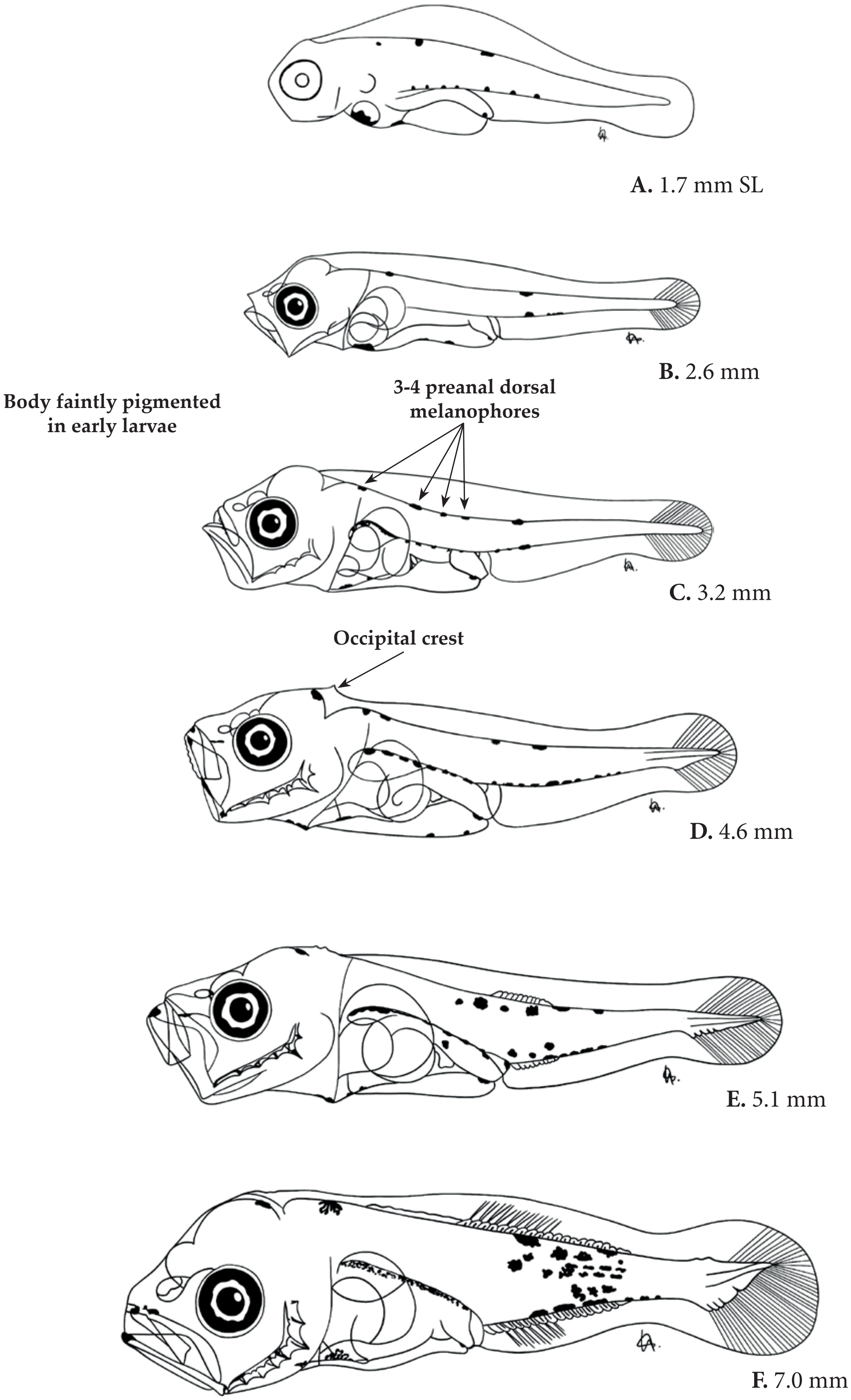
3.0 mm SL



3.1 mm SL

CARANGIFORMES

Trachurus mediterraneus (Steindachner, 1868)



Literature: Alemany (1997), Demir (1961), Froese and Pauly (2022), Padoa (1956f), Sabatés (1988), Smith–Vaniz (1986)

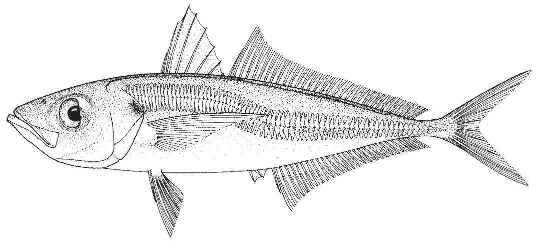
Illustrations' sources: A-F: L. Rodríguez (**A:** redrawn from Alemany, 1997; **B-F:** redrawn from Demir, 1961)

CARANGIDAE

Trachurus trachurus (Linnaeus, 1758) Atlantic horse mackerel – Chinchard d'Europe

Habitat: neritic, benthopelagic, between 40 and 500 m depth (usually 100-200 m depth)
Distribution: eastern Atlantic Ocean, from Cape Verde to Norway, and the Mediterranean Sea
Spawning season: probably all year-round

Meristic characters
Myomeres: 24
Vertebrae: 24
1st dorsal fin: VIII
2nd dorsal fin: I +29-33
1st anal fin: II
2nd anal fin: I + 24-29



EGGS Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.81-1.04 mm
Perivitelline space: small
Yolk: segmented; unpigmented
Oil globules: one; diam. 0.19-0.23 mm; pigmented
Colour: transparent

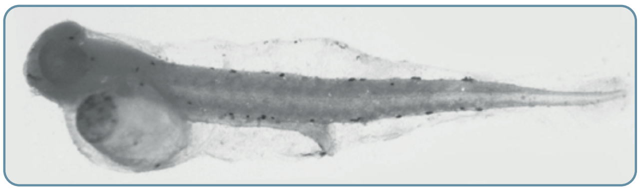
YOLK–SAC LARVAE Fig. B

Hatch size: about 2.2 mm
Body: relatively elongate and slender
Yolk sac: ovoid, projected beyond snout
Oil globule location: at anterior end of yolk sac
Anus: detached from yolk sac, reaches finfold border
Preanus length: > 50% SL
Pigmentation: melanophores are irregularly spread over body, except in caudal region; melanophores on dorsal finfold; oil globule pigmented

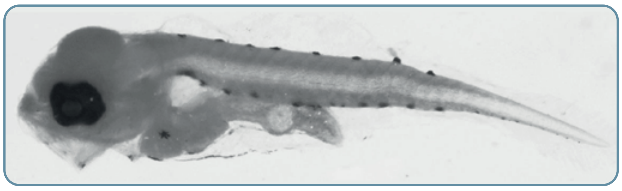
LARVAE Figs. C-H

Body: relatively elongate in early larvae, gradually deepens and tapers to narrow caudal peduncle; very similar to *T. mediterraneus* (differences between two species mainly lie on pigmentation patterns)
Head: large, snout moderately pointed; mouth oblique
Eye: round and relatively large
Gut: triangular
Preanus length: > 50% SL
Air bladder: present
Spination: an occipital crest and two series of preopercular spines with spine at angle in outer series longer
Pigmentation: dorsal and ventral body rows of melanophores; dorsal row of about 10 melanophores, ends at about mid tail; ventral row consists of 4-5 large postanal melanophores, followed by small melanophores extending to nearly notochord end; melanophores on lower jaw, ventral surface of abdomen and over head; peritoneum and air bladder pigmented
Length at flexion: may begin at about 5.0 mm SL
Length at transformation: unknown

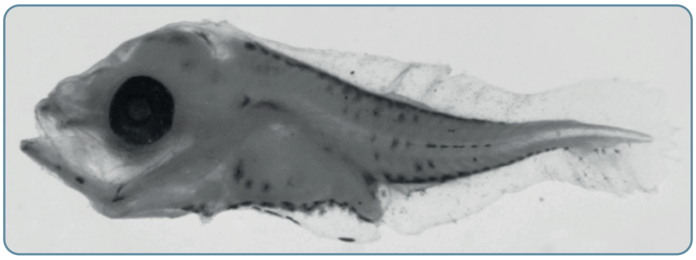
PHOTOS by J.M. Rodriguez



2.7 mm SL



3.4 mm SL

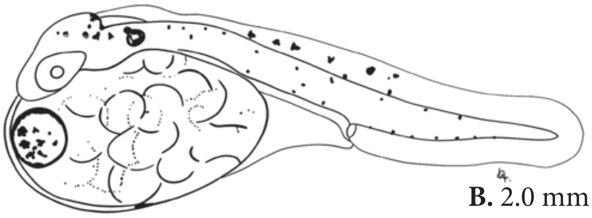


5.3 mm SL

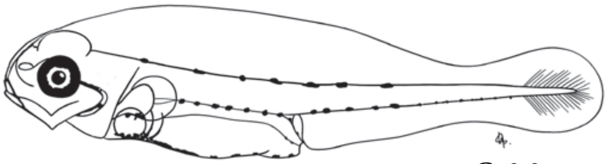
CARANGIFORMES

Trachurus trachurus (Linnaeus, 1758)

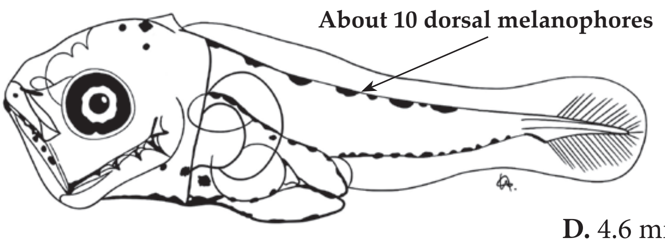
A.



B. 2.0 mm

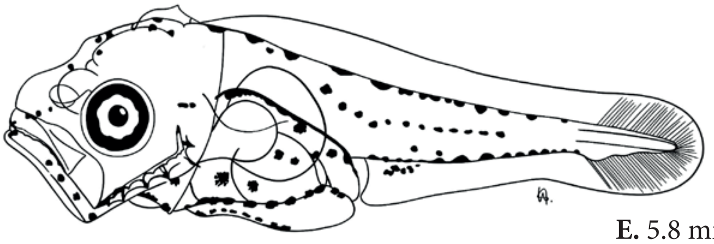


C. 3.2 mm

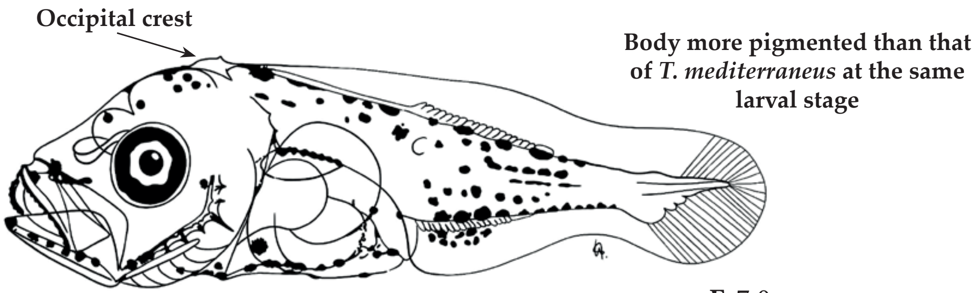


D. 4.6 mm

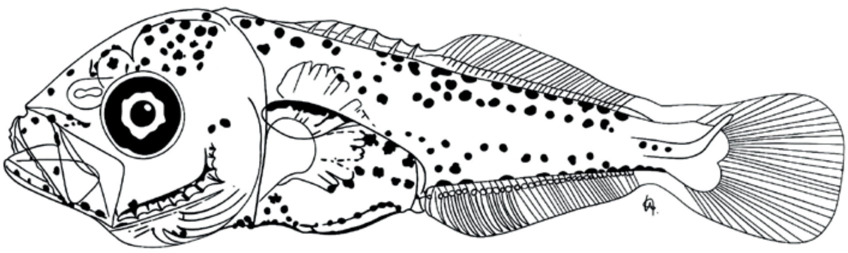
H. Preopercular crests in a 5.0 mm SL larva



E. 5.8 mm



F. 7.0 mm



G. 10.5 mm

Literature: Demir (1961), Froese and Pauly (2022), Padoa (1956f), Russell (1976), Smith–Vaniz (1986)

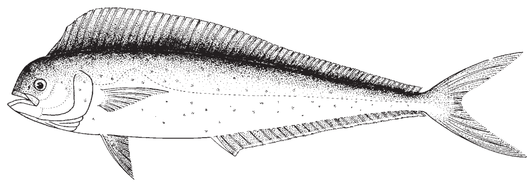
Illustrations' sources: A: Padoa (1956e); **B-H:** L. Rodríguez (**B-G:** redrawn from Demir, 1961; **H:** redrawn from Padoa, 1956f)

CORYPHAENIDAE

Coryphaena hippurus Linnaeus, 1758 — Common dolphinfish – Coryphène commune

Habitat: neritic and oceanic, pelagic
Distribution: worldwide, in tropical and subtropical waters, and the Mediterranean Sea
Spawning season: May to September

Meristic characters
Myomeres: 30-31
Vertebrae: 30-31
Dorsal fin: 58-66
Anal fin: 25-31



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 1.3 mm
Perivitelline space: small
Yolk: segmented; pigmented
Oil globules: one; diam. 0.3-0.4 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

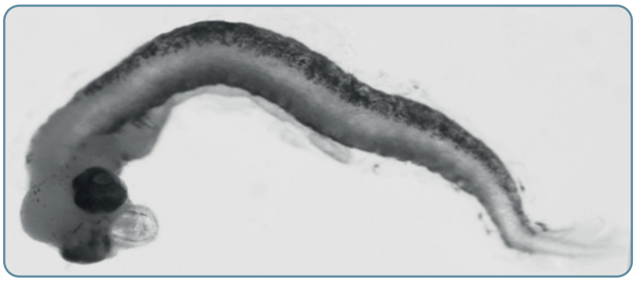
Hatch size: about 4.0 mm TL
Body: elongate
Yolk sac: ovoid
Oil globule location: at ventral, posterior end of yolk sac
Anus: detached from yolk sac, reaches finfold border
Preanus length: about 60% SL
Pigmentation: body (except caudal region), yolk sac and oil globule strongly pigmented

LARVAE — Figs. C-H

Body: elongate
Head: moderately blunt; mouth oblique
Eye: round
Gut: elongate, tubular in early larvae
Preanus length: about 60% SL
Air bladder: absent
Spination: preopercular, supraocular, post-temporal, ptreotic and articular spines (see illustration H)

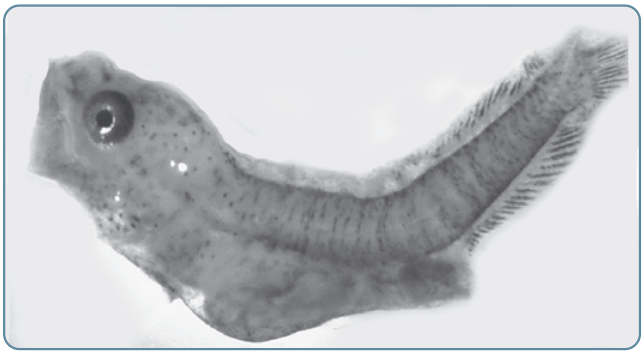
Pigmentation: body heavily pigmented; melanophores arranged in bars in late larvae; caudal region unpigmented in early larvae; pelvic-fin rays pigmented in larvae > 8.0 mm SL
Length at flexion: 7.5-9.0 mm SL
Length at transformation: 25.0-30.0 mm SL

PHOTOS — by J.M. Rodriguez



3.8 mm SL

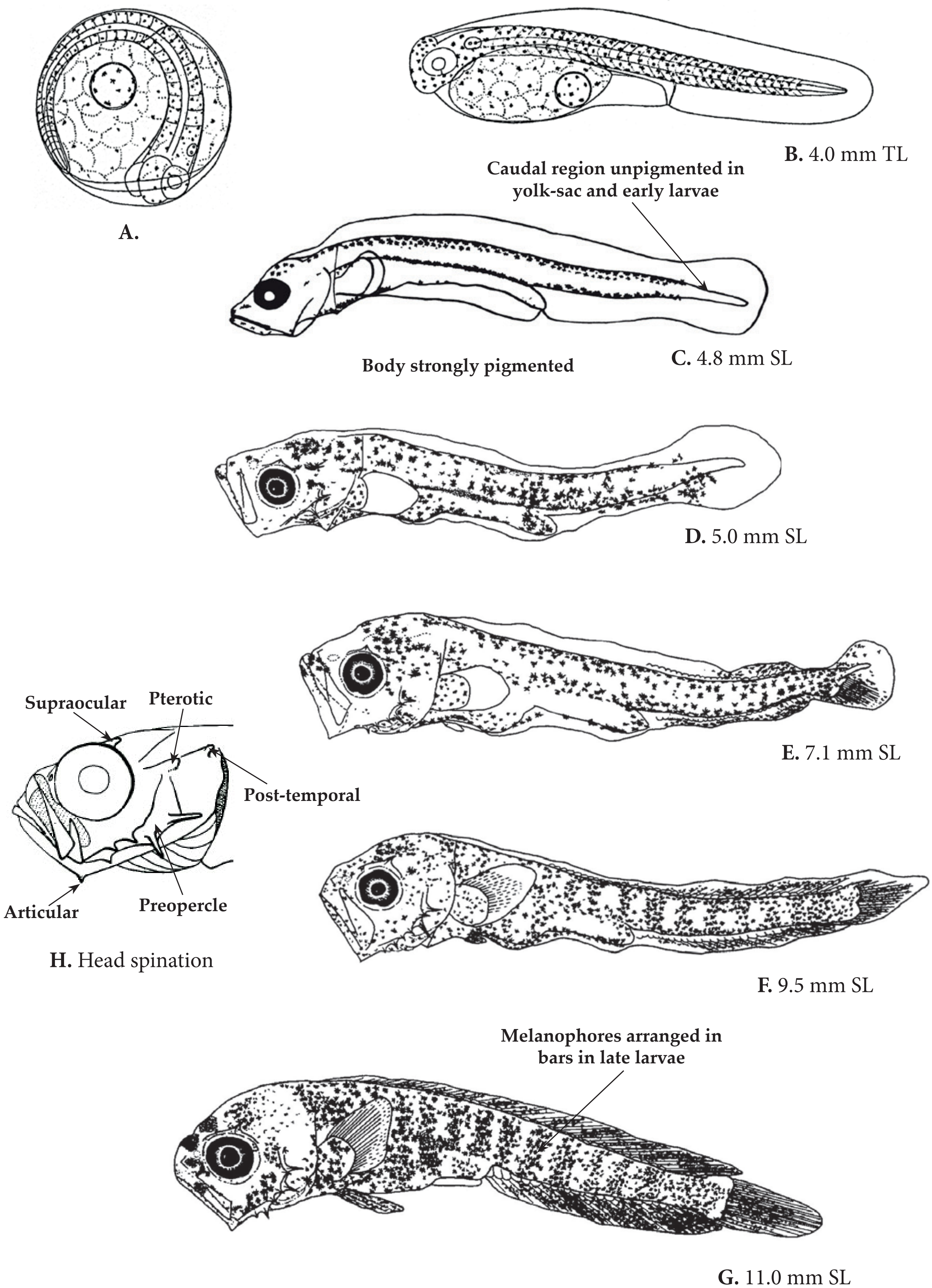
4.4 mm SL



mid-sized larva

CARANGIFORMES

Coryphaena hippurus Linnaeus, 1758



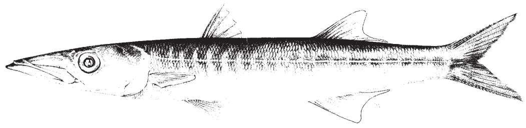
Literature: Collette (1986a), Ditty (2006b), Fahay (2007), Froese and Pauly (2022), Mito (1960)

Illustrations' sources: A, B: Mito (1960); **C:** Alemany (1997); **D-G:** Ditty *et al.* (1994); **H:** Fahay (2007)

Sphyraena guachancho Cuvier, 1829 — Guachanche barracuda

Habitat: neritic, between 0 and 100 m depth
Distribution: Atlantic Ocean. Eastern Atlantic, from Angola to Senegal
Spawning season: summer (western Atlantic Ocean)

Meristic characters
Myomeres: 24
Vertebrae: 24
1st dorsal fin: VI
2nd dorsal fin: 9
Anal fin: II + 8



EGGS

Undescribed

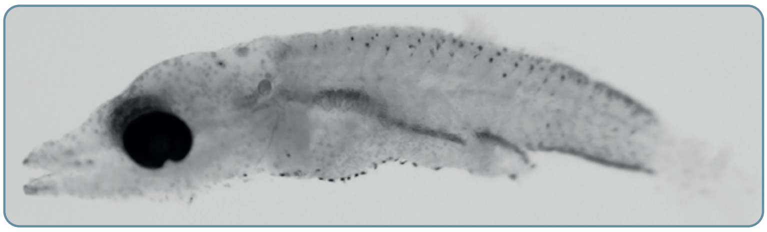
YOLK–SAC LARVAE

Undescribed

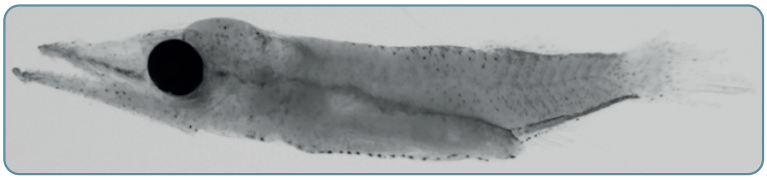
LARVAE — Figs. A-E

Body: elongate, with dorsal and ventral margins parallel; body depth decreases with development from 17% in early larvae to 13% SL in late larvae
Head: moderate; snout pointed and relatively concave, increases in length with development from 27% SL in early larvae to 38% SL in late larvae; mouth large, reaches anterior margin of eye, ventral, with prominent teeth in both jaws; lower jaw extends beyond upper jaw and develops a fleshy tip at 5.4 mm SL
Eye: round and large
Gut: thick
Preanus length: increases from 65% SL in early larvae to 70% SL in late larvae
Air bladder: present
Spination: 3-4 spines on posterior edge of preopercle
Pigmentation: double row of melanophores along dorsal midline of body and along ventral midline of tail, increasing in number with development and extending along sides of body; dorsal surface of head lightly pigmented or unpigmented in early larvae, becomes strongly pigmented in late larvae; ventral row of melanophores extends from isthmus to anus; fleshy lower jaw-tip pigmented; lateral sides of gut unpigmented
Length at flexion: 3.7-7.1 mm SL
Length at transformation: begins at 13.0 mm SL

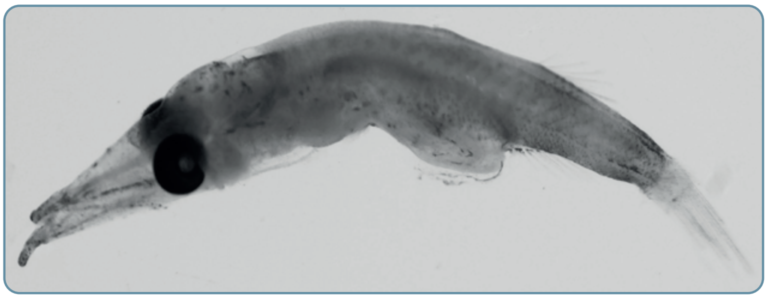
PHOTOS — by S. Isari



4.0 mm SL

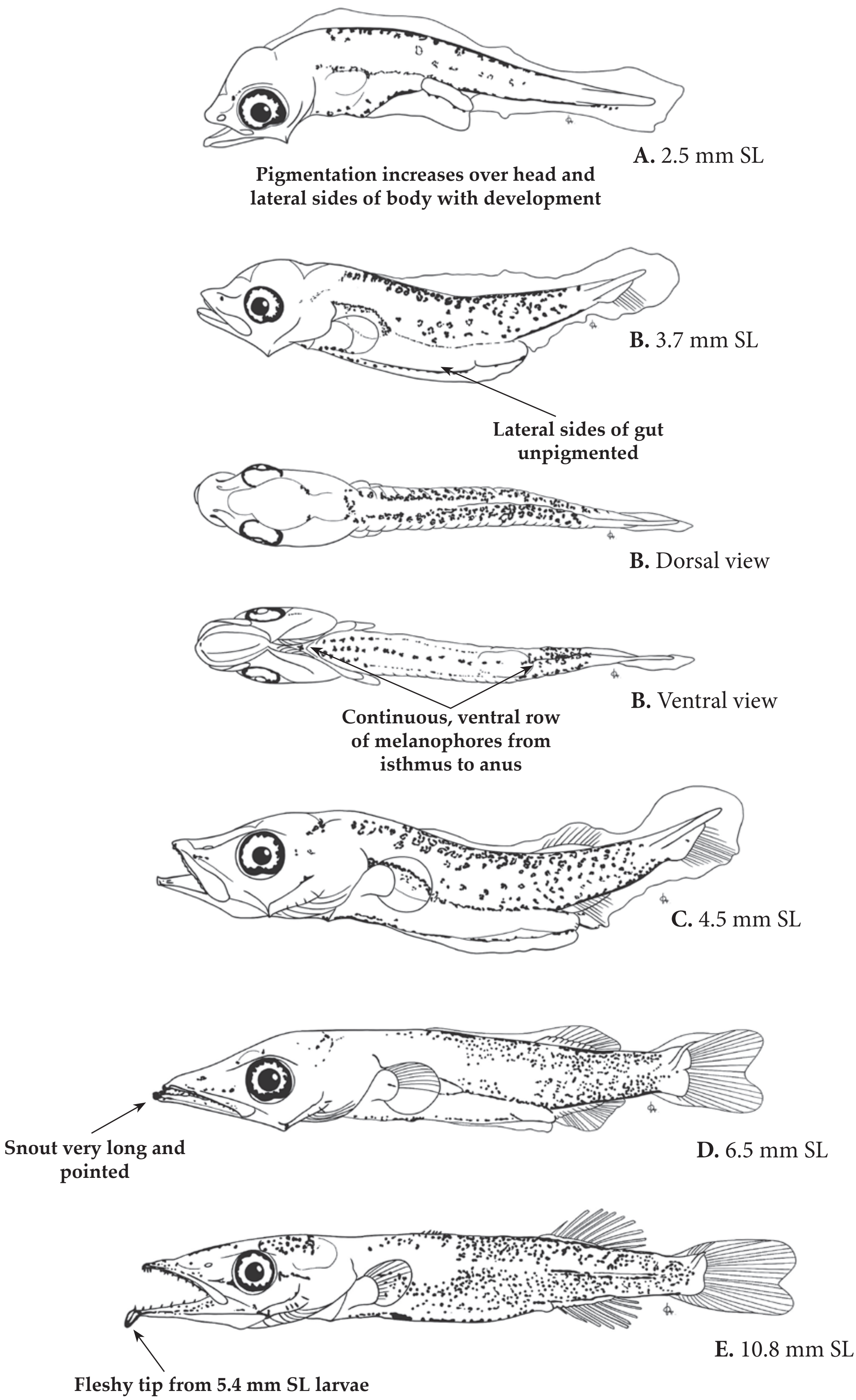


6.8 mm SL



8.1 mm SL

Sphyraena guachancho Cuvier, 1829



Literature: De Sylva (1990), Ditty *et al.* (2006b), Fahay (2007), Froese and Pauly (2022), Matsuura and Suzuki (1997)

Illustrations' sources: A-E: L. Rodríguez (redrawn from Matsuura and Suzuki, 1997)

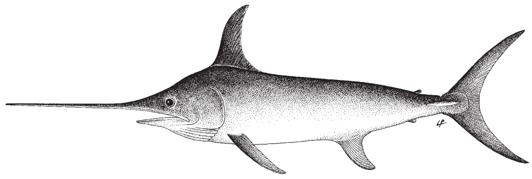
XIPHIIDAE

Xiphias gladius Linnaeus, 1758

Swordfish - Espadon

Habitat: oceanic, pelagic and mesopelagic, to 800 m depth
Distribution: worldwide in tropical-temperate waters
Spawning season: year-round

Meristic characters
Myomeres: 24
Vertebrae: 24
1st dorsal fin: 38-45
2nd dorsal fin: 4-5
Anal fin: 12-16



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 1.6-1.8 mm
Perivitelline space: small
Yolk: segmented; pigmented
Oil globules: one; diam. 0.40-0.52 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

Hatch size: about 4.2 mm
Body: elongate
Yolk sac: elongated, large
Oil globule location: at ventral, posterior edge of yolk sac
Anus: detached from yolk sac, reaches finfold border
Preanus length: about 67% SL
Pigmentation: body and finfold covered with small melanophores; oil globule and yolk sac pigmented

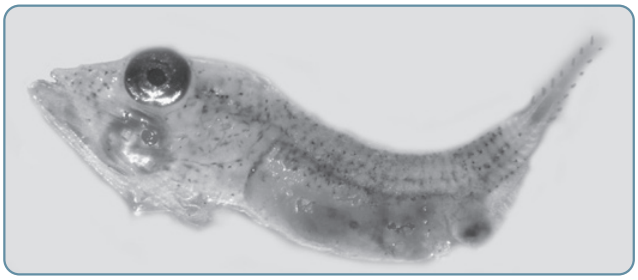
LARVAE — Figs. C-F

Body: relatively elongate
Head: shallow; mouth very large with very elongated jaws; teeth well developed from larvae of 6.0 mm SL
Eye: round and large
Gut: bulky and elongated
Preanus length: about 70-80% SL, increases with development
Air bladder: absent
Spination: frontal crest on dorsum, anterior to eye; preopercular spines large, often slightly curved, with 2 spines at angle longer; supraocular crest with strong spines; 1-2 strong pteroptic spines; 2 post-temporal spines, increasing to 3; spinous scales appear at 12.0-15.0 mm SL
Pigmentation: scattered melanophores over body, except caudal peduncle
Length at flexion: 8.0-12.0 mm SL
Length at transformation: unknown

PHOTOS

by J.M. Rodriguez

3.7 mm SL



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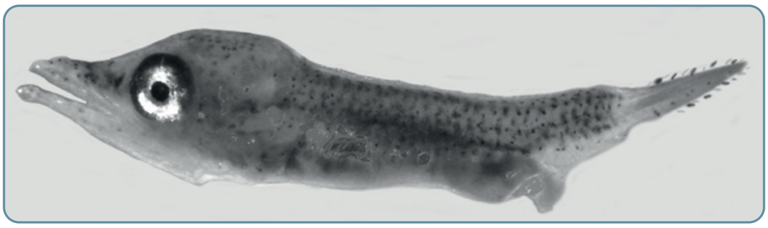

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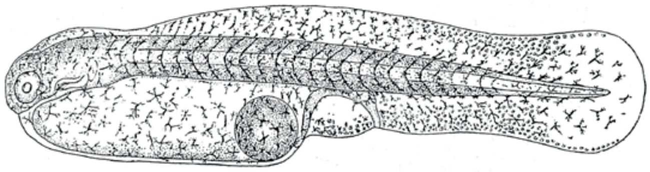
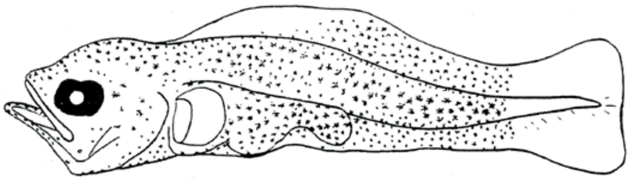
CARANGIFORMES

Xiphias gladius Linnaeus, 1758

A.



B. 4.2 mm SL

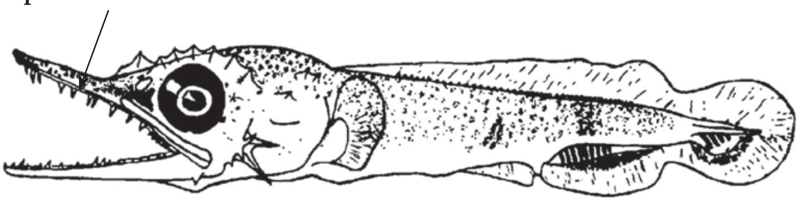


Body, except caudal peduncle, covered by small branched melanophores

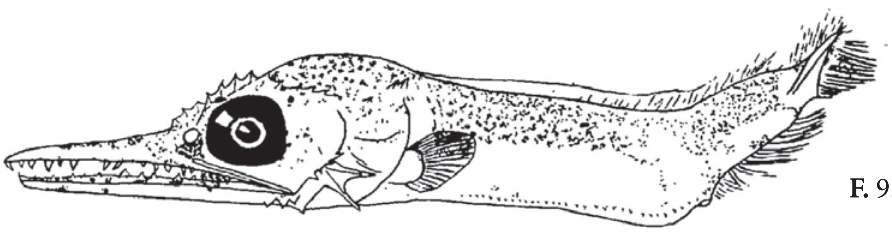
C. 4.1mm SL

D. 6.1 mm SL

Mouth large with long jaws and prominent teeth



E. 7.8 mm SL



F. 9.0 mm SL

Spinous scales in larvae of 12.0-15.0 mm SL

Literature: Arata Jr. (1954), Fahay (2007), Nakamura (1986), Padoa (1956t)

Illustrations' sources: A, B: Padoa (1956t); **C:** Alemany (1997); **D:** Collette *et al.* **(1984); E, F:** Arata Jr. (1954)

POMACENTRIDAE

Chromis chromis (Linnaeus, 1758)

Damselfish - Castagnole

Habitat: neritic, in midwater, between 3 and 35 m depth

Distribution: eastern Atlantic Ocean, from Angola to Portugal, and the Mediterranean Sea

Spawning season: summer

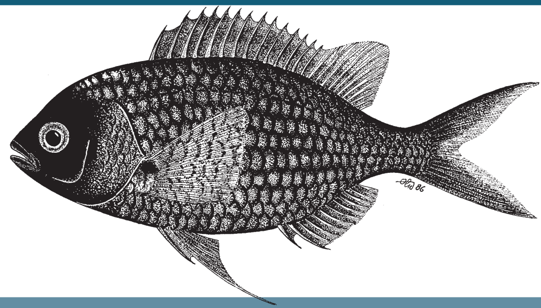
Meristic characters

Myomeres: 26

Vertebrae: 26

Dorsal fin: XIV + 8-11

Anal fin: II + 9-11



EGGS — Fig. A

Habitat: demersal, attached to hard substrates
Shape: elliptical
Chorion: with adhesive filaments; diam. 0.85–0.90 x 0.70–0.72 mm
Perivitelline space: small
Yolk: segmented; pigmented
Oil globules: one; 0.20 mm; unpigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

Hatch size: about 2.6 mm TL
Body: elongate and slender
Yolk sac: ovoid, pigmented
Oil globule location: at anterior, ventral edge of yolk sac
Anus: slightly detached from yolk sac, reaches finfold border
Preanus length: about 33% SL
Pigmentation: row of postanal ventral melanophores; occipital melanophores; yolk sac pigmented

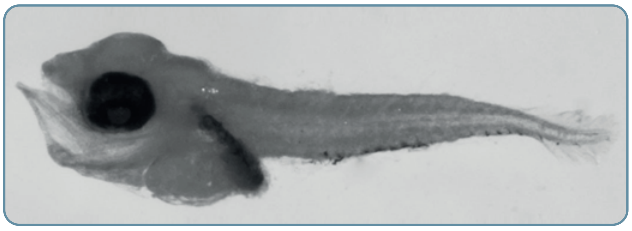
LARVAE — Figs. C-F

Body: elongate and laterally compressed in early larvae, deepens after flexion becoming moderately stocky
Head: deep with rounded snout in early larvae, becomes slightly pointed in late larvae; mouth protractile and oblique
Eye: round and large
Gut: triangular and bulky; anus moderately protruding
Preanus length: < 50% SL
Air bladder: absent
Spination: none

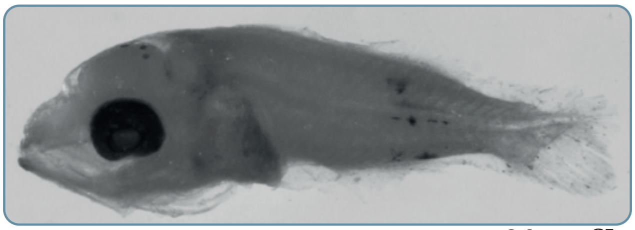
Pigmentation: similar to yolk-sac larva in early larvae; with development, postanal-ventral melanophores reduce and concentrate, forming a ventral bar at about mid-tail; in late larvae, melanophores appear on mid-lateral line and on dorsum, at same level of ventral group forming a dorsum-ventral bar; peritoneum pigmented; melanophores on head
Length at flexion: begins at 3.60 mm SL and is completed at 4.75 mm SL
Length at transformation: unknown

PHOTOS

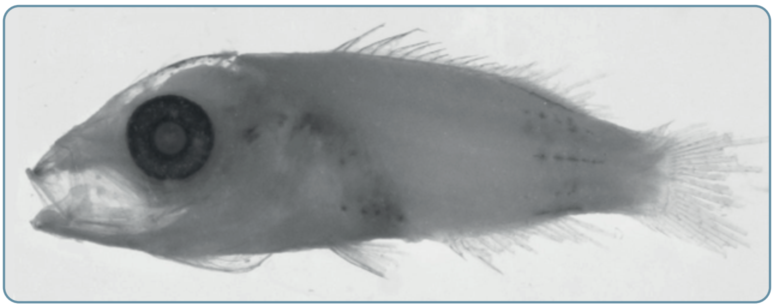
by J.M. Rodriguez



2.4 mm SL



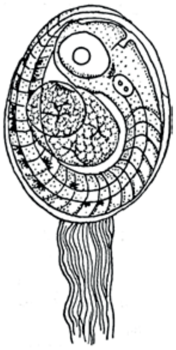
3.9 mm SL



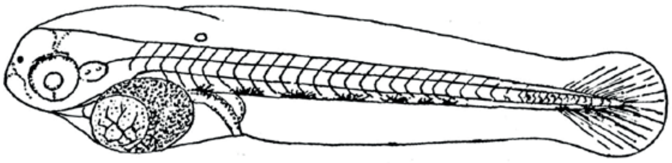
7.1 mm SL

CICHLIFORMES

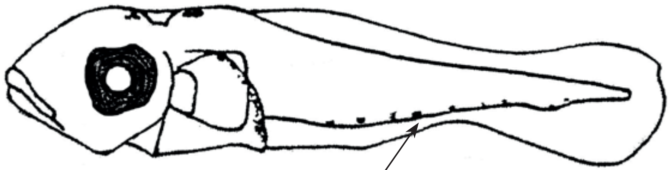
Chromis chromis (Linnaeus, 1758)



A.

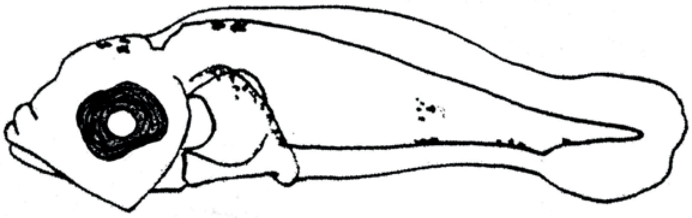


B. 2.6 mm

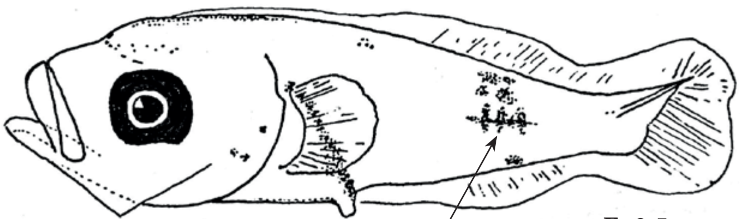


Postanal, ventral row of melanophores

C. 2.4 mm SL

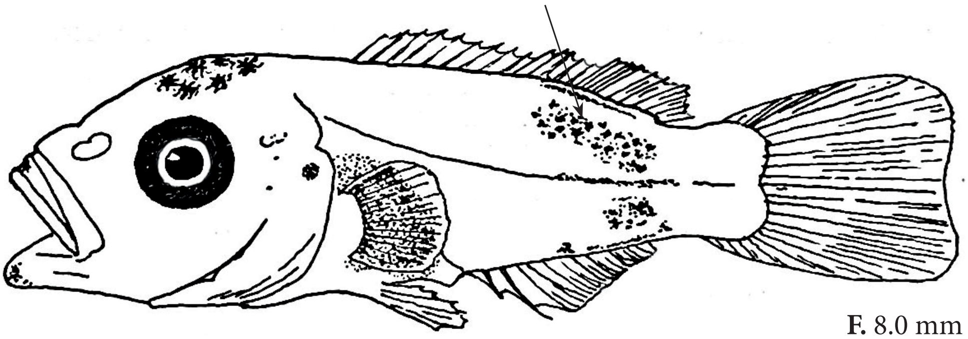


D. 2.5 mm SL



E. 3.5 mm

Postanal pigmentation reduced to a bar situated at about mid-tail in later larvae



F. 8.0 mm

Literature: Fage (1918), Froese and Pauly (2022), Padoa (1956m), Quignard and Pras (1986b), Sabatés (1988)

Illustrations' sources: A, B: Padoa (1956m); **C, D:** Alemany (1997); **E, F:** Fage (1918)

BELONIDAE

Belone belone (Linnaeus, 1761) Garfish - Orphie

Habitat: neritic, epipelagic
Distribution: eastern Atlantic Ocean, from Cape Verde to Norway, and the Mediterranean Sea
Spawning season: February to May (Mediterranean Sea)

Meristic characters
Myomeres: 75-84
Vertebrae: 75-84
Dorsal fin: 16-20
Anal fin: 19-23

EGGS Fig. A

Habitat: demersal
Shape: spherical
Chorion: with filaments; diam. 3.0-3.5 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: none
Colour: transparent

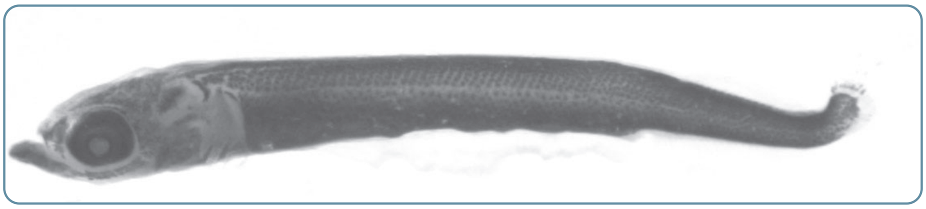
YOLK–SAC LARVAE Fig. B

Hatch size: about 9.0 mm in an advanced stage of development
Body: elongate and relatively slender; no dorsal finfold; large ventral finfold
Head: relatively small; lower jaw slightly projected beyond upper jaw; mouth open
Yolk sac: elongated
Anus: detached from yolk sac, reaches finfold border
Preanus length: about 72% SL
Pigmentation: body completely covered with melanophores; yolk sac barely visible due to pigmentation; eye pigmented

LARVAE Figs. C-E

Body: elongate and slender
Head: small; mouth small, lower jaw very large, strongly projected beyond upper jaw
Eye: round and large
Gut: elongate, tube-like
Preanus length: about 77% SL
Air bladder: small
Spination: none
Pigmentation: strongly pigmented; melanophores arranged along myomeres in dorsal half of body
Length at flexion: unknown
Length at transformation: unknown

PHOTOS by J.M. Rodriguez

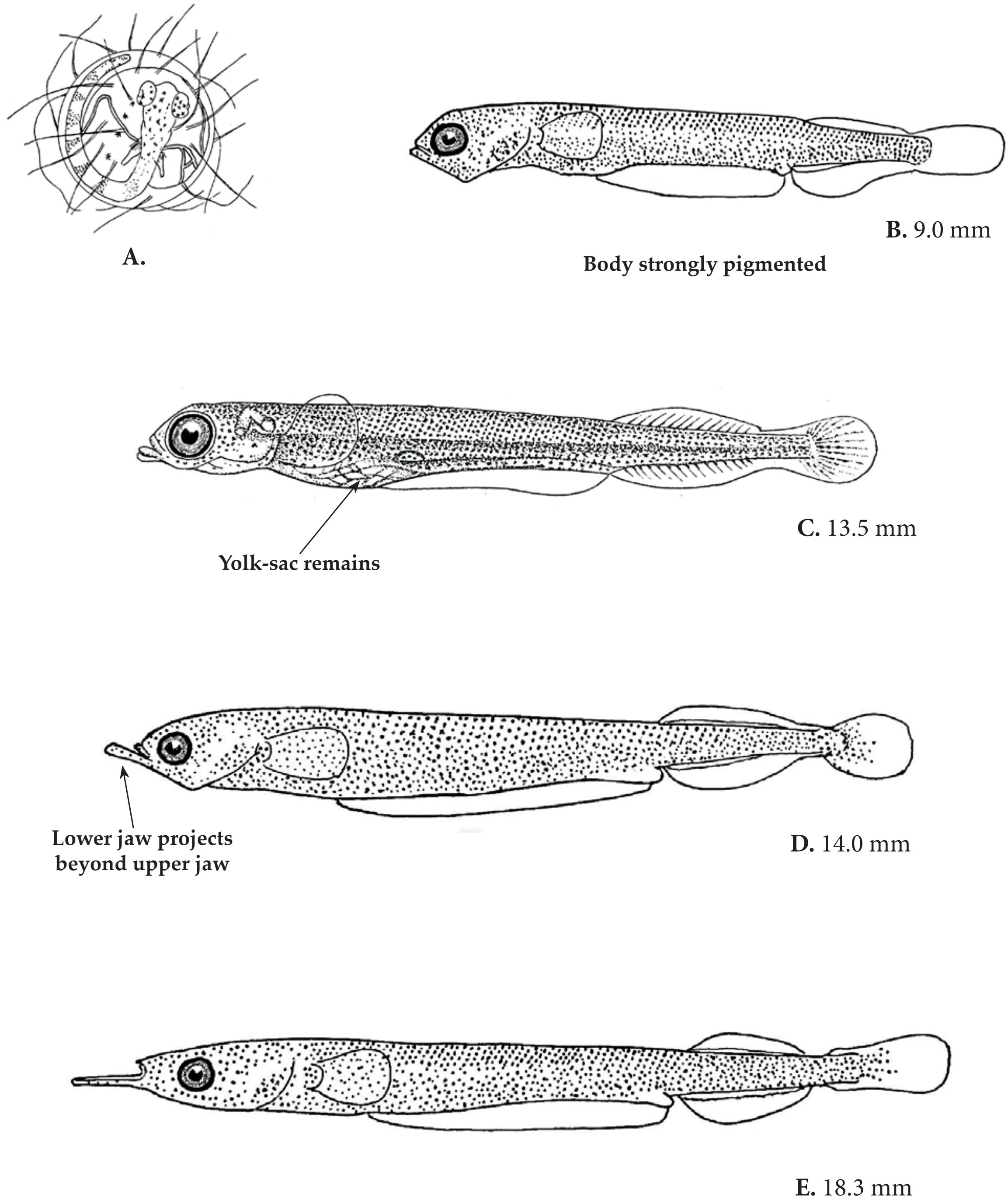


13.0 mm SL

Not sized

BELONIFORMES

Belone belone (Linnaeus, 1761)



Literature: Collette and Parin (1986), D'Ancona (1931e), Froese and Pauly (2022), Russell (1976)

Illustrations' sources: A, C-E: modified from Russell (1976); **B:** D'Ancona (1931e)

Scomberesox saurus (Walbaum, 1792) — Atlantic saury - Balaou atlantique

Habitat: oceanic, epipelagic (usually in the very upper layer)
Distribution: North Atlantic Ocean. Eastern Atlantic, from Morocco to Iceland, and the Mediterranean Sea
Spawning season: year-round in waters between 16.5 °C and 23.5 °C (western Atlantic Ocean)

Meristic characters
Myomeres: 64-68
Vertebrae: 64-68
Dorsal fin: 9-12
Dorsal finlets: 5-6
Anal fin: 12-13
Anal finlets: 5-7

EGGS — Fig. A

Habitat: pelagic
Shape: slightly oval
Chorion: with rigid, uniformly-spaced bristles; max. diam. 2.15-2.76 mm
Perivitelline space: small
Yolk: unsegmented; unpigmented
Oil globules: none
Colour: transparent

YOLK–SAC LARVAE — Fig. B

Hatch size: 6.0-8.5 mm
Body: relatively elongate and slender; caudal fin well developed and flexion underway at hatching
Yolk sac: elongated
Anus: detached from yolk sac, reaches finfold border
Pigmentation: body unpigmented at hatching; melanophores develop early; dense, deep-blue coloring (black in preserved organisms) over entire body, excluding fins and yolk; eyes pigmented at hatching
Preanus length: about 60% SL

LARVAE — Figs. C-F

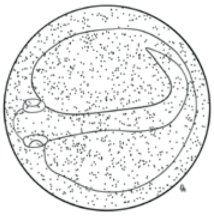
Body: elongate, slender and cylindrical; dorsal and anal fins opposite, located posteriorly on body; preanal finfold persistent; finlets form in larvae of about 25.0 mm SL
Head: relatively large; snout very short; mouth small and oblique
Eye: round and large
Gut: elongate, tube-like
Preanus length: 60-70% TL
Air bladder: absent
Spination: none
Pigmentation: dorsum dark-blue in live larvae (black in preserved larvae), flanks silvery
Length at flexion: 4.4 mm
Length at transformation: about 25.0 mm

PHOTOS — by J.M. Rodriguez

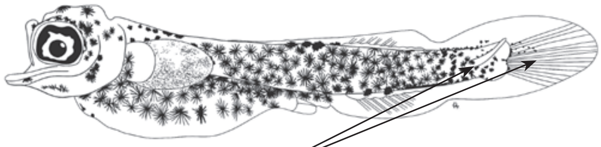
11.6 mm SL

18.0 mm SL

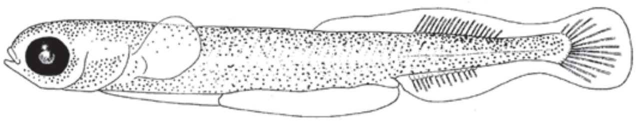
Scomberesox saurus (Walbaum, 1792)



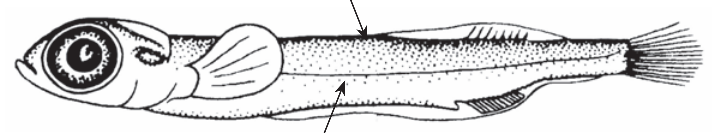
A.



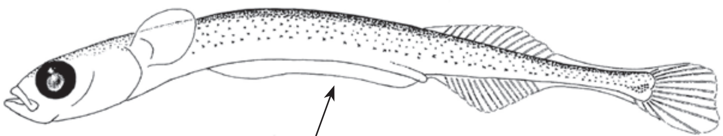
B. 4.4 mm SL



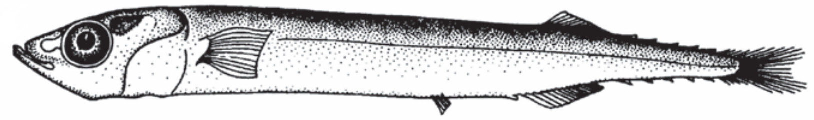
C. 7.5 mm SL



D. 10.7 mm SL



E. 13.5 mm SL



F. 24.8 mm SL

Literature: Collette and Parin (1986), D'Ancona (1931e), Fahay (2007), Hardy and Collette (2003, 2006), Nerestov and Shiganova (1976), Wisner (1990)

Illustrations' sources: A, B: L. Rodríguez (A: redrawn from Collette *et al.*, 1984a; **B:** redrawn from Hardy and Collette, 2003); **C:** Sanzo (1940); **D-F:** D'Ancona (1931e)

Blennius ocellaris Linnaeus, 1758 — Butterfly blenny - Blennie papillon

Habitat: neritic, demersal, between 0 and 8 m depth
Distribution: eastern Atlantic Ocean, from Morocco to the English Channel, and the Mediterranean Sea
Spawning season: April to August

Meristic characters
Myomeres: NA
Vertebrae: NA
Dorsal fin: XI-XII + 14-16
Anal fin: II + 16

EGGS — Fig. A

Habitat: demersal, attached to shells and hollow objects
Shape: sub-spherical
Chorion: fluted; diam. 1.12-1.20 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: several; no information on diameter and pigmentation
Colour: transparent

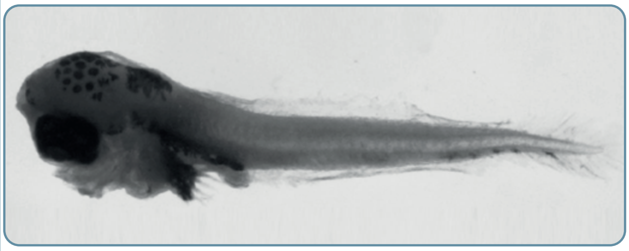
YOLK–SAC LARVAE

Hatch size: about 4.5 mm
Body: elongate; pectoral fins apparent
Yolk sac: ovoid and relatively small
Oil globule location: no information
Anus: a bit detached from yolk sac, reaches finfold border
Preanus length: about 40% SL
Pigmentation: melanophores on head, snout and peritoneum; pectoral fins strongly pigmented with melanophores arranged in longitudinal rows between incipient rays; row of melanophores on ventral tail-end region; yolk sac and eyes pigmented

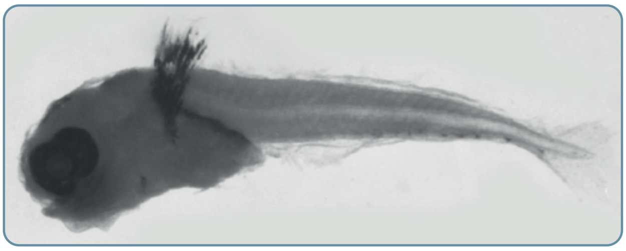
LARVAE — Figs. B-F

Body: moderately elongate and slender in early larvae, deepens through pectoral and abdominal regions with development; pectoral fins large (reaching anus) and rounded; 12 pectoral-fin rays
Head: moderately large and rounded; mouth small; teeth apparent in late larvae
Eye: round and large
Gut: short and triangular
Preanus length: increases with development to about 50% SL
Air bladder: absent
Spination: none
Pigmentation: some melanophores on head; peritoneum heavily pigmented; 5-6 ventral melanophores at posterior half of postanal region; pectoral fins large, rounded, heavily pigmented with melanophores located between fin rays
Length at flexion: completed at 7.5 mm
Length at transformation: unknown

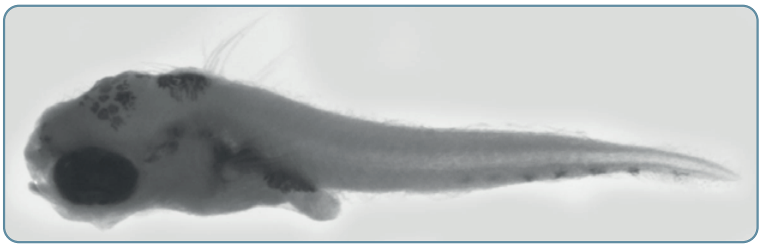
PHOTOS — by J.M. Rodriguez



3.5 mm SL

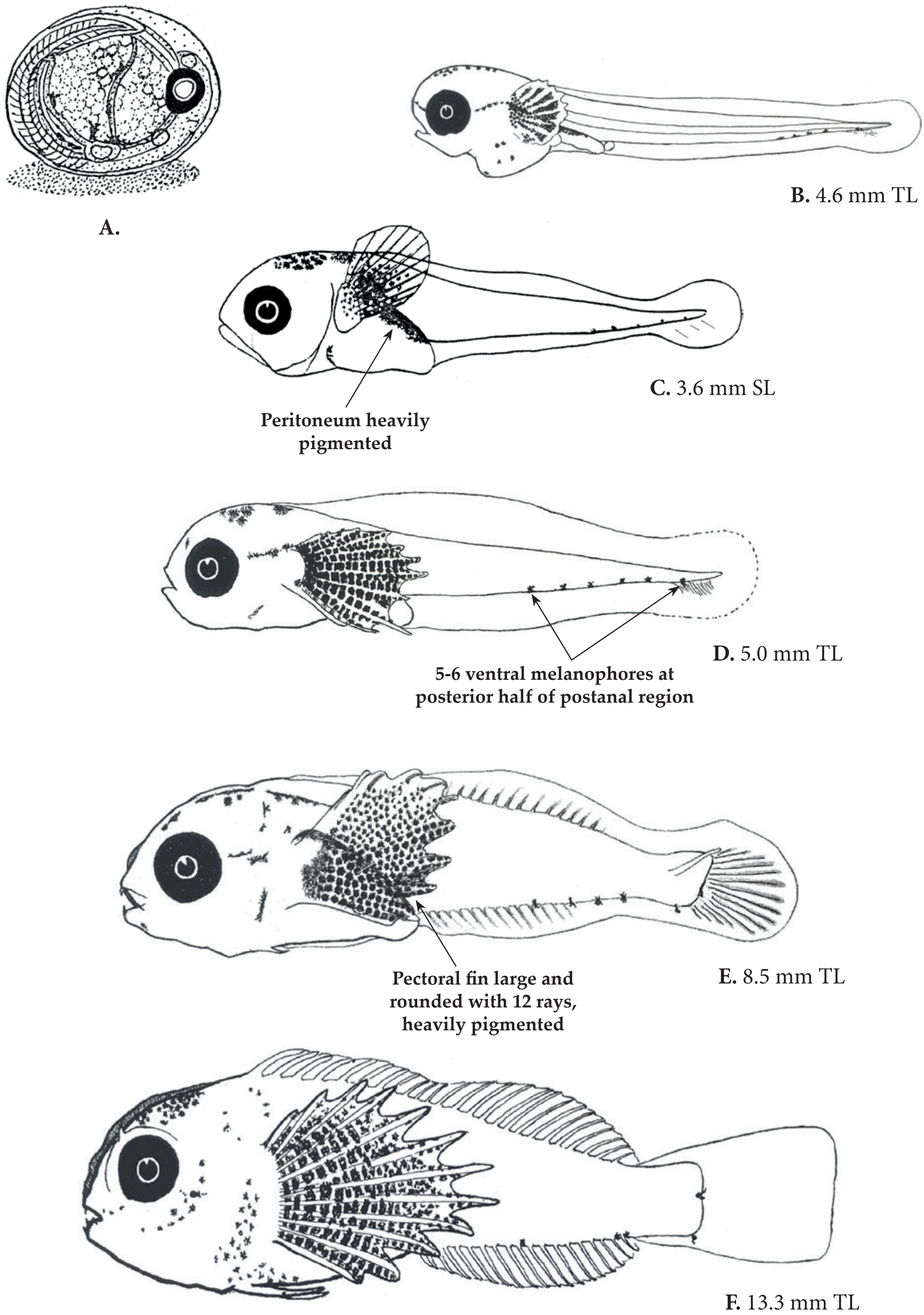


3.6 mm SL



3.9 mm SL

Blennius ocellaris Linnaeus, 1758



Literature: Fives (1986), Ford (1922), Padoa (1956b), Russell (1976), Zander (1986)

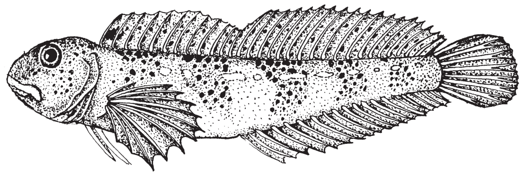
Illustrations' sources: A: Cipria (1938); **B, D-F:** Ford (1922); **C:** Alemany (1997)

BLENNIIDAE

Lipophrys pholis (Linnaeus, 1758) — Shanny

Habitat: neritic, demersal, between 0 and 8 m depth
Distribution: eastern Atlantic Ocean, from Morocco to Norway, and the Mediterranean Sea
Spawning season: April to August

Meristic characters
Myomeres: NA
Vertebrae: NA
Dorsal fin: XII + 18
Anal fin: II + 18-19



EGGS

Habitat: demersal, attached to substrate by a circular disc
Shape: hemispherical
Chorion: no information; diam. 1.18-1.60 mm
Perivitelline space: small
Yolk: unsegmented; unpigmented
Oil globules: several
Colour: translucent

YOLK–SAC LARVAE — Fig. A

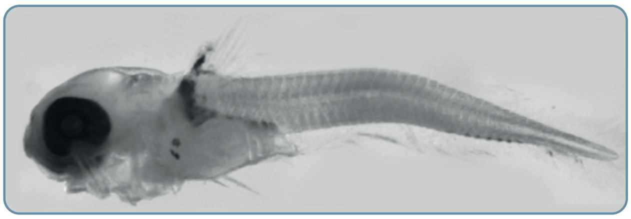
Hatch size: about 4.4 mm
Body: elongate; pectoral fins apparent, nearly reaching anus
Yolk sac: ovoid
Oil globule location: no information
Anus: slightly detached from yolk sac, reaches finfold border
Preanus length: about 40% SL
Pigmentation: melanophores on head and snout; peritoneum pigmented; postanal region unpigmented; pectoral fins heavily pigmented; yolk sack unpigmented; eyes pigmented

LARVAE — Figs. B-E

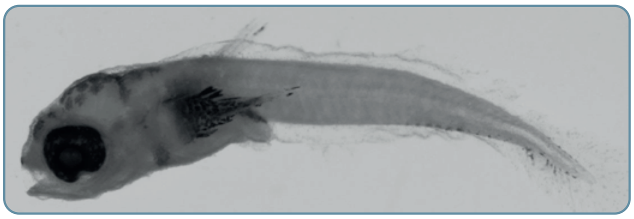
Body: moderately elongate and slender; pectoral fins very large, extending to mid-tail, and pointed, with 13 rays; teeth apparent from early larvae on
Head: rounded; mouth small
Eye: round and large
Gut: triangular
Preanus length: increases with development to about 50% SL

Air bladder: absent
Spination: none
Pigmentation: melanophores over head and close to operculum; peritoneum and base of caudal fin pigmented; row of melanophores on ventral tail-end region; pectoral fins heavily pigmented
Length at flexion: unknown
Length at transformation: unknown

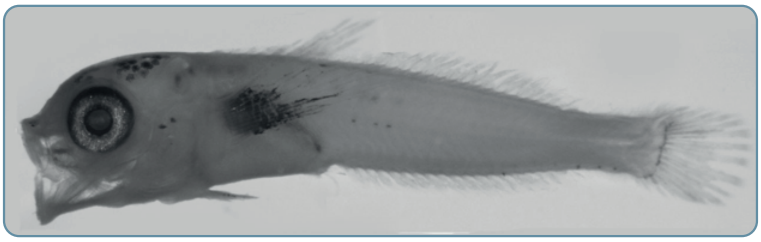
PHOTOS — by J.M. Rodriguez



4.6 mm SL



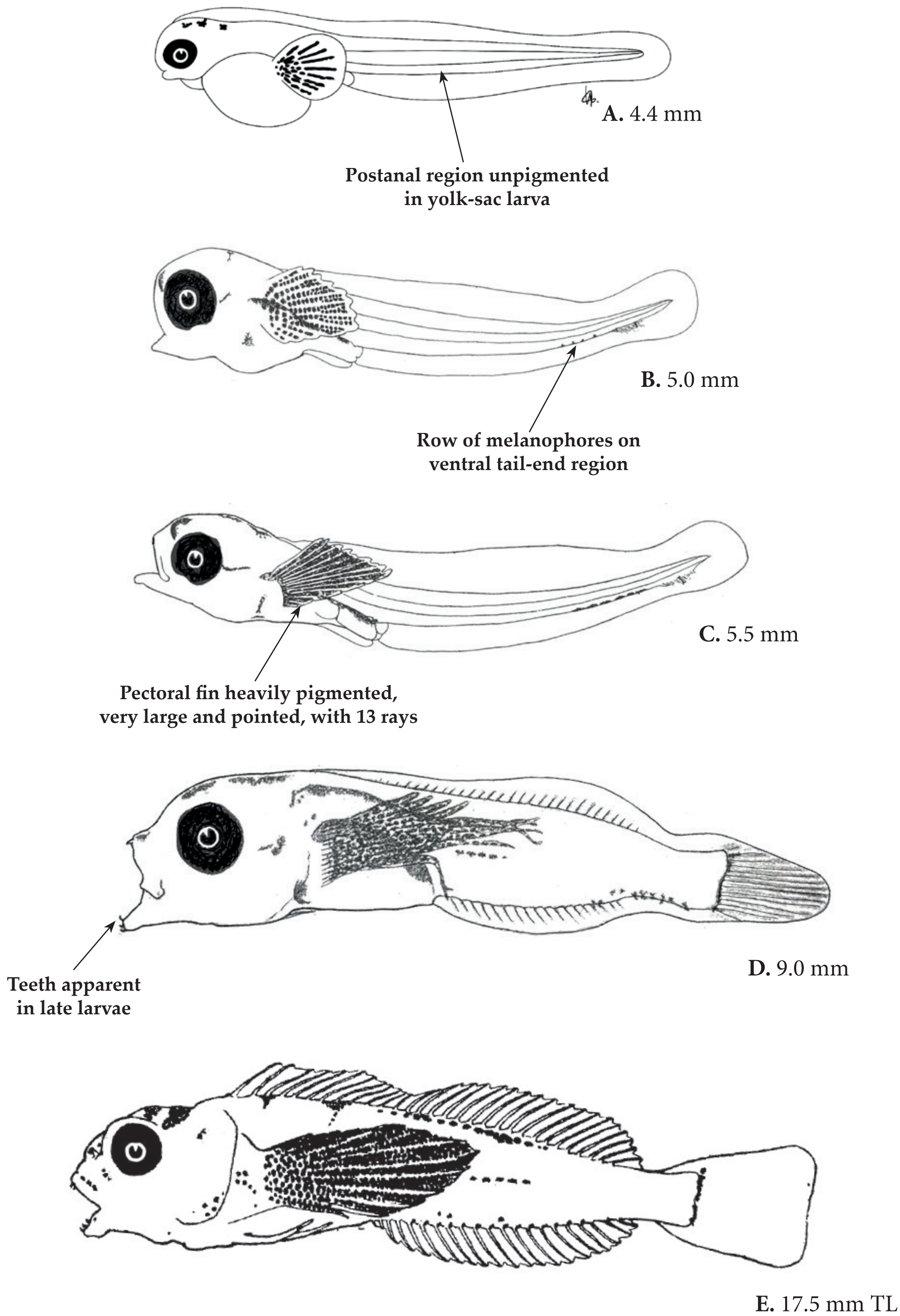
5.6 mm SL



9.0 mm SL

BLENNIIFORMES

Lipophrys pholis (Linnaeus, 1758)



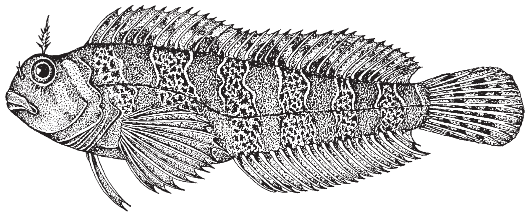
Literature: Fives (1986), Ford (1922), Froese and Pauly (2022), Padoa (1956b), Russell (1976), Zander (1986)

Illustrations' sources: A: L. Rodríguez (redrawn from Padoa, 1956b); **B-E:** Ford (1922)

Parablennius gattorugine (Linnaeus, 1758) — Tompot blenny

Habitat: neritic, demersal, between 3 and 32 m depth
Distribution: eastern Atlantic Ocean, from South Guinea to the Bay of Biscay, and the Mediterranean Sea
Spawning season: March to May

Meristic characters
Myomeres: NA
Vertebrae: NA
Dorsal fin: XIII + 18-19
Anal fin: II + 19-20



EGGS

Habitat: demersal, adherent, in a single layer
Shape: hemispherical
Chorion: diam. 1.6 mm
Perivitelline space: small
Yolk: unsegmented
Oil globules: none
Colour: purple and gold in live eggs

YOLK–SAC LARVAE

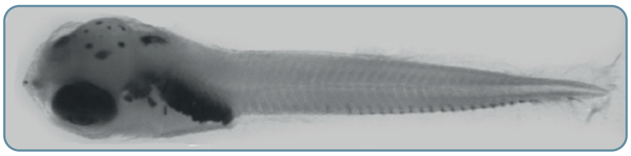
Hatch size: about 4.5 mm
Body: elongate; pectoral fins apparent and rounded
Yolk sac: no information
Anus: no information
Preanus length: < 30% SL
Pigmentation: dorsal side of gut, from behind eye to anus, pigmented; a few melanophores on snout and top of head; pectoral fins unpigmented; eye pigmented

LARVAE — Figs. A-D

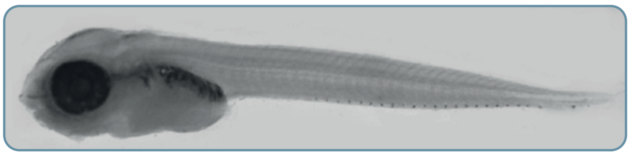
Body: moderately elongate and slab-sided; caudal peduncle deep; dorsal and ventral margins nearly parallel; pectoral fins with 14 rays, fairly long and pointed in late larvae
Head: relatively small; mouth small; teeth apparent in late larvae
Eye: round and relatively large
Gut: triangular and short
Preanus length: < 30% SL
Air bladder: absent
Spination: none

Pigmentation: dorso-lateral side of gut strongly pigmented; postanal, ventral row of 19 to 21 regularly spaced melanophores, beginning some distance behind anus and reaching caudal peduncle; melanophores on head and snout; some caudal melanophores; lateral row of melanophores above notochord in late larvae; no melanophores over anus; pectoral-fin base pigmented; dorsal row of melanophores in later larvae, while lateral row disappears
Length at flexion: unknown
Length at transformation: unknown

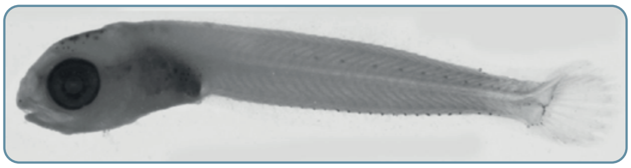
PHOTOS — by J.M. Rodriguez



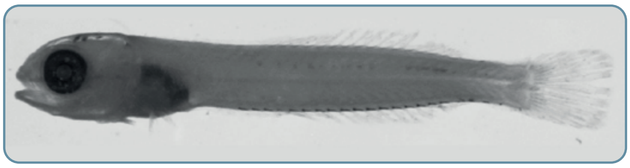
3.8 mm SL



4.5 mm SL

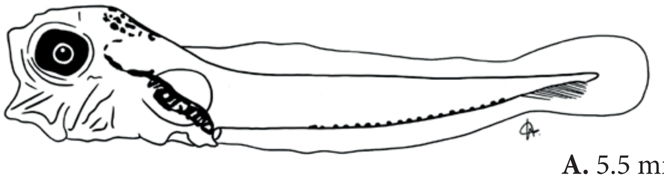


9.4 mm SL

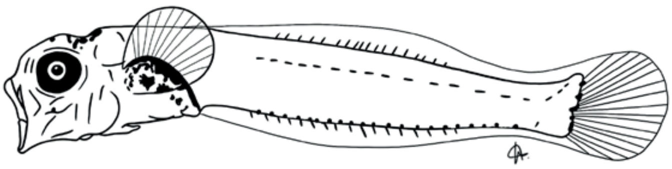


10.5 mm SL

Parablennius gattorugine (Linnaeus, 1758)

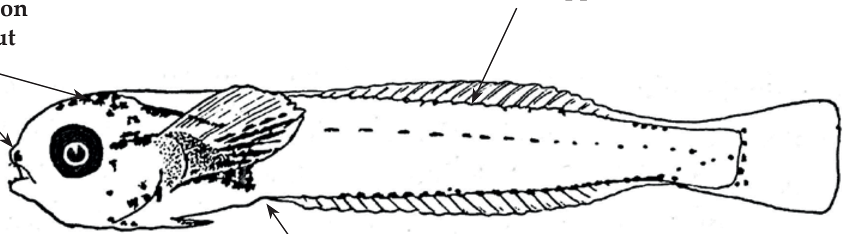


A. 5.5 mm

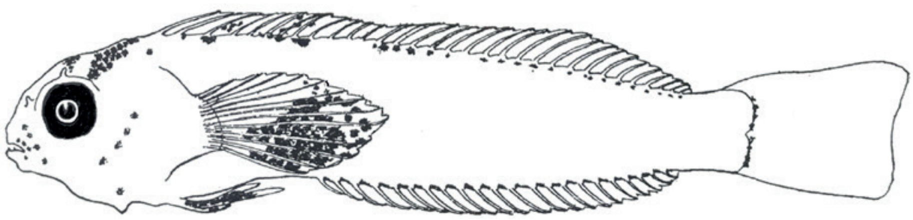


B. 10.8 mm

B. Detail of pectoral fin



C. 13.0 mm



D. 18.5 mm

Literature: Fives (1986), Ford (1922), Froese and Pauly (2022), Padoa (1956b), Russell (1976), Sabatés (1988), Zander (1986)

Illustrations' sources: A, B: L. Rodríguez (redrawn from Fives, 1986); **C, D:** Ford (1922)

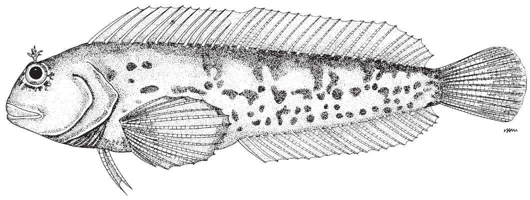
BLENNIIDAE

Parablennius pilicornis (Cuvier, 1829)

Ringneck blenny

Habitat: neritic, demersal, between 0 and 25 m depth
Distribution: eastern Atlantic Ocean, from Namibia to Bay of Biscay, and the Mediterranean Sea
Spawning season: unknown

Meristic characters
Myomeres: NA
Vertebrae: NA
Dorsal fin: XII + 21
Anal fin: II + 23



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

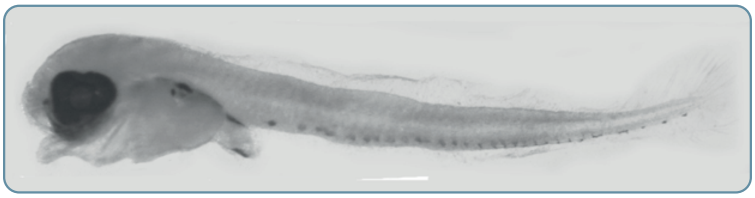
LARVAE

Figs. A-F

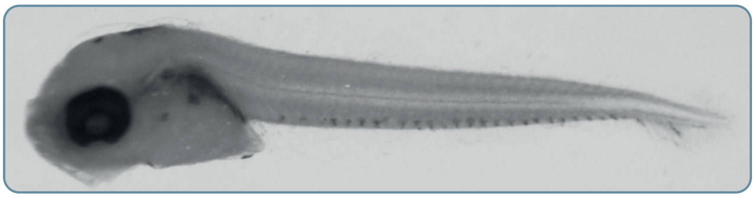
Body: elongate and slab-sided; caudal peduncle deep; dorsal and ventral margins nearly parallel; pectoral fins small and rounded
Head: relatively small; mouth small; teeth in larvae > 6.0 mm SL
Eye: round and relatively large
Gut: triangular and short
Preanus length: 36% of SL in early larvae, decreases to 32% in late larvae
Air bladder: absent
Spination: 6-8 preopercular spines in larvae > 4.0 mm SL
Pigmentation: stellate melanophores over head (only one in early larvae); peritoneal region heavily pigmented; a single melanophore ventrally over anus; ventral row of melanophores from anus to notochord tip; a melanophore on caudal–fin base in late larvae; dorsal pigmentation on tail appears in larvae of about 8.5 mm SL, spreading forward
Length at flexion: 5.0-6.0 mm SL
Length at transformation: unknown

PHOTOS

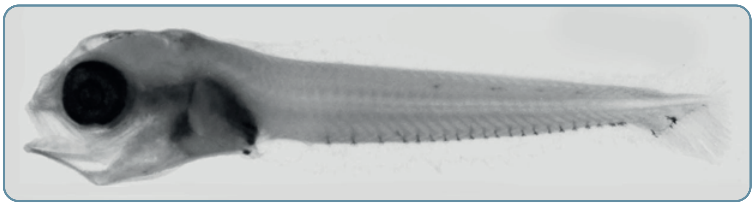
by J.M. Rodriguez



2.8 mm SL



4.1 mm SL

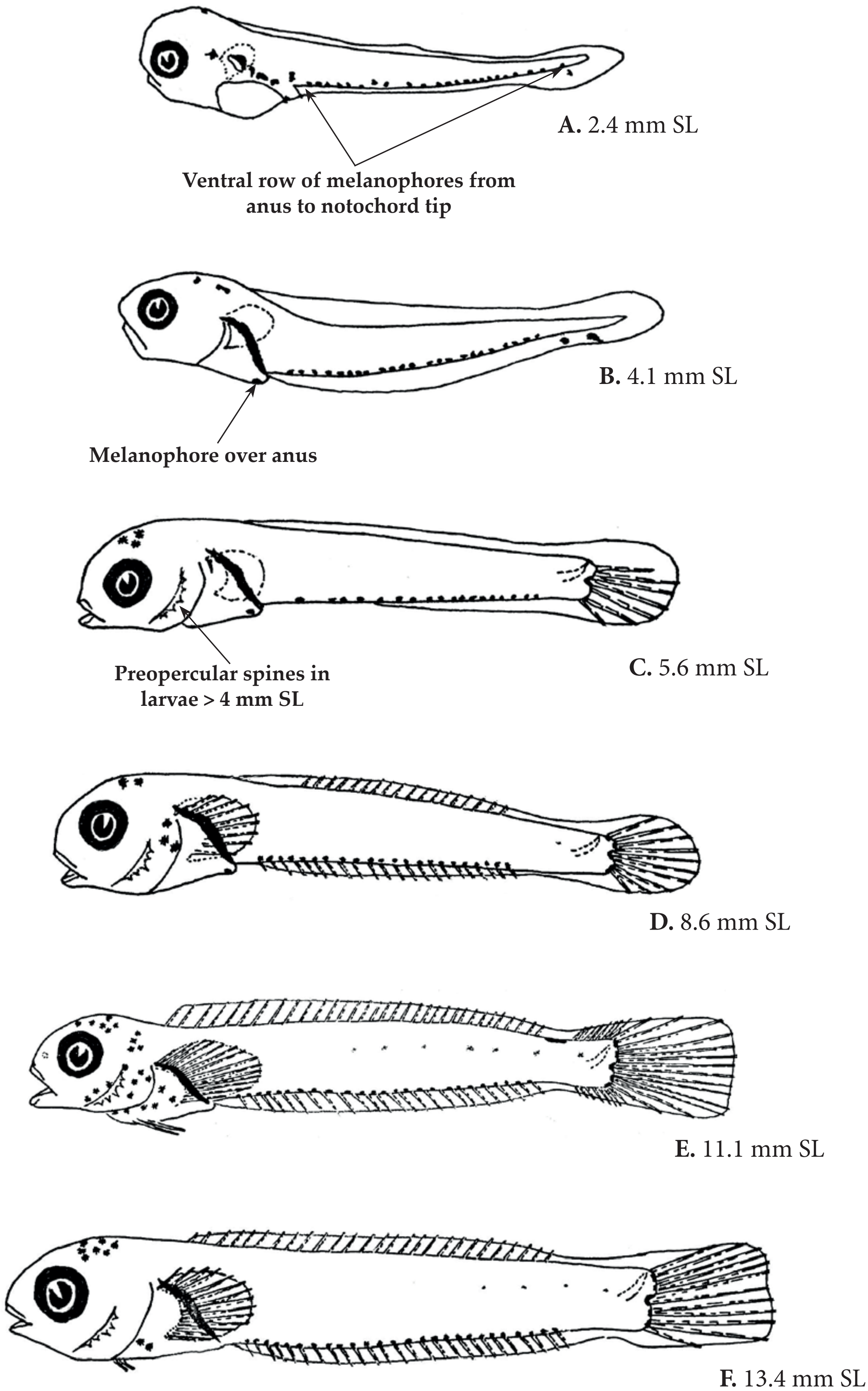


5.4 mm SL

6.5 mm SL

BLENNIIFORMES

Parablennius pilicornis (Cuvier, 1829)



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Literature: Froese and Pauly (2022), Olivar (1986), Olivar and Fortuño (1991)

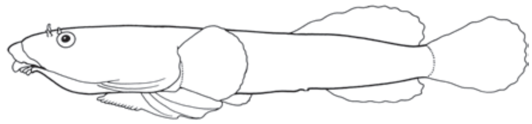
Illustrations' sources: A-F: Olivar (1986)

Diplecogaster bimaculata (Bonnaterre, 1788)

Two-spotted clingfish
Lépadogastère à deux tâches

Habitat: neritic, demersal, between 5 and 200 m depth
Distribution: eastern Atlantic Ocean, from Morocco to Norway, and the Mediterranean Sea
Spawning season: unknown

Meristic characters
Myomeres: NA
Vertebrae: NA
Dorsal fin: 5-7
Anal fin: 4-6



EGGS — Fig. A

Habitat: demersal, attached to empty shells
Shape: flattened, oval-shaped
Chorion: smooth, size 1.37-1.54 mm long, 1.08-1.24 mm wide, 0.62-0.70 mm high
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: one; diam. 0.24-0.28 mm
Colour: slightly dark

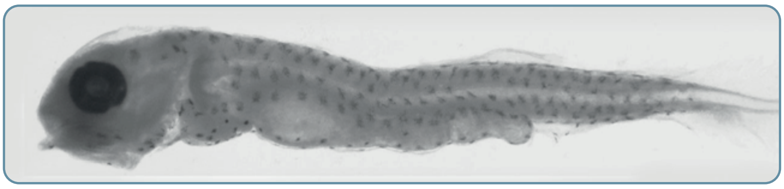
YOLK–SAC LARVAE — Fig. B

Hatch size: may be about 4.3 mm
Body: elongate; mouth well formed at hatching
Yolk sac: circular and small
Oil globule location: no information
Anus: detached from yolk sac, reaches finfold border
Preanus length: about 65% SL
Pigmentation: rounded stellate melanophores arranged in fairly regular rows along sides of body and gut; no melanophores on head; caudal region free of pigment; yolk sac pigmented with melanophores along surface of yolk; eye pigmented

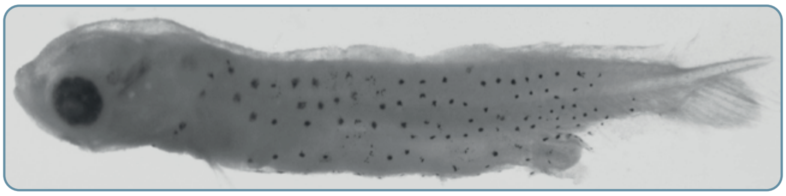
LARVAE — Figs. C-D

Body: elongate and slender; pelvic fins develop into a sucker at about 6.0 mm
Head: moderate in size, pointed; mouth terminal
Eye: round and relatively small
Gut: long, tube-like
Preanus length: about 70% SL
Air bladder: absent
Spination: none
Pigmentation: similar to yolk–sac larvae, melanophores extend backwards on caudal region with development
Length at flexion: unknown
Length at transformation: unknown

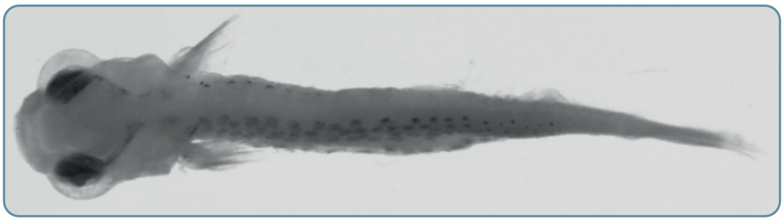
PHOTOS — by J.M. Rodriguez



4.9 mm SL

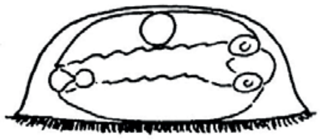


6.4 mm SL

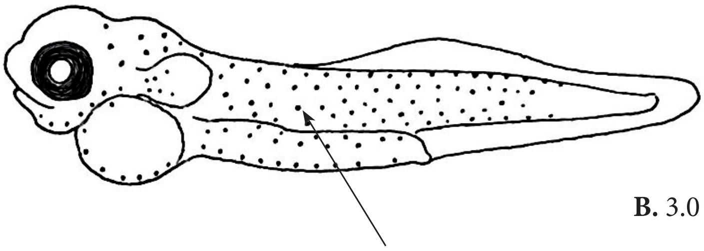


6.4 mm SL (dorsal view)

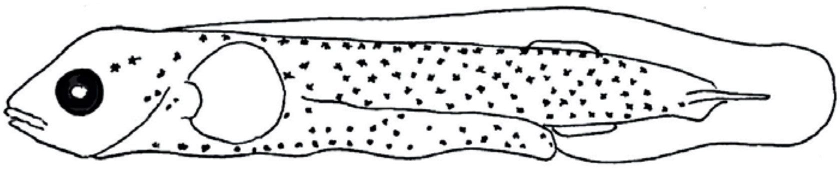
Diplecogaster bimaculata (Bonnaterre, 1788)



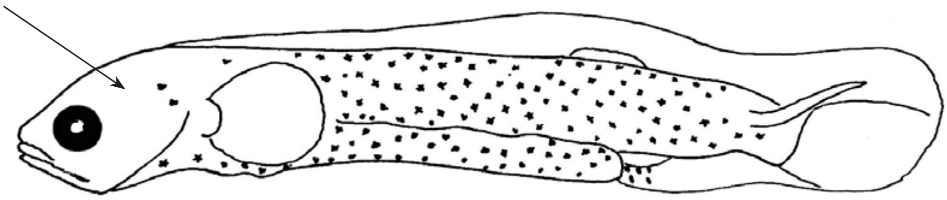
A.



B. 3.0 mm



C. 6.5 mm



D. 8.0 mm

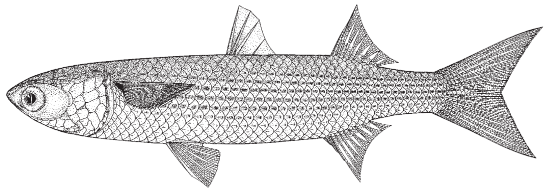
Literature: Briggs (1986), Brito *et al.* (2002), Russell (1976)

Illustrations' sources: A-D: modified from Russell (1976)

Mugil cephalus Linnaeus, 1758 — Flathead grey mullet - Mulet à grosse tête

Habitat: neritic, pelagic, inshore, entering estuaries and lagoons
Distribution: cosmopolitan in coastal waters of tropical, subtropical and temperate seas
Spawning season: July to October

Meristic characters
Myomeres: 24
Vertebrae: 24
Dorsal fin: V + 7-9
Anal fin: III + 8-9



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.72 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: one; diam. 0.28 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

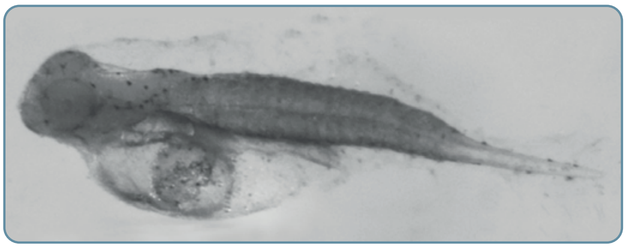
Hatch size: about 2.5 mm
Body: elongated
Yolk sac: ovoid
Oil globule location: at posterior edge of yolk sac
Anus: detached from yolk sac, reaches finfold border
Preanus length: about 60% SL
Pigmentation: heavily pigmented, except caudal region; dorsal and ventral rows of about 4 dotted melanophores at caudal region; yolk sac pigmented with melanophores located around oil globule; oil globule strongly pigmented

LARVAE — Figs. C-F

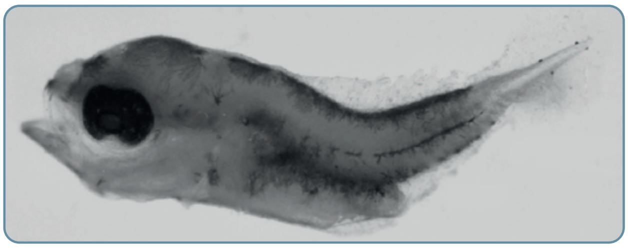
Body: relatively stubby
Head: moderate with an oblique mouth
Eye: round and large
Gut: large and bulky
Preanus length: up to 70% SL
Air bladder: apparent, even in early larvae
Spination: none

Pigmentation: strongly pigmented, except lateral sides of head and caudal region, where dotted melanophores of yolk-sack larvae persist; pigment is heaviest on dorsum, dorsal surface of gut and on postanal ventral region; mid–lateral row of melanophores apparent
Length at flexion: about 4.0-5.0 mm
Length at transformation: 10.0 mm

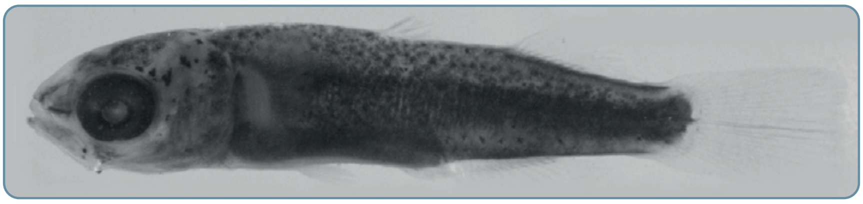
PHOTOS — by J.M. Rodriguez



2.3 mm SL

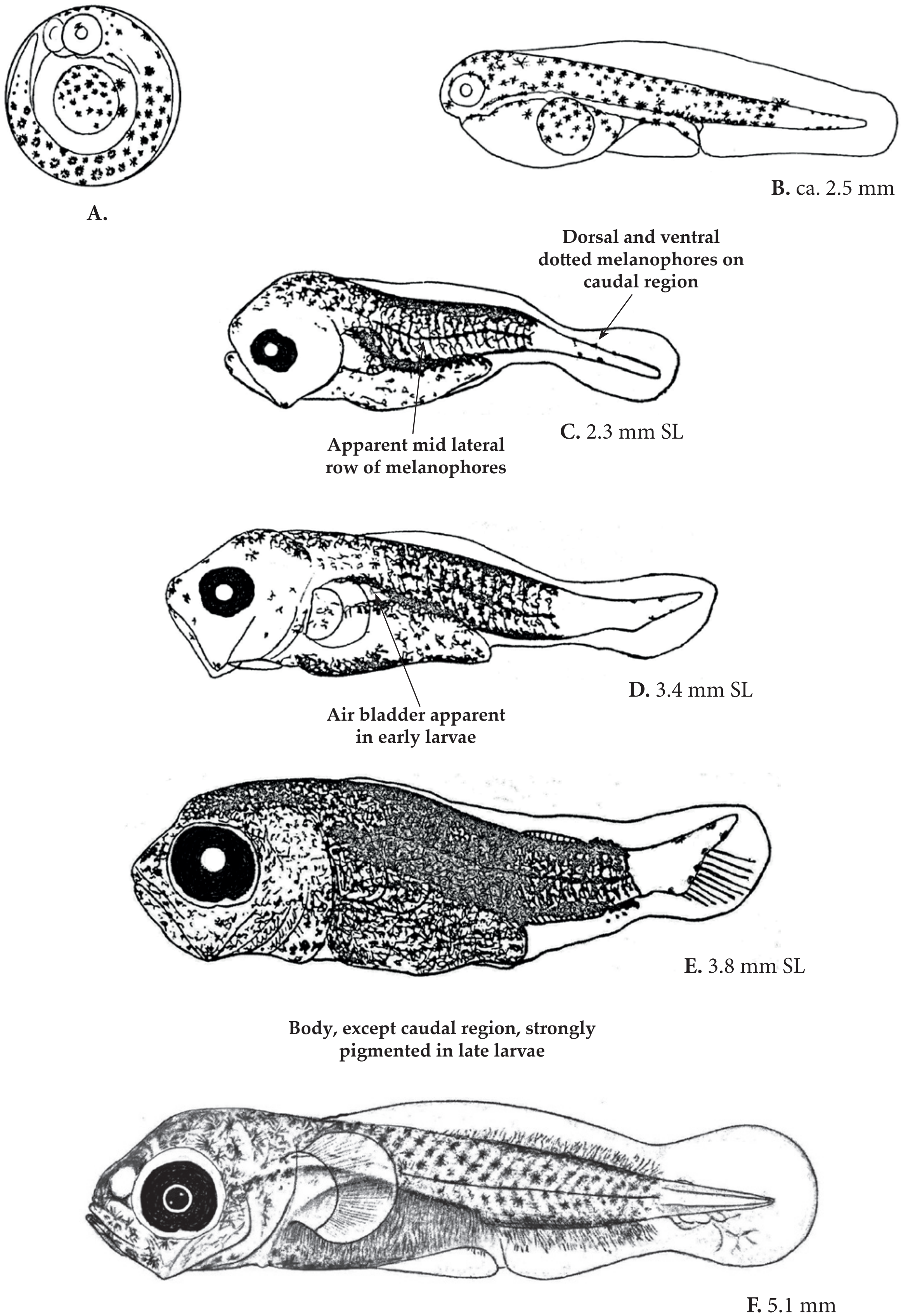


3.3 mm SL



7.5 mm SL

Mugil cephalus Linnaeus, 1758



Literature: Ben–Tuvia (1986), Ditty *et al.* (2006b), Fahay (2007), Froese and Pauly (2022), Sanzo (1936), Vialli (1937)

Illustrations' sources: A, B, F: Sanzo (1936); **C-E:** Alemany (1997)

MORONIDAE

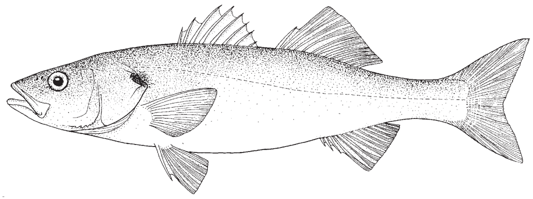
PERCIFORMES

Dicentrarchus labrax (Linnaeus, 1758)

European seabass – Bar européen

Habitat: neritic, demersal, between 10 and 100 m depth
Distribution: eastern Atlantic Ocean, from Senegal to Norway, and the Mediterranean Sea
Spawning season: January to March (Mediterranean Sea)

Meristic characters
Myomeres: 24
Vertebrae: 24
1st dorsal fin: XIII-IX
2nd dorsal fin: I + 12-13
Anal fin: III + 10-12



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 1.20-1.51 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: one; diam. 0.36-0.46 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

Hatch size: 3.5-4.0 mm
Body: elongate
Yolk sac: ovoid
Oil globule location: at ventral side of yolk sac
Anus: detached from yolk sac, reaches finfold border
Preanus length: > 50% SL
Pigmentation: strongly pigmented with melanophores forming bands situated over yolk sac, at level of anus, mid-tail and caudal region; ventral row of melanophores (above gut) and postanal region; yolk sac and oil globule pigmented

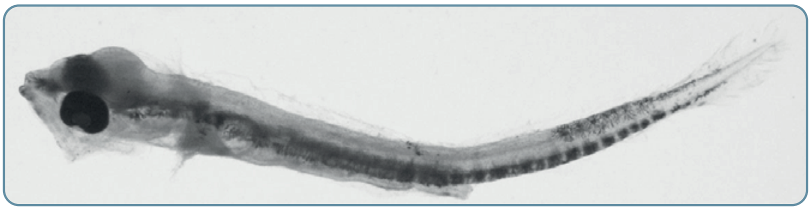
LARVAE — Figs. C-G

Body: very elongate and narrow
Head: small; mouth terminal and small
Eye: round
Gut: elongate, tube-like, forming a slight curve above air bladder
Preanus length: about 50% SL
Air bladder: present, prominent in late larvae
Spination: none

Pigmentation: continuous line of melanophores stretching from snout to caudal–fin base; dorsal melanophores restricted to tail end; tip of snout and lower jaw pigmented; melanophores on ventral side of head and gut; air bladder pigmented
Length at flexion: about 6.0 mm SL
Length at transformation: unknown

PHOTOS

by J.M. Rodriguez

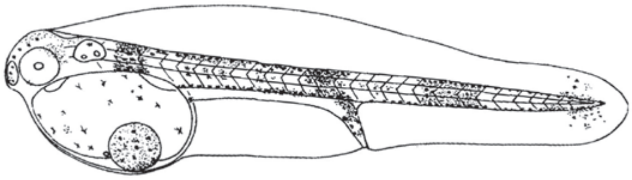


5.6 mm SL

6.7 mm SL

Dicentrarchus labrax (Linnaeus, 1758)

A.



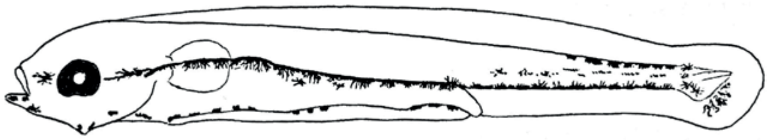
B. 4.5 mm

C. 5.0 mm

Continuous line of melanophores spreading from snout to caudal-fin base

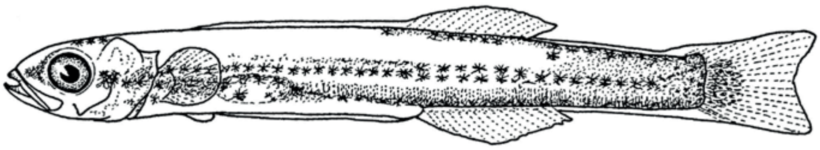
Tips of upper and lower jaw pigmented

D. 6.0 mm



E. 9.0 mm

F. 11.0 mm



G. 17.0 mm

Literature: Bertolini (1933b), Froese and Pauly (2022), Russell (1976), Sabatés (1988), Tortonese (1986d)

Illustrations' sources: A, G: Bertolini (1933b); **B, C:** Kennedy and Fitzmaurice (1968); **D-F:** modified from Russell (1976)

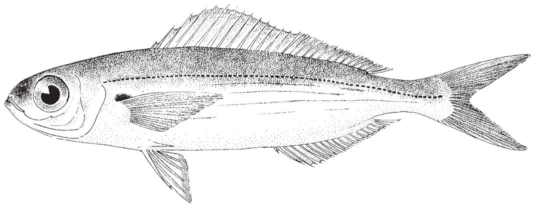
SPARIDAE

Boops boops (Linnaeus, 1758)

Bogue – Bogue

Habitat: neritic, benthopelagic, between 10 and 200 m depth
Distribution: eastern Atlantic Ocean, from Angola to Norway, and the Mediterranean Sea
Spawning season: March to May

Meristic characters
Myomeres: 24
Vertebrae: 24
Dorsal fin: XIII-XV + 12-16
Anal fin: III + 14-16



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.89 mm
Perivitelline space: small
Yolk: unsegmented: unpigmented
Oil globules: one; diam. 0.2 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

Hatch size: about 3.2 mm
Body: elongate and slender
Yolk sac: elongated
Oil globule location: at posterior end of yolk sac
Anus: close behind yolk sac, reaches finfold border
Preanus length: about 45% SL
Pigmentation: dorsal row of melanophores to about mid-tail; opposing dorsal and ventral bars of melanophores in posterior mid–tail; ventral series of melanophores posterior to ventral tail bar; a melanophore under urostyle; oil globule pigmented

LARVAE — Figs. C-G

Body: elongate and slender in early larvae, increases in height during development
Head: small; snout slightly rounded
Eye: round and large
Gut: triangular, terminal section forms a right angle with body
Preanus length: about 40% SL
Air bladder: prominent from early larvae on
Spination: opercular spines in larvae longer than 4.8 mm

Pigmentation: opposing dorsal and ventral bars of melanophores at about mid-tail in early larvae; a row of postanal ventral melanophores (ventral bar disappears with development); peritoneum pigmented; single melanophores over head (several in late larvae), under gut, and under urostyle (may be 2 in late larvae), which migrates to caudal-fin base with development; air bladder pigmented
Length at flexion: 5.20-5.80 mm
Length at transformation: unknown

PHOTOS

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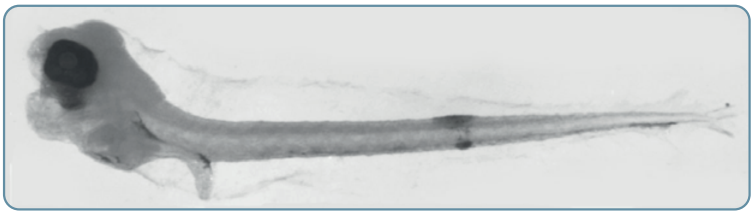
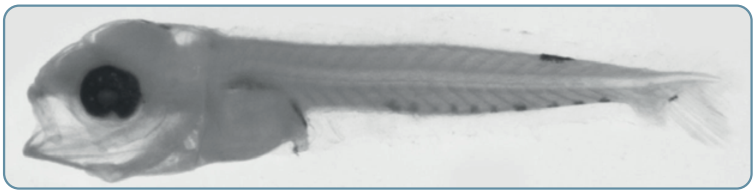
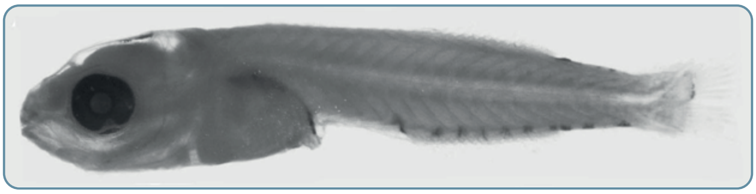


3.1 mm SL



6.1 mm SL

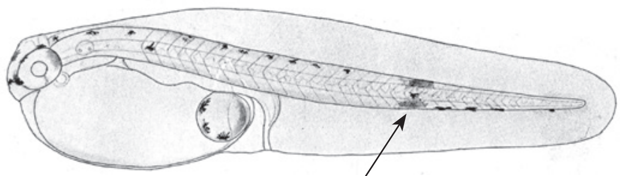


8.1 mm SL

PERCIFORMES

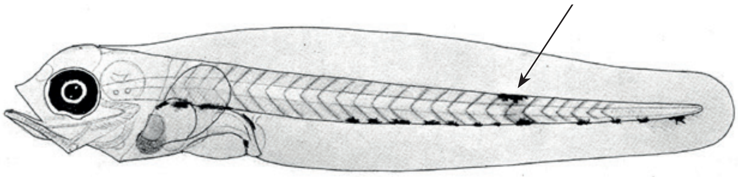
Boops boops (Linnaeus, 1758)

A.

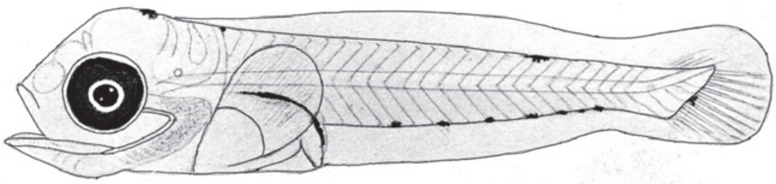


B. 3.2 mm

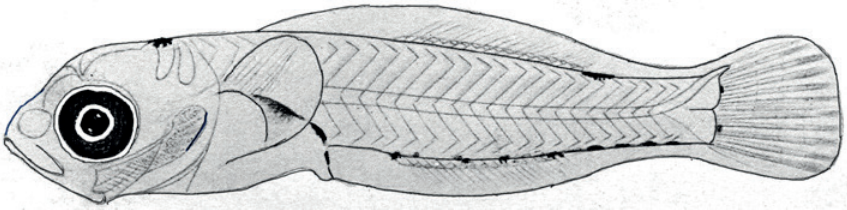
Opposing dorsal and ventral bars of melanophores at about mid-tail



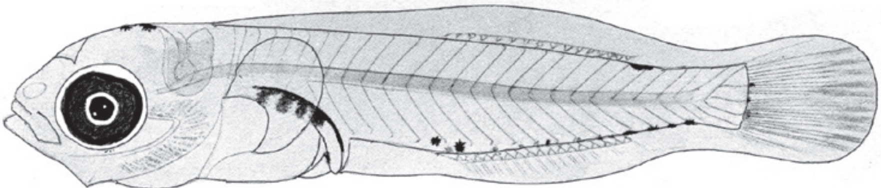
C. 5.2 mm



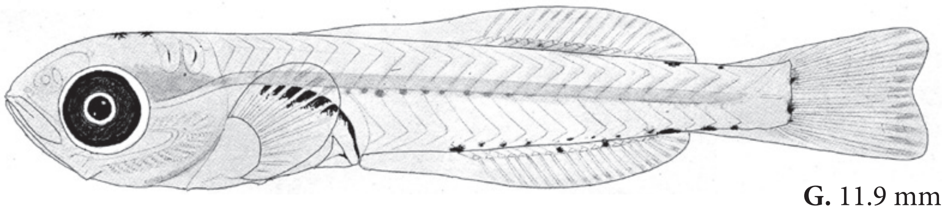
D. 6.0 mm



E. 7.1 mm



F. 8.2 mm



G. 11.9 mm

Literature: Bauchot and Hureau (1986), De Gaetani (1937), Froese and Pauly (2022), Ranzi (1933), Sabatés (1988)

Illustrations' sources: A-G: De Gaetani (1937)

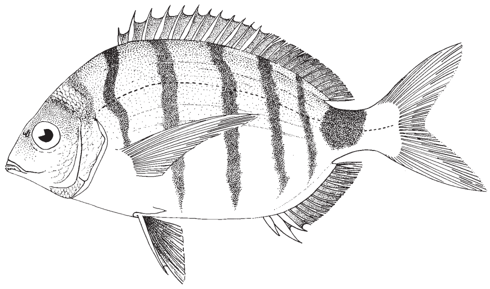
SPARIDAE

Diplodus sargus (Linnaeus, 1758)

White seabream – Sar commun

Habitat: neritic, littoral, demersal, to 50 m depth
Distribution: eastern Atlantic Ocean, from Angola to the British Iles, and the Mediterranean Sea
Spawning season: March to June (western Mediterranean Sea)

Meristic characters
Myomeres: 24
Vertebrae: 24
Dorsal fin: XI-XII + 12-15
Anal fin: III + 12-14



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.88-0.97 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: one; diam. 0.19-0.21 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

Hatch size: about 2.5 mm
Body: elongate and slender
Yolk sac: ovoid
Oil globule location: at posterior edge of yolk sac
Anus: close behind yolk sac, reaches finfold border
Preanus length: about 30% SL
Pigmentation: scattered melanophores over dorsum, ventral anterior mid-tail and above gut; oil globule pigmented

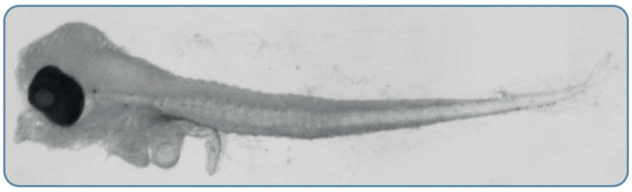
LARVAE — Figs. C-F

Body: elongate (the most among species belonging to this genus) and slender in early larvae
Head: relatively small; mouth small; snout rounded, mainly in later larvae
Eye: round and relatively large
Gut: triangular; anus forms a right angle with body
Preanus length: about 30% SL in early larvae, increases with development
Air bladder: present
Spination: two series of preopercular spines
Pigmentation: postanal ventral row of melanophores; peritoneum, ventral region of gut, occipital and shoulder regions pigmented; air bladder pigmented; there may be a dorsal melanophore on mid-tail in larvae about 4.0 mm long
Length at flexion: 7.5-8.0 mm
Length at transformation: unknown

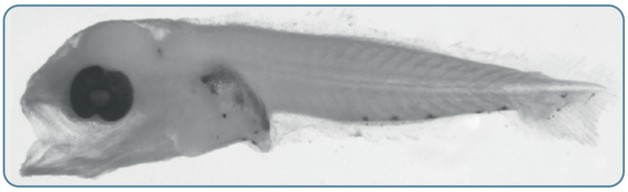
The genus *Diplodus* includes several species whose ELS are very similar. Here, the ELS of *D. sargus* are described as an aid to identify *Diplodus* larvae.

PHOTOS

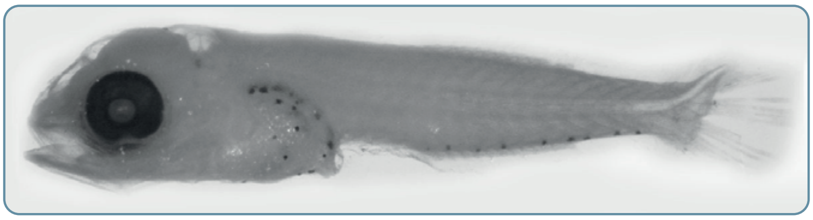
by J.M. Rodriguez



Diplodus sp. 2.4 mm SL



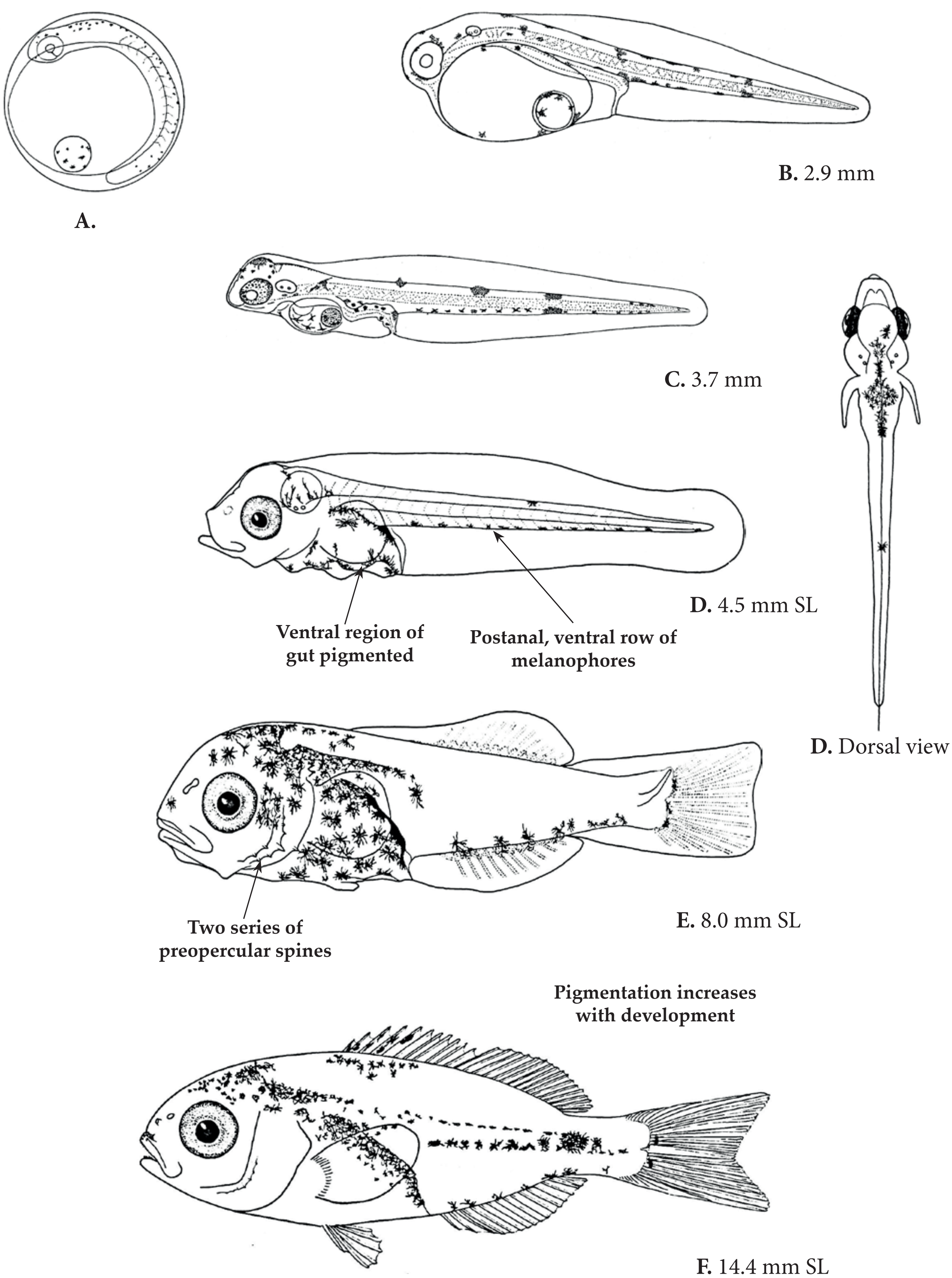
Diplodus sp. 4.5 mm SL



Diplodus sp. 5.4 mm SL

PERCIFORMES

Diplodus sargus (Linnaeus, 1758)



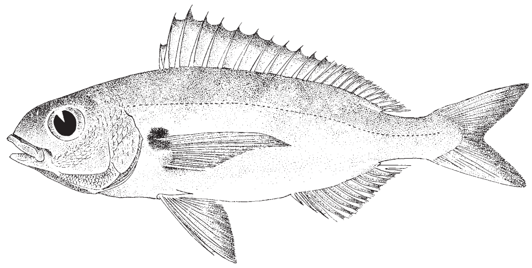
Literature: Bauchot and Hureau (1986), Olivar and Fortuño (1991), Ranzi (1933), Sabatés (1988)

Illustrations' sources: A-C: Ranzi (1933); **D-F:** Brownell (1979)

Pagellus acarne (Risso, 1826) — Axillary seabream – Pageot acarne

Habitat: neritic/upper slope, demersal, to 500 m depth
Distribution: eastern Atlantic Ocean, from Senegal to the British Isles, and the Mediterranean Sea
Spawning season: November to March

Meristic characters
Myomeres: 24
Vertebrae: 24
Dorsal fin: XII-XIII + 10-12
Anal fin: III + 9-10



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.9-1.0 mm
Perivitelline space: small
Yolk: unsegmented; unpigmented
Oil globules: one; diam. about 0.20 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

Hatch size: about 2.4 mm
Body: elongate
Yolk sac: ovoid
Oil globule location: at posterior, ventral edge of yolk sac
Anus: slightly detached from yolk sac, reaches finfold border
Preanus length: about 58% SL
Pigmentation: a dorsal and an opposed ventral melanophore at about mid-tail; a melanophore on ventral side of gut; oil globule pigmented

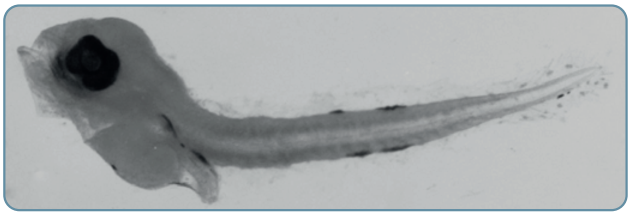
LARVAE — Figs. C-G

Body: shorter and stouter than that of *P. bogaraveo*
Head: relatively small; mouth relatively large; snout pointed
Eye: round and large
Gut: triangular; terminal section forms a right angle with body
Preanus length: about 52% SL
Air bladder: present
Spination: two series of preopercular spines, with central spine of outer series longer

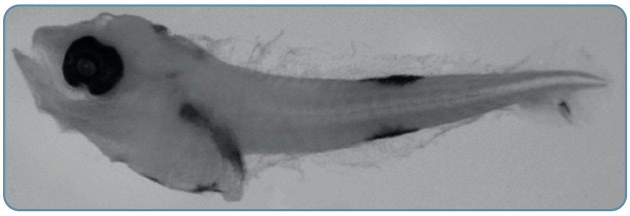
Pigmentation: a large dorsal (in some individuals there may be 2) and an opposed large ventral melanophore (in some, mainly early larvae up to 4) at about mid-tail; a melanophore on head, and on tip of upper jaw; peritoneum, air bladder, lateral side of gut pigmented; 2 (one in early larvae) melanophores on caudal-fin base; air bladder pigmented; pigmentation increases with development.
Length at flexion: unknown
Length at transformation: unknown

Remark: pigmentation quite variable

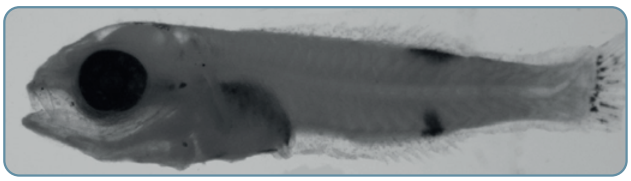
PHOTOS — by J.M. Rodriguez



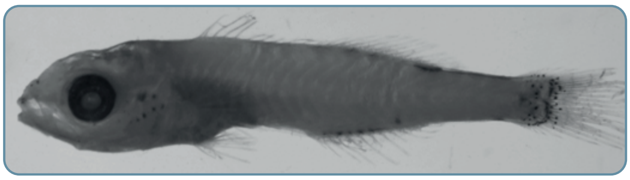
2.0 mm SL



3.7 mm SL

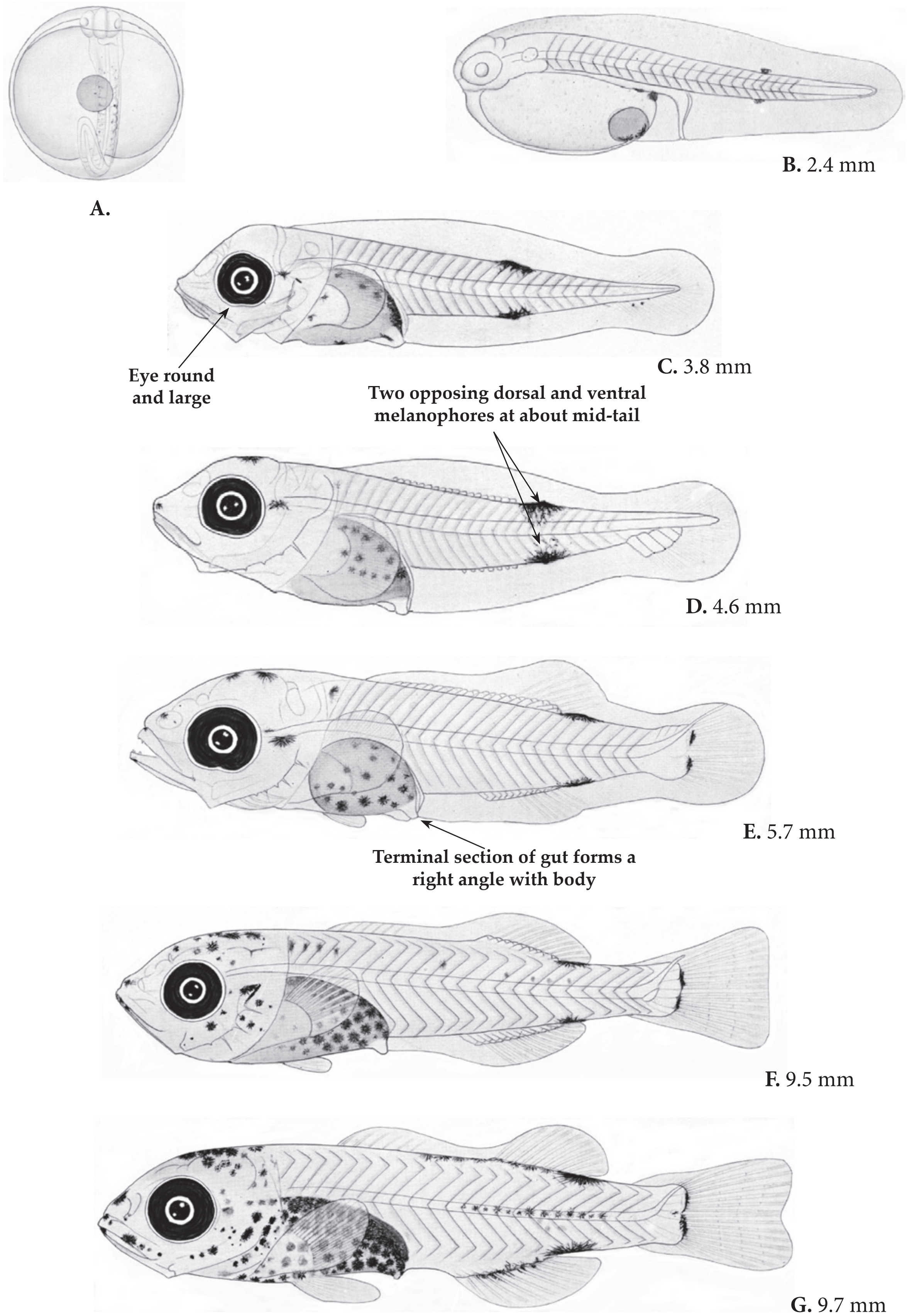


6.0 mm SL



11.5 mm SL

Pagellus acarne (Risso, 1826)



Literature: Bauchot and Hureau (1986), Froese and Pauly (2022), De Gaetani (1935), Ranzi (1933)

Illustrations' sources: A-G: De Gaetani (1935)

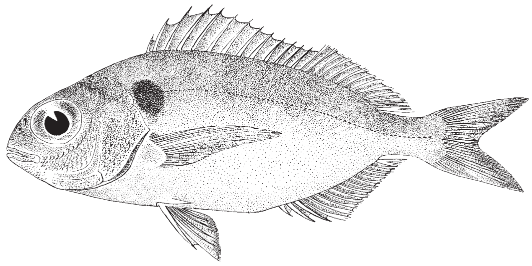
SPARIDAE

PERCIFORMES

Pagellus bogaraveo (Brünnich, 1768) — Blackspot(=red) seabream - Dorade rose

Habitat: neritic/upper slope, demersal, to 700 m depth
Distribution: eastern Atlantic Ocean, from Mauritania to Norway, and the Mediterranean Sea
Spawning season: January to May

Meristic characters
Myomeres: 24
Vertebrae: 24
Dorsal fin: XII-XIII + 11-13
Anal fin: III + 11-12



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. about 1.20 mm
Perivitelline space: small
Yolk: unsegmented; unpigmented
Oil globules: one; diam. about 0.28 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

Hatch size: about 3.8 mm
Body: elongate and slender
Yolk sac: ovoid
Oil globule location: at posterior edge of yolk sac
Anus: close behind yolk sac, reaches finfold border
Preanus length: about 40% SL
Pigmentation: dorsal melanophores between head and end of tail region; two opposing groups of melanophores at posterior tail; oil globule pigmented

LARVAE — Figs. C-G

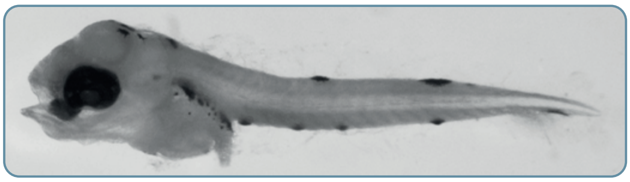
Body: relatively elongate and slender
Head: relatively small; mouth small; snout rounded
Eye: round and large
Gut: triangular; terminal section forms a right angle with body
Preanus length: about 40% SL
Air bladder: present
Spination: two series of preopercular spines

Pigmentation: numerous melanophores over head; large dorsal melanophores (2-4) on tail; about 6 (smaller) ventral melanophores on postanal region; peritoneum and ventral side of gut pigmented; a melanophore on ventral side of caudal peduncle in early larvae; caudal-fin base pigmented in later larvae; air bladder pigmented
Length at flexion: unknown
Length at transformation: unknown

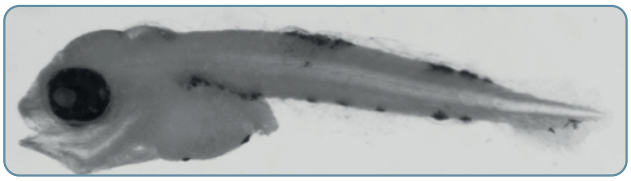
Remark: pigmentation quite variable

PHOTOS — by J.M. Rodriguez

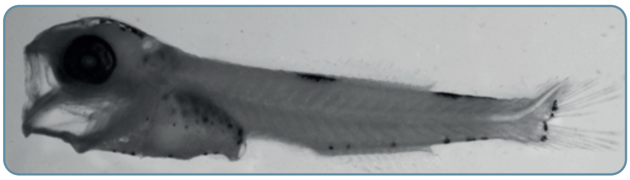
2.0 mm SL



4.5 mm SL

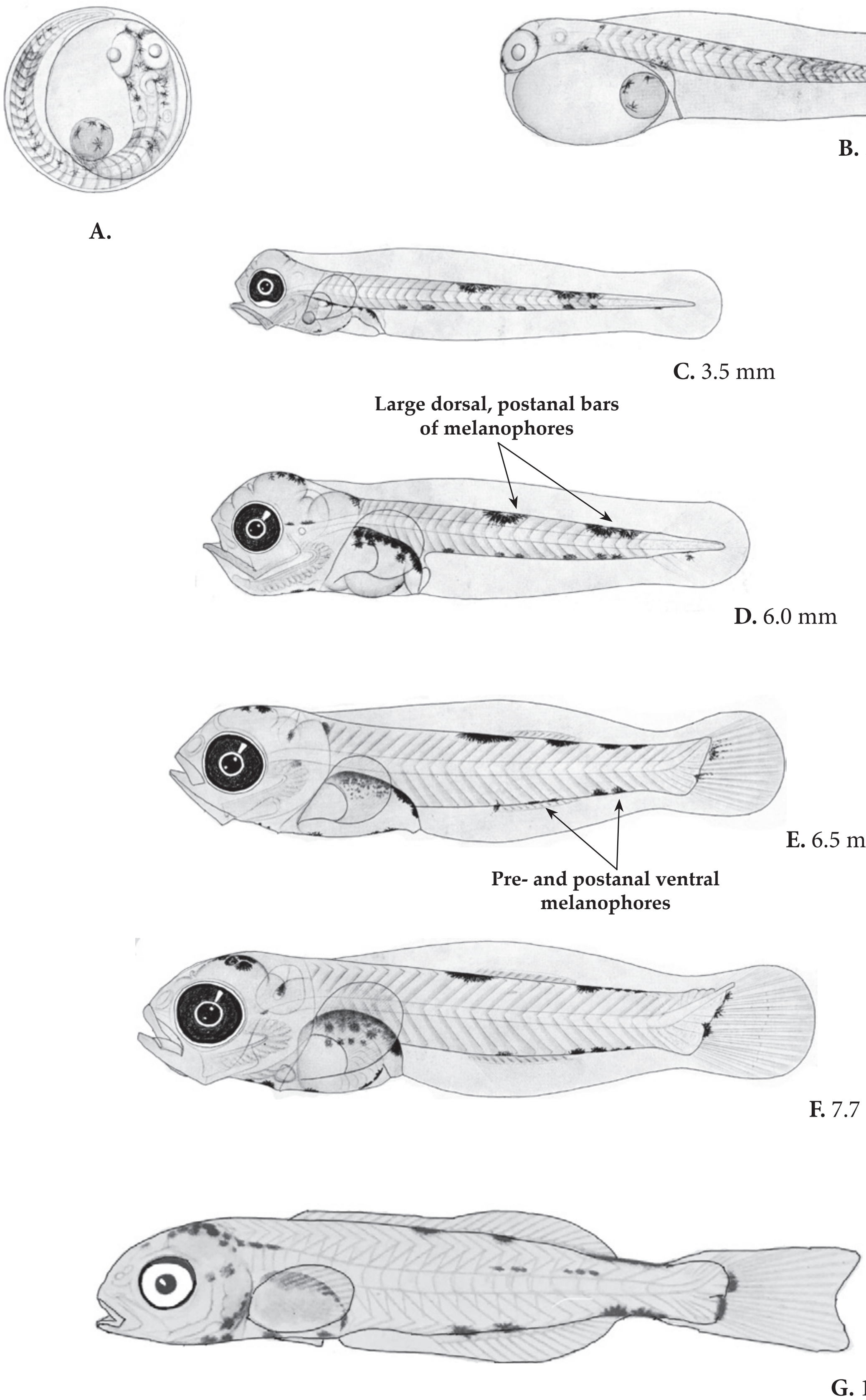


5.9 mm SL



8.0 mm SL

Pagellus bogaraveo (Brünnich, 1768)



Literature: Arbault and Boutin (1968), Bauchot and Hureau (1986), De Gaetani (1934), Ranzi (1933)

Illustrations' sources: A–F: De Gaetani (1934); **G:** Ranzi (1933)

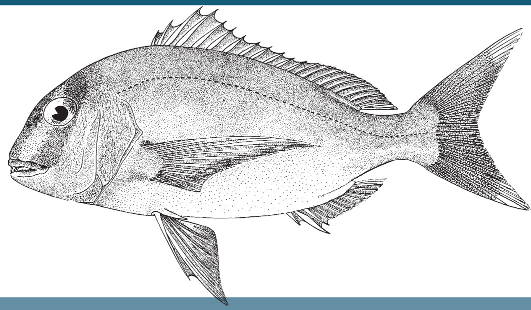
SPARIDAE

Pagrus pagrus (Linnaeus, 1758)

Red porgy – Pagre rouge

Habitat: neritic, benthopelagic, between 0 and 250 m depth
Distribution: eastern Atlantic Ocean, from Morocco to the British Isles, and the Mediterranean Sea
Spawning season: April to June

Meristic characters
Myomeres: 24
Vertebrae: 24
Dorsal fin rays: XI-XIII+ 9-12
Anal fin rays: III+7-9



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.89-0.93 mm
Perivitelline space: small
Yolk: unsegmented; unpigmented
Oil globules: one; diam. 0.18-0.20 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

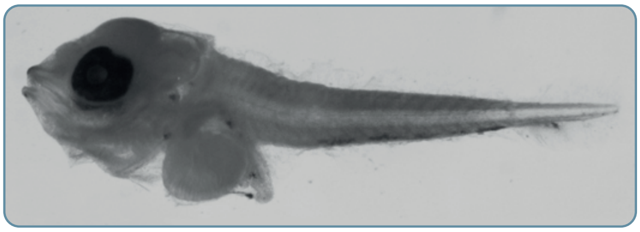
Hatch size: 1.92-3.04 mm SL
Body: slender
Yolk sac: elongate
Oil globule location: at posterior edge of yolk sac
Anus: close behind yolk sac, reaches finfold border
Preanus length: 40% SL
Pigmentation: melanophores along dorsal and ventral (from anus) midlines of body; head and oil globule pigmented

LARVAE — Figs. C-F

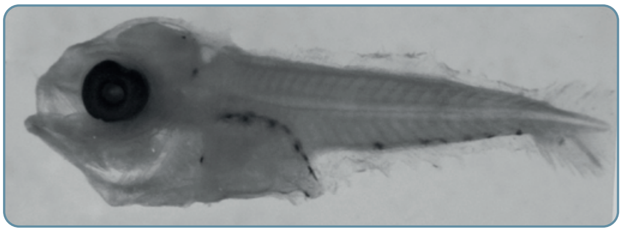
Body: relatively short and moderately deep through pectoral region
Head: large; mouth moderate
Eye: round and large
Gut: triangular; terminal section forms a right angle with body in early larvae
Preanus length: increases from 40% in early larvae to 60% in late larvae
Air bladder: present
Spination: occipital crest from early larvae on (specific character among Sparidae species); two series of preopercular spines, posterior series more developed with central spine very long; supraorbital spinous arch
Pigmentation: light; peritoneum pigmented; about 6 postanal, ventral melanophores that reduce to 1-3 during development; single melanophores on head, over terminal section of gut and base of caudal fin; air bladder pigmented
Length at flexion: 4.60-6.41 mm SL
Length at transformation: 9.5-13.0 mm SL

PHOTOS

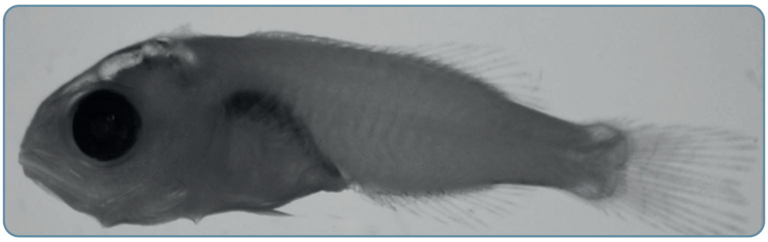
by J.M. Rodriguez



3.7 mm SL



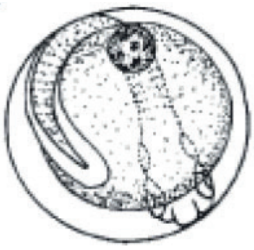
4.6 mm SL



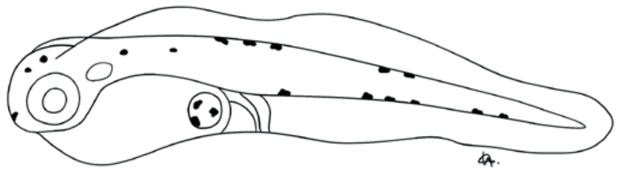
7.8 mm SL

PERCIFORMES

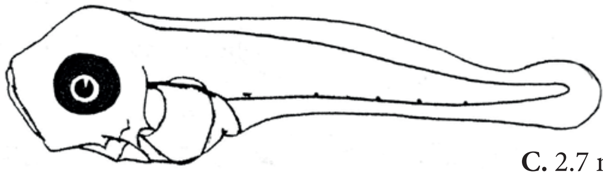
Pagrus pagrus (Linnaeus, 1758)



A.

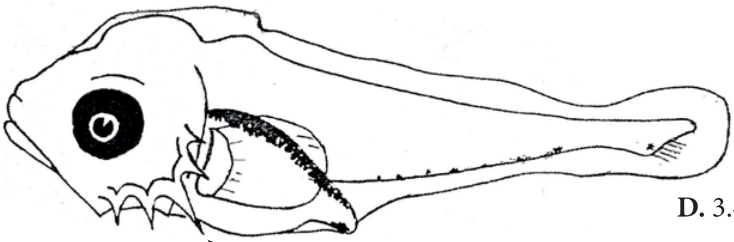


B. 2.4 mm SL



C. 2.7 mm SL

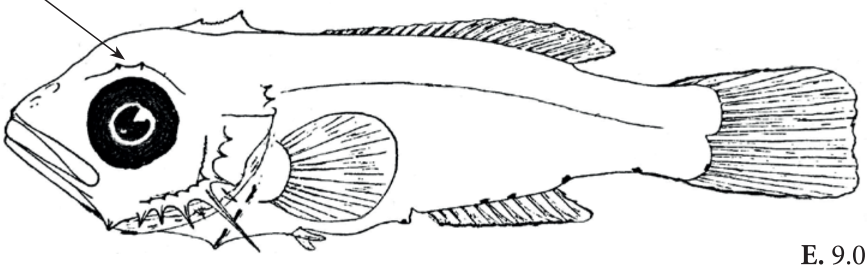
Body scantly pigmented



D. 3.4 mm SL

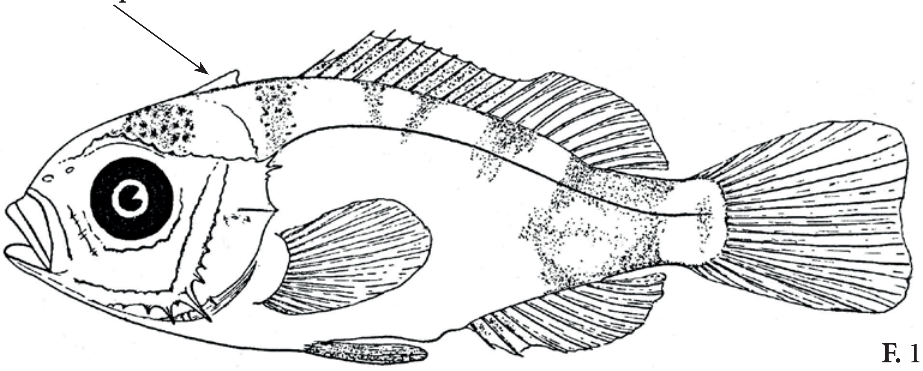
Supraorbital spinous arch

Large preopercular central spine



E. 9.0 mm

The only Sparidae species with occipital crest



F. 15.5 mm

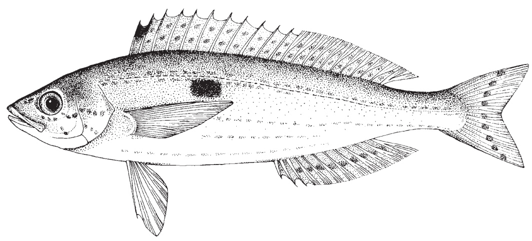
Literature: Fahay (2007), Froese and Pauly (2022), Bauchot and Hureau (1986), Machinandiarena *et al.* (2003), Ranzi (1933)

Illustrations' sources: A: Machinandiarena *et al.* (2003); **B:** L. Rodríguez (redrawn from Machinandiarena *et al.*, 2003); **C, D:** Alemany (1997); **E, F:** Fage (1918)

Spicara smaris (Linnaeus, 1758) — Picarel - Picarel

Habitat: neritic, demersal, between 15 and 170 m depth
Distribution: eastern Atlantic Ocean, from Morocco to Portugal, and the Mediterranean Sea
Spawning season: February to May

Meristic characters
Myomeres: NA
Vertebrae: NA
Dorsal fin: XI-XII + 10-12
Anal fin: III + 8-10



EGGS — Fig. A

Habitat: demersal, attached to objects
Shape: slightly elliptical
Chorion: smooth; size 0.89 x 0.72 mm
Perivitelline space: small
Yolk: segmented; unpigmented
Oil globules: one; diam. 0.19-0.21 mm; unpigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

Hatch size: unknown
Body: elongate and slender
Yolk sac: spherical
Oil globule location: in central-ventral side of yolk sac
Anus: close behind yolk sac, reaches finfold border
Preanus length: about 30% SL
Pigmentation: unpigmented

LARVAE — Figs. C-G

Body: elongate and slender in early larvae, becomes more robust with development
Head: moderately large and pointy
Eye: round and large
Gut: triangular
Preanus length: < 50% SL
Air bladder: present
Spination: two series of preopercular spines

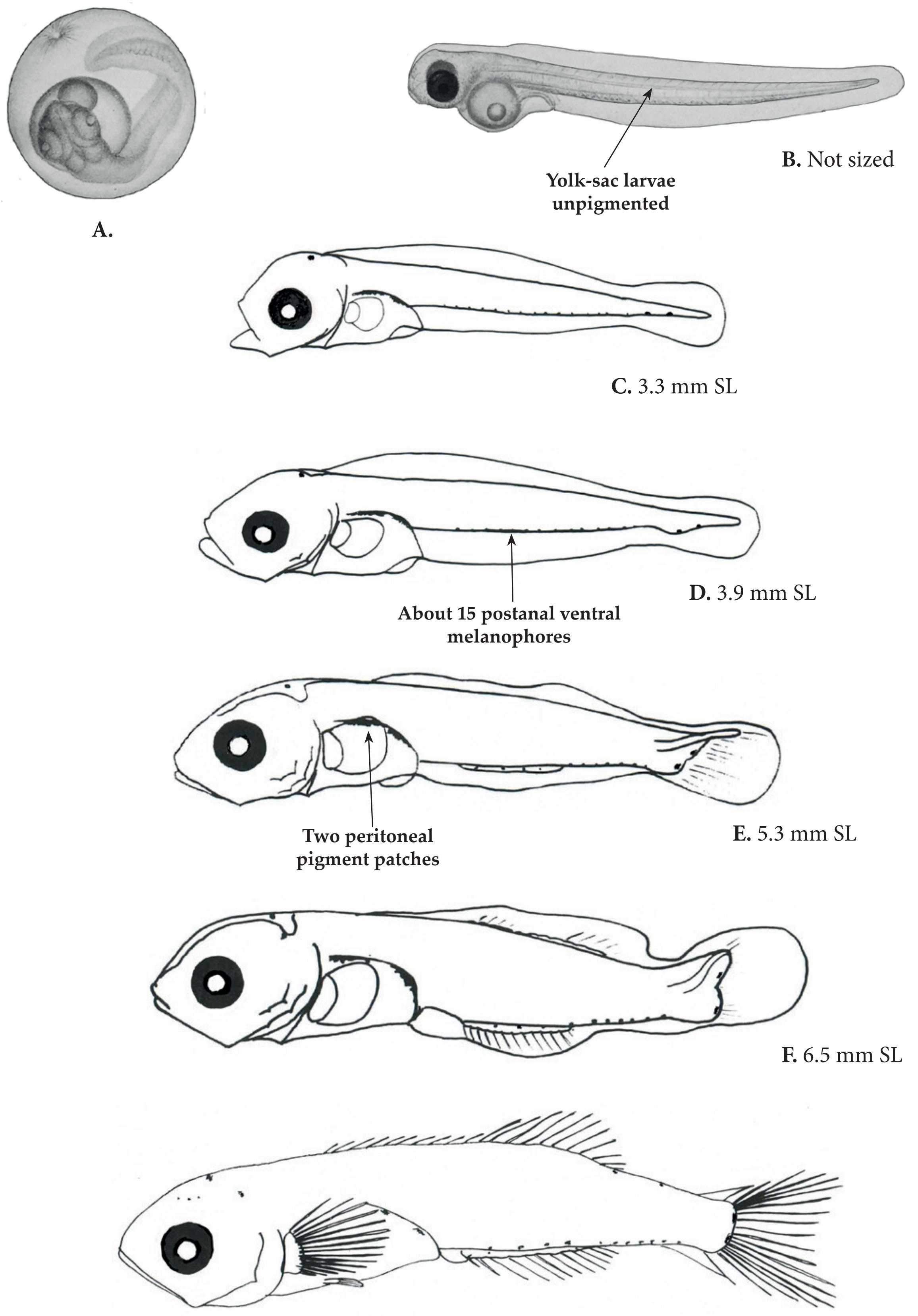
Pigmentation: a small occipital melanophore; 2 peritoneal pigment patches; around 15 postanal ventral melanophores, between beginning of anal fin to base of caudal fin; 1-3 dotted melanophores under urostyle that move to caudal-fin base in late larvae; 2 melanophores between dorsal and caudal fins in late larvae
Length at flexion: almost completed at 6.5 mm SL
Length at transformation: unknown

PHOTOS — by J.M. Rodriguez

3.4 mm SL

6.8 mm SL

Spicara smaris (Linnaeus, 1758)



Literature: Alemany (1997), Froese and Pauly (2022), Montalenti (1937c), Tortonese (1986b)

Illustrations' sources: A, B: Montalenti (1937c); **C-G:** Alemany (1997)

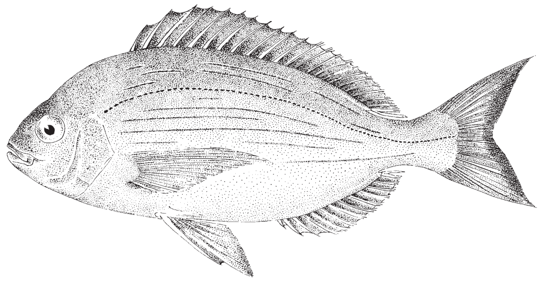
SPARIDAE

Spondyliosoma cantharus (Linnaeus, 1758)

Black seabream - Dorade grise

Habitat: neritic, demersal, from 5 to 300 m depth
Distribution: eastern Atlantic Ocean, from Namibia to Scandinavia, and the Mediterranean Sea
Spawning season: April to June

Meristic characters
Myomeres: 24
Vertebrae: 24
Dorsal fin: XI + 11-13
Anal fin: III + 9-11



EGGS

Habitat: demersal
Shape: spherical
Chorion: smooth; diam. 1.0-1.2 mm
Perivitelline space: moderately large
Yolk: unsegmented; pigmented
Oil globules: one; diam. 0.20-0.25 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. A

Hatch size: about 3.2 mm SL
Body: elongate and slender
Yolk sac: rounded
Oil globule location: ventral, posterior in yolk sac
Anus: slightly detached from yolk sac, reaches finfold border
Preanus length: about 33% SL
Pigmentation: yolk sac strongly pigmented; row of ventral melanophores from anus to about mid–tail in early yolk–sac larvae, reaches caudal region later; melanophores on head; yolk sac and oil globule pigmented

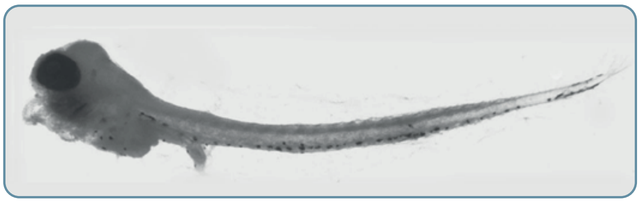
LARVAE — Figs. B-E

Body: elongate and slender in early larvae, increases in height during development
Head: relatively small; mouth relatively large
Eye: round and large
Gut: triangular; terminal section forms a right angle with body
Preanus length: < 50% SL until after flexion
Air bladder: present
Spination: two preopercular crests of small spines

Pigmentation: a postanal ventral, row of melanophores; ventral-lateral scattered melanophores developing at about 4.0 mm SL, becoming more numerous during development; peritoneum and ventral side of abdomen pigmented; a melanophore over terminal section of gut; melanophores over head and anterior region of trunk; air bladder pigmented
Length at flexion: about 6.0 mm SL
Length at transformation: unknown

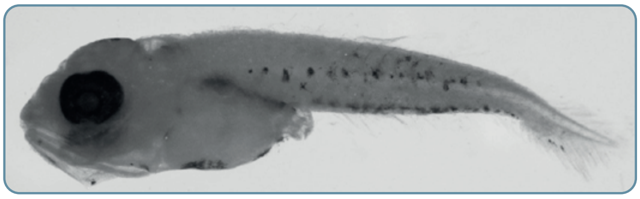
PHOTOS

by J.M. Rodriguez

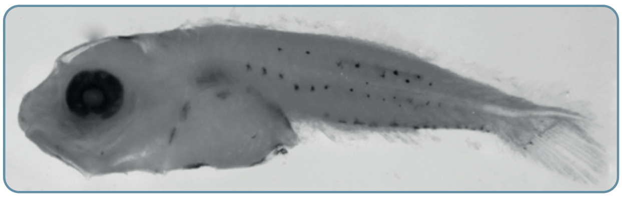


3.7 mm SL

4.1 mm SL



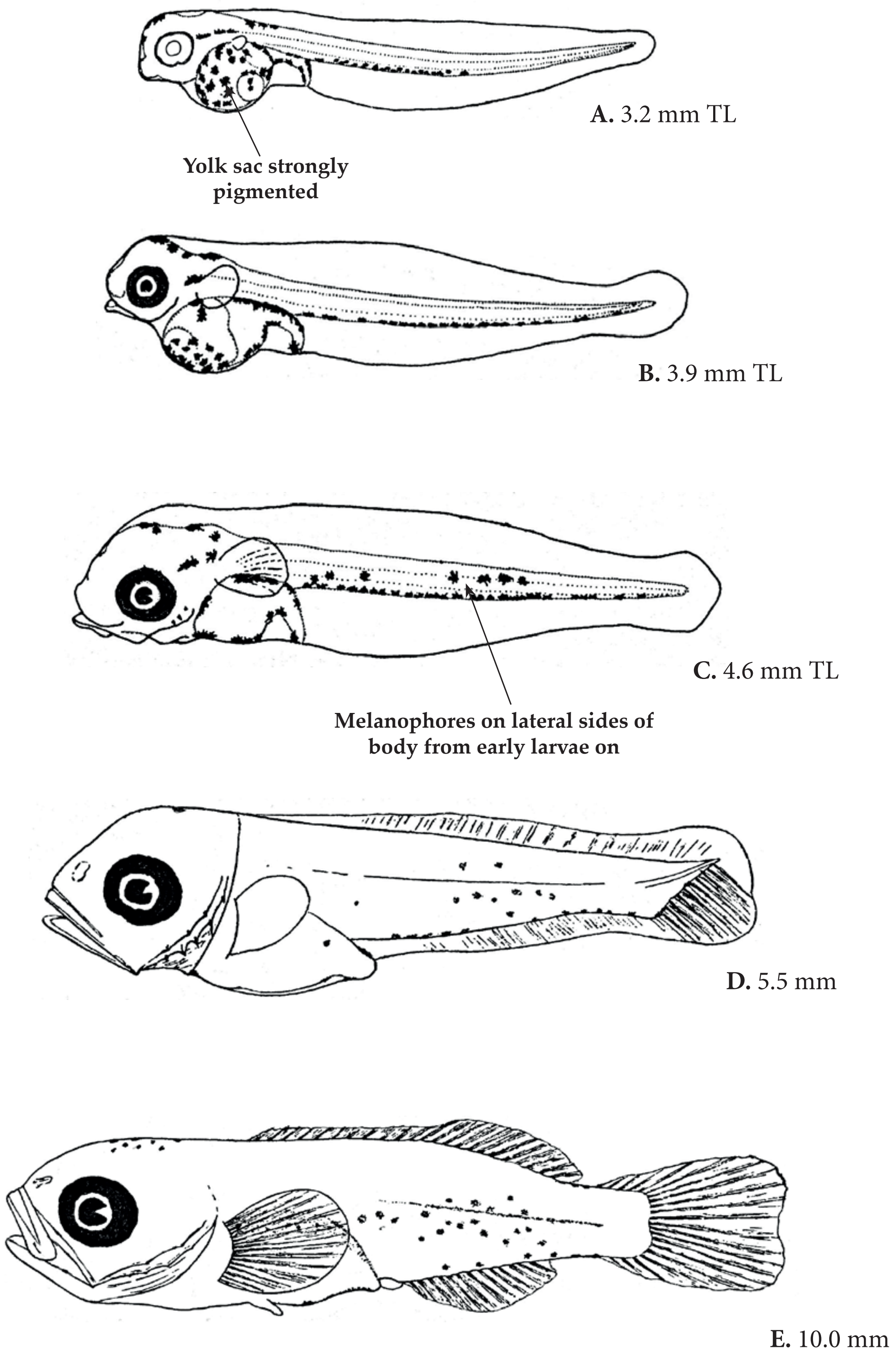
5.1 mm SL



6.2 mm SL

PERCIFORMES

Spondyliosoma cantharus (Linnaeus, 1758)



Literature: Bauchot and Hureau (1986), Camus and Besseau (1986), Fage (1918), Froese and Pauly (2022), Ranzi (1933), **Russell (1976)**

Illustrations' sources: A-C: Camus and Besseau (1986); **D, E:** Fage (1918)

CEPOLIDAE

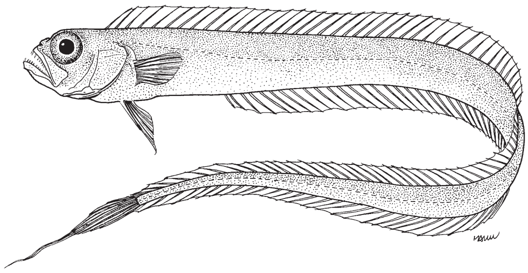
PERCIFORMES

Cepola macrophthalma (Linnaeus, 1758)

Red bandfish – Cépole commune

Habitat: neritic, demersal, from 15 to about 400 m depth
Distribution: eastern Atlantic Ocean, from north of Senegal to the British Isles, and the Mediterranean Sea
Spawning season: spring and autumn (Mediterranean Sea)

Meristic characters
Myomeres: NA
Vertebrae: NA
Dorsal fin: 67-69
Anal fin: 60



EGGS

The egg description that is available is not accurate

YOLK–SAC LARVAE

Undescribed

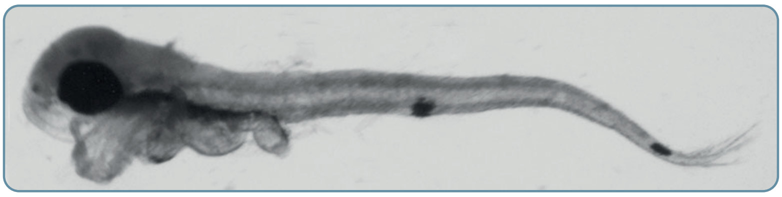
LARVAE

Figs. A-D

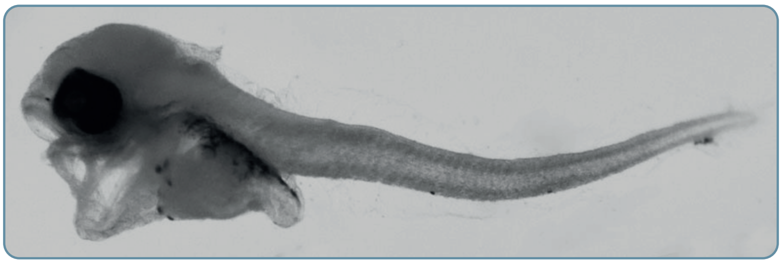
Body: rather elongate in early larvae, becomes very deep through head and pectoral regions with development
Head: moderately large
Eye: round and relatively large
Gut: triangular
Preanus length: about 50% SL
Air bladder: absent
Spination: from 3.0 mm, larvae show 2 opercular spines and an indication of an occipital spine; late larvae show two series of preopercular spines (7-9 spines), those at angle longer; occipital and supraorbital (with 4-5 teeth) crests, and a row of 6-7 small denticles along lower margin of jaw
Pigmentation: peritoneal region strongly pigmented; groups of 1-3 ventral melanophores, at about middle of tail and on caudal region; some melanophores under gut, over head and one over terminal gut; pigmentation disappears from tail and increases in anterior region of head and trunk during development
Length at flexion: unknown
Length at transformation: unknown

PHOTOS

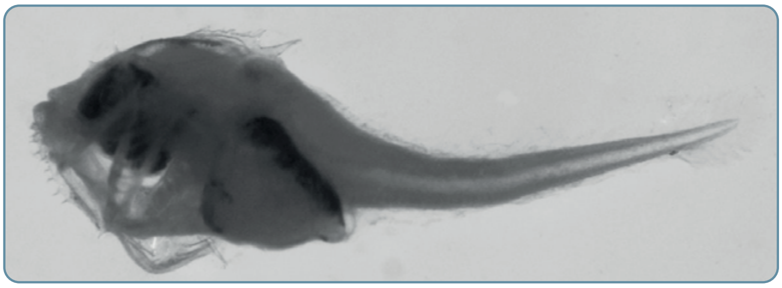
by J.M. Rodriguez



2.4 mm SL

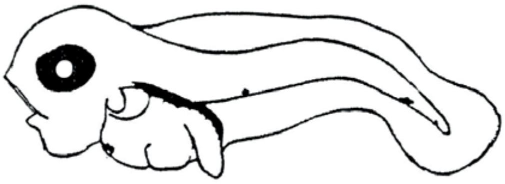


3.0 mm SL

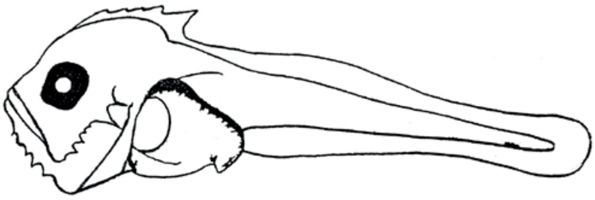


4.3 mm SL

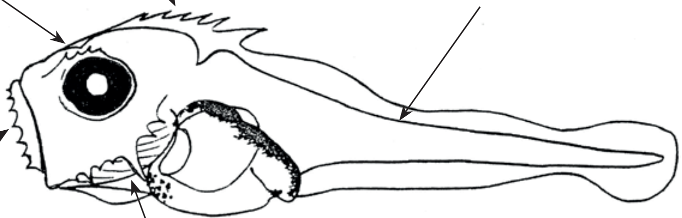
Cepola macrophthalma (Linnaeus, 1758)



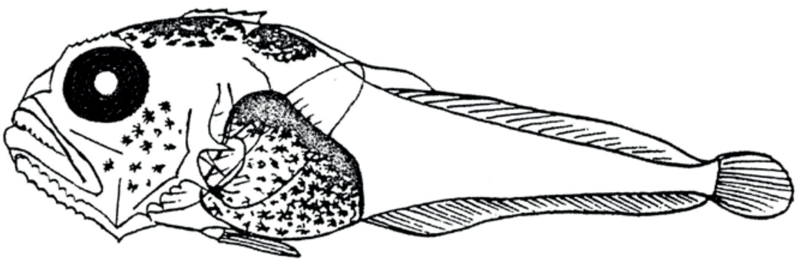
A. 1.7 mm SL



B. 3.0 mm SL



C. 3.9 mm SL



D. 7.2 mm SL

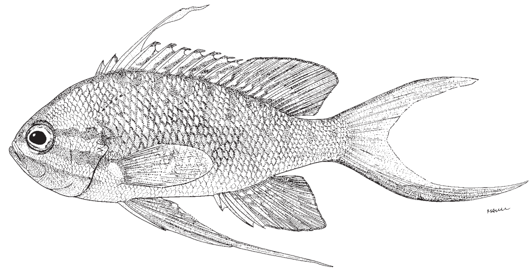
Literature: Montalenti (1937a), Russell (1976), Sabatés (1988), Tortonese (1986c)

Illustrations' sources: A-D: Alemany (1997)

Anthias anthias (Linnaeus, 1758) — Swallowtail seaperch – Barbier hirondelle

Habitat: neritic, demersal, to 300 m depth
Distribution: eastern Atlantic Ocean, from northern Namibia to Portugal, and the Mediterranean Sea
Spawning season: March to August

Meristic characters
Myomeres: NA
Vertebrae: NA
Dorsal fin: X + 15
Anal fin: III + 7



EGGS

Undescribed

YOLK–SAC LARVAE

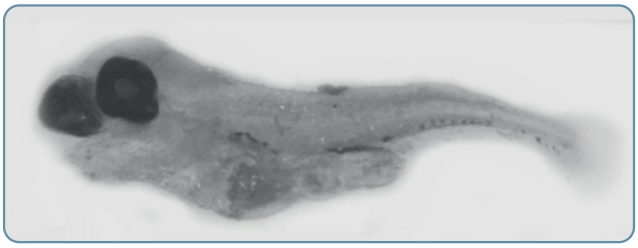
Undescribed

LARVAE — Figs. A-E

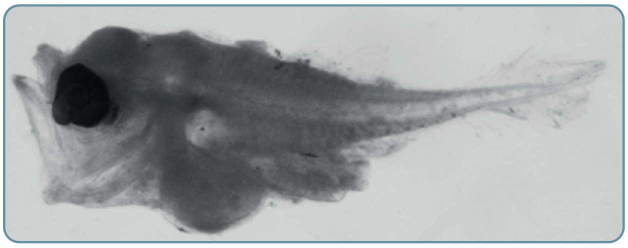
Body: deep through pectoral region, tapering towards caudal peduncle, becoming very deep and kite-shaped during development; 2nd dorsal-fin ray and first two pelvic-fin rays very elongated
Head: large and deep; mouth ventral and large
Eye: relatively large and round
Gut: triangular
Preanus length: > 50% SL
Air bladder: present
Spination: a supraorbital crest; three series (two in early larvae) of opercular spines, an inner series of short spines and two outer series with stronger spines, with central spine very elongated

Pigmentation: peritoneal region pigmented; a relatively large spot over terminal gut and another one (large) opposite it in dorsal region, which migrates to dorsal fin with development; a series of melanophores between anus and caudal fin, decreasing in number to 3 in late larvae; a melanophore on caudal-fin base; air bladder pigmented
Length at flexion: 3.3–6.0 mm SL, usually completed at 5.6 mm SL
Length at transformation: unknown

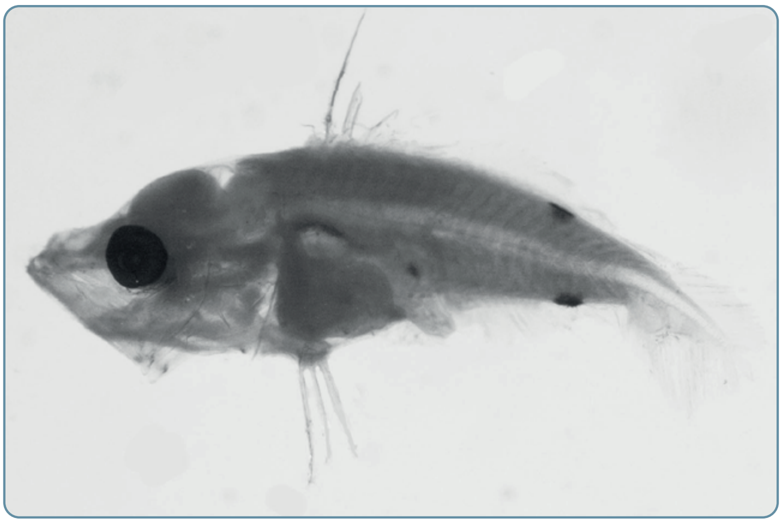
PHOTOS — by J.M. Rodriguez



1.6 mm SL

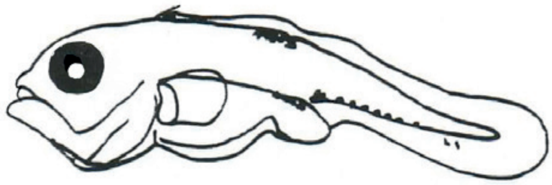


2.0 mm SL

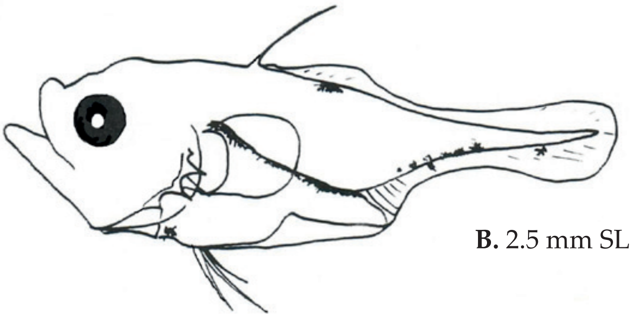


5.6 mm SL

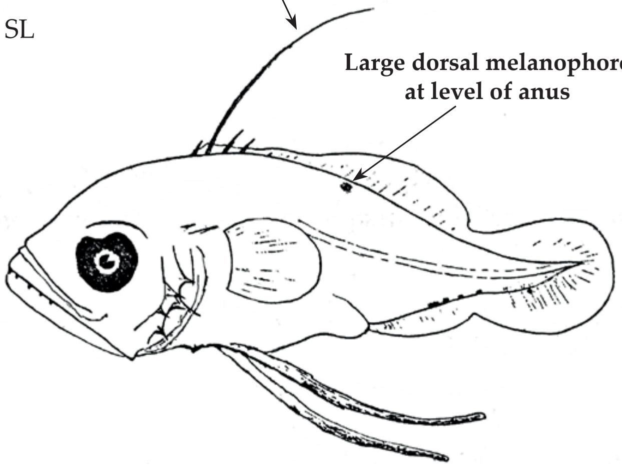
Anthias anthias (Linnaeus, 1758)



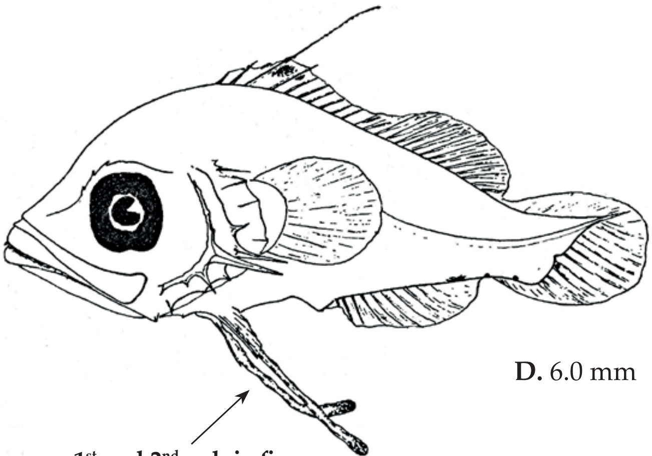
A. 1.9 mm SL



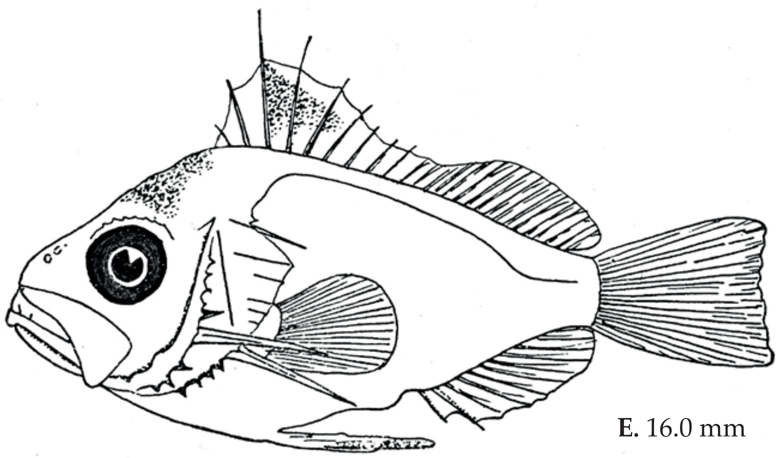
B. 2.5 mm SL



C. 4.0 mm



D. 6.0 mm



E. 16.0 mm

Literature: Alemany (1997), Bertolini (1933b), Froese and Pauly (2022), Olivar and Fortuño (1991), Sabatés (1988), Tortonese (1986d)

Illustrations' sources: A, B: Alemany (1997); **C-E:** Fage (1918)

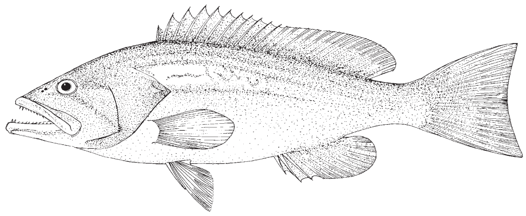
SERRANIDAE

Epinephelus costae (Steindachner, 1878)

Goldblotch grouper - Mérou badèche

Habitat: neritic, demersal, between 20 and 80 m depth
Distribution: Eastern Atlantic, from Angola to Portugal, and the Mediterranean Sea
Spawning season: May to October

Meristic characters
Myomeres: 24
Vertebrae: 24
Dorsal fin: XI + 15-17
Anal fin: III + 8



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

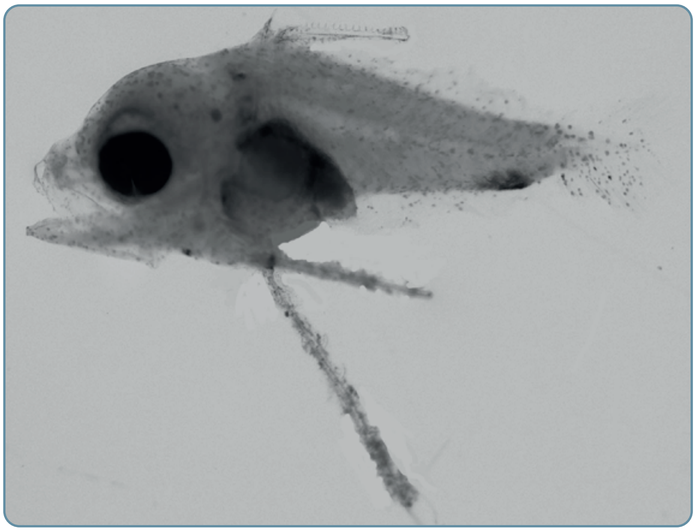
Figs. A-E

Body: deep through head and trunk in early larvae, becomes moderately elongate with development; 2nd spine of 1st dorsal fin and pelvic-fin spine strongly developed and stout with serrate edges; dorsal-fin spine grows in length from 24% to 59% SL
Head: large, deeper in early larvae; snout moderately pointed
Eye: round and large
Gut: triangular
Preanus length: around 55% SL
Air bladder: absent
Spination: 2-4 (number increases with development) preopercular spines, with spine at preopercle angle longer and serrate; a post-temporal spine in late larvae
Pigmentation: body slightly pigmented; a ramified melanophore on ventral region of caudal peduncle, migrates to lateral side of it with development; peritoneum pigmented; some melanophores on top of head in late larvae
Length at flexion: unknown
Length at transformation: unknown

Note: the early life stages of this species were described by Aboussouan (1972) as those of *E. aeneus*. However, genetic analysis adscribed them to *E.costae*.

PHOTOS

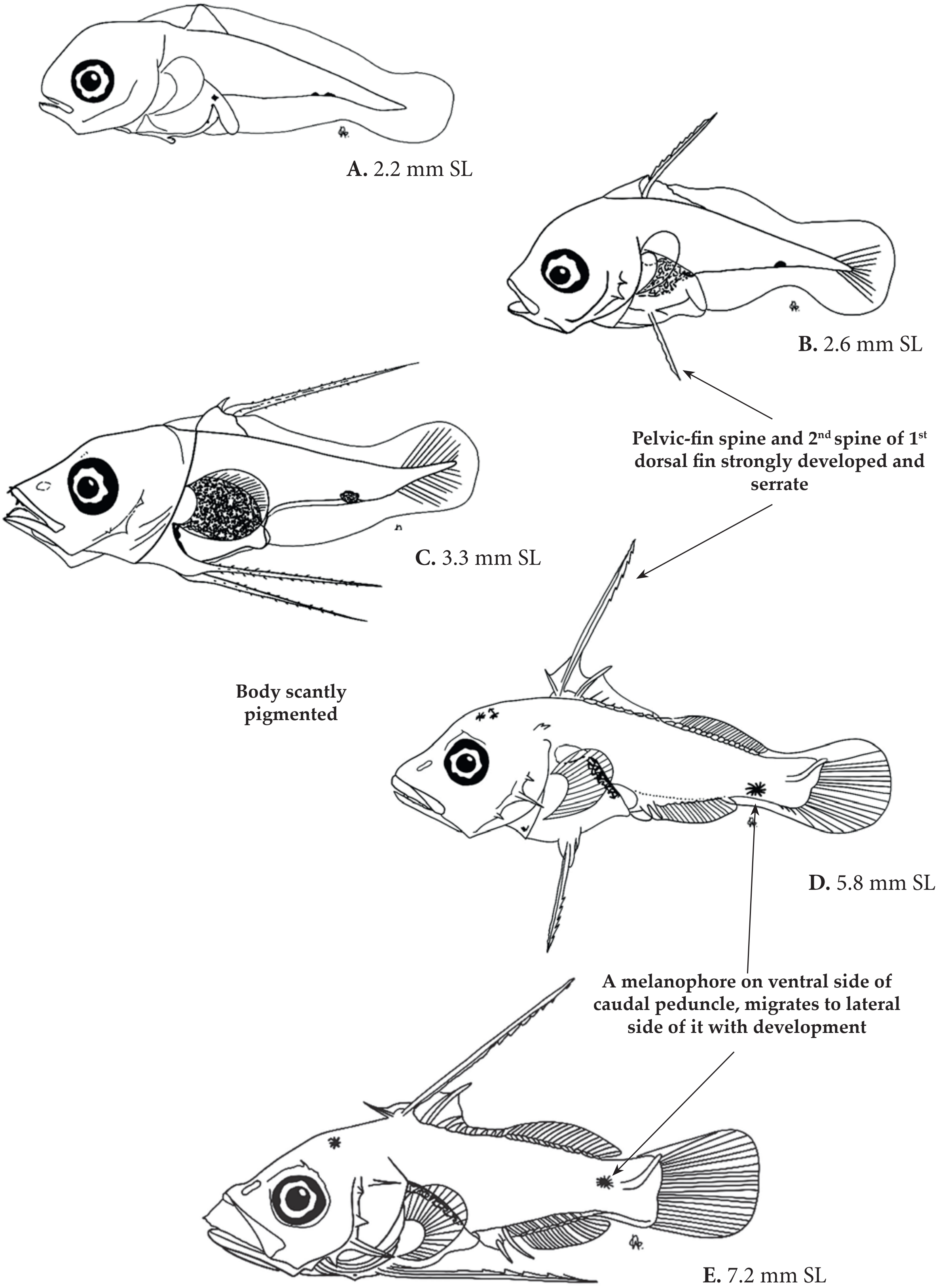
by S. Isari



4.9 mm SL

PERCIFORMES

Epinephelus costae (Steindachner, 1878)



Literature: Aboussouan (1972), Heemstra and Randall (2016)

Illustrations' sources: A-E: L. Rodríguez (redrawn from Aboussouan, 1972)

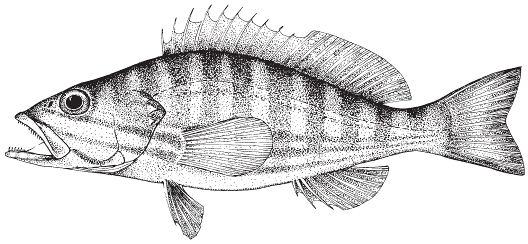
SERRANIDAE

Serranus cabrilla (Linnaeus, 1758)

Comber - Serran-chèvre

Habitat: neritic and upper slope, demersal, to about 500 m depth
Distribution: eastern Atlantic Ocean, from South Africa to the English Channel, and the Mediterranean Sea
Spawning season: February to June (Canary Islands)

Meristic characters
Myomeres: 24
Vertebrae: 24
Dorsal fin rays: X+13-15
Anal fin rays: III+7-8



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.90-0.97 mm
Perivitelline space: small
Yolk: unsegmented; unpigmented
Oil globules: one; diam. 0.14-0.15 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

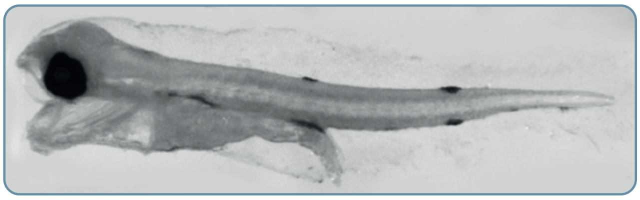
Hatch size: 1.84-2.30 mm SL
Body: elongated and slender
Yolk sac: ovoid, large, projected beyond snout
Oil globule location: at ventral side of yolk sac
Anus: detached from yolk sac, reaches finfold border
Preanus length: about 55% SL
Pigmentation: row of dorsal melanophores extending from head to level of anus; a large melanophore on terminal gut; a dorsal and a ventral large melanophore situated at about mid-tail; oil globule pigmented

LARVAE — Figs. C-F

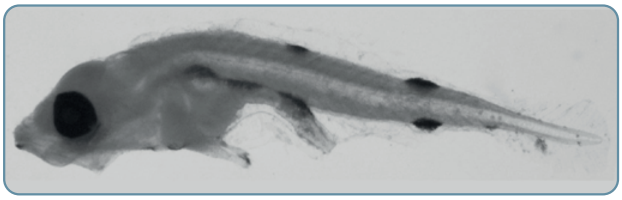
Body: elongated in early larvae, increases in height with development; pelvic fins long; third dorsal-fin spine becomes stouter and longer
Head: large and concave; mouth large, extending to about midline of eye and slightly oblique
Eye: round
Gut: elongated and globose
Preanus length: about 50% SL
Air bladder: present
Spination: two rows of preopercular spines, anterior row with 2 short spines and posterior row with 3 larger spines; a series of small opercular spines; 2 otocistic spines
Pigmentation: similar to yolk-sac larvae; with development add melanophores on ventral abdominal region and 3 postanal ventral melanophores, one located between anus and large ventral melanophore and 2 posterior to it, the last one migrates to base of caudal fin; tip of lower jaw, pelvic fins and air bladder pigmented
Length at flexion: about 6.1 mm SL
Length at transformation: unknown

PHOTOS

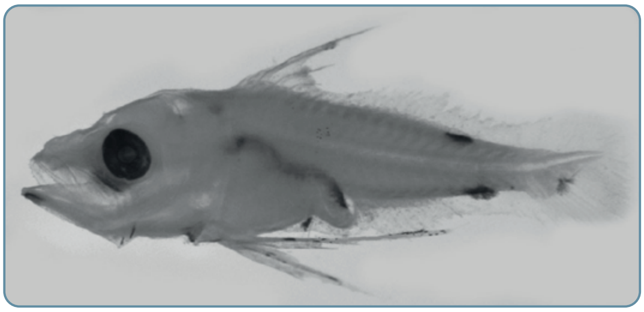
by J.M. Rodriguez



3.0 mm SL



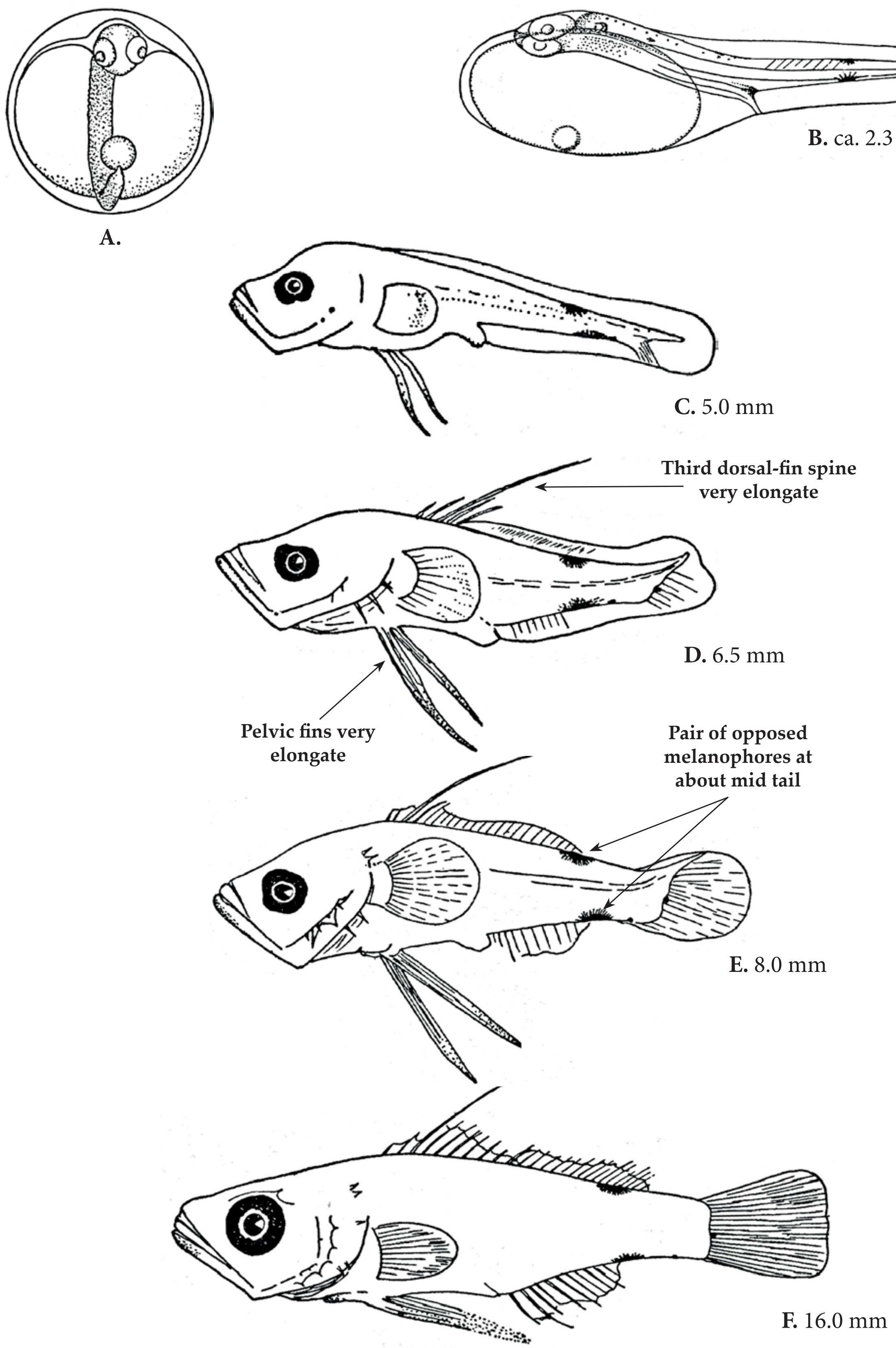
4.0 mm SL



6.2 mm SL

PERCIFORMES

Serranus cabrilla (Linnaeus, 1758)



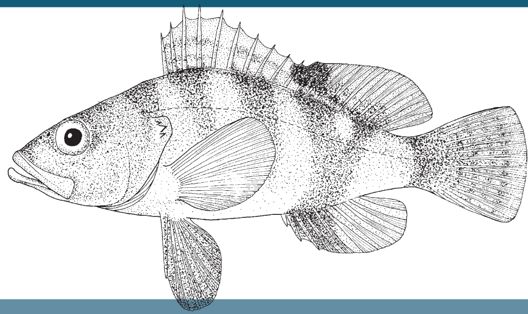
Literature: Alemany (1997), Bertolini (1933b), Fage (1918), Froese and Pauly (2022), Olivar and Fortuño (1991), Russell (1976), Tortonese (1986l)

Illustrations' sources: A-C: Bertolini (1933b); **D-F:** Fage (1918)

Serranus hepatus (Linnaeus, 1758) — Brown comber – Serran tambour

Habitat: neritic, demersal, between 5 and 100 m depth
Distribution: eastern Atlantic Ocean, from Senegal to Portugal, and the Mediterranean Sea
Spawning season: March to August (Mediterranean Sea)

Meristic characters
Myomeres: 24
Vertebrae: 24
Dorsal fin: X + 11-13
Anal fin: III + 6-7



EGGS

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.78 mm
Perivitelline space: small
Yolk: unsegmented
Oil globules: one; diam. 0.14 mm
Colour: transparent

YOLK–SAC LARVAE

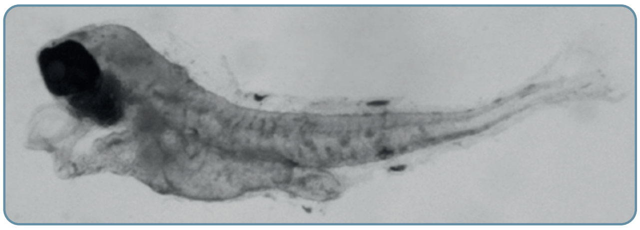
Undescribed

LARVAE — Figs. A-F

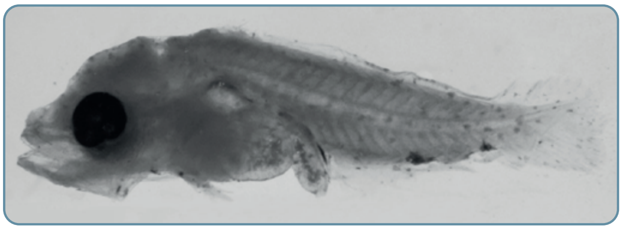
Body: moderately stocky, deepest through pectoral region; pelvic fins weakly developed
Head: large, moderately deep and slightly concave; mouth relatively large and slightly oblique
Eye: round
Gut: relatively elongated and globose
Preanus length: > 50% SL
Air bladder: present
Spination: two series of preopercular spines, posterior series with larger spines; 4 opercular spines, upper spine much longer

Pigmentation: 2 dorsal and a single ventral melanophore over finfold in early larvae; 3 regularly spaced, postanal, ventral melanophores; a melanophore over anus and another on cleithral symphysis; some melanophores on ventral surface of gut; no dorsal melanophores; peritoneum, air bladder and pelvic fins pigmented
Length at flexion: almost completed at 5.7 mm SL
Length at transformation: unknown

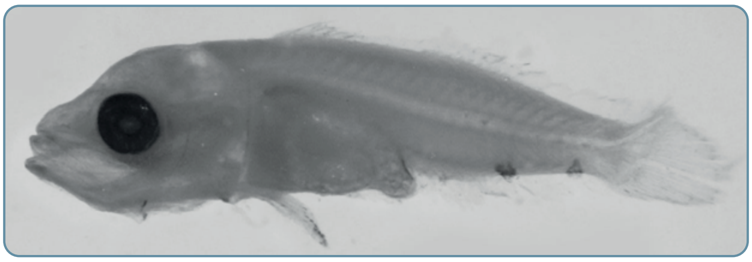
PHOTOS — by J.M. Rodriguez



2.1 mm SL

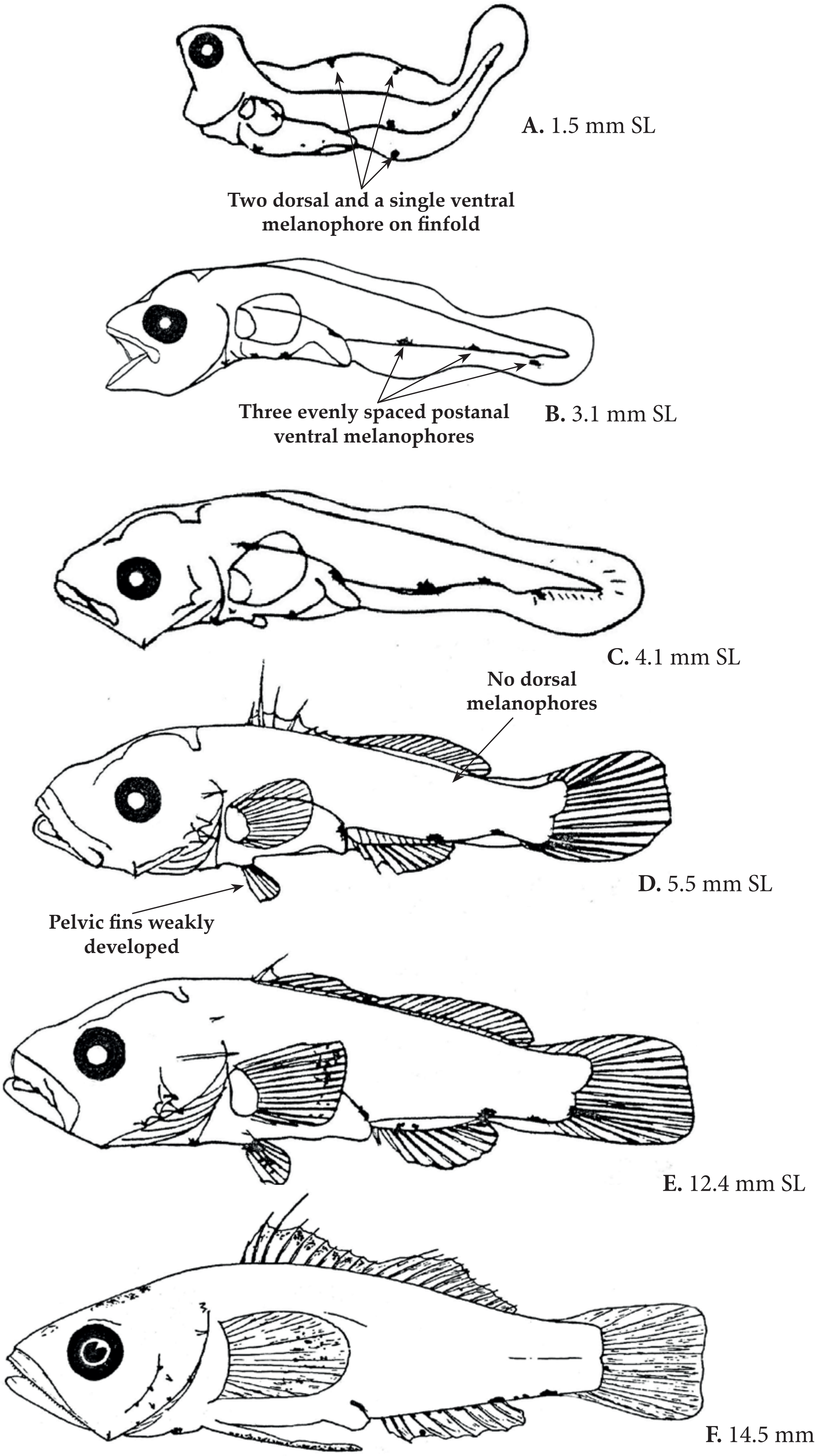


5.5 mm SL



6.5 mm SL

Serranus hepatus (Linnaeus, 1758)



Literature: Alemany (1997), Bertolini (1933b), Fage (1918), Tortonese (1986d)

Illustrations' sources: A-E: Alemany (1997); **F:** Fage (1918)

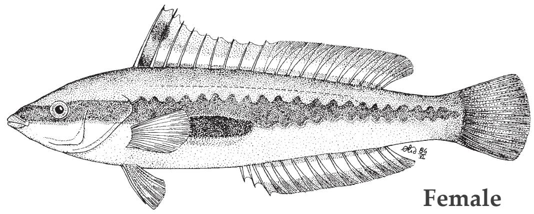
LABRIDAE

Coris julis (Linnaeus, 1758)

Rainbow wrasse - Girelle

Habitat: neritic, demersal, from one to about 60 m depth
Distribution: eastern Atlantic Ocean, from Gabon to Sweden, and the Mediterranean Sea
Spawning season: April to August (Mediterranean Sea)

Meristic characters
Myomeres: 25-26
Vertebrae: 25-26
Dorsal fin: VII + 11-12
Anal fin: III + 11-12



Female

EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.60-0.67 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: one; diam. 0.12-0.16 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

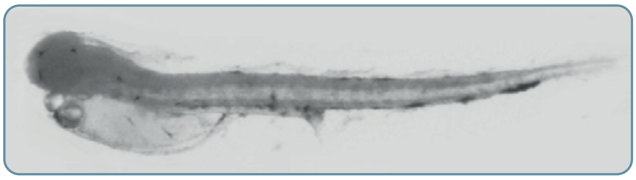
Hatch size: about 2.2 mm
Body: elongate and slender
Yolk sac: elongated, projected beyond snout
Oil globule location: at anterior end of yolk sac
Anus: detached from yolk sac, reaches finfold border
Preanus length: about 50% SL
Pigmentation: several dorsal melanophores decrease in number to 2 and migrate to finfold during development; row of ventral melanophores along trunk and tail, ending in a large melanophore

LARVAE — Figs. C-G

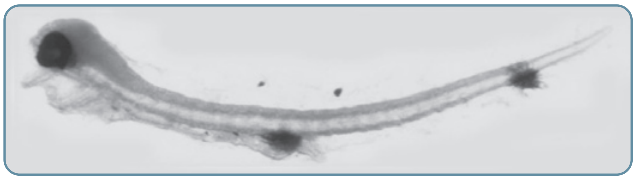
Body: laterally compressed; elongated in early larvae, increases in height during development
Head: small with moderately pointed snout; mouth relatively small and oblique
Eye: round
Gut: elongate, ends in a prominent loop
Preanus length: about 50% SL
Air bladder: absent
Spination: none
Pigmentation: 2 dorsal melanophores on finfold in early larvae which remain on dorsal fin in late larvae; 2 large ventral melanophores, one over gut, close to gut loop (expands over it with development) and another in caudal region (forms a bar in late larvae)
Length at flexion: completed at 9.8 mm SL
Length at transformation: unknown

PHOTOS

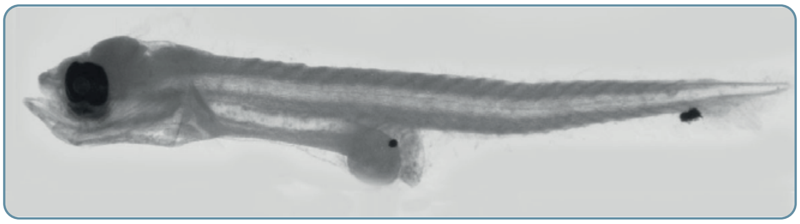
by J.M. Rodriguez



2.2 mm SL



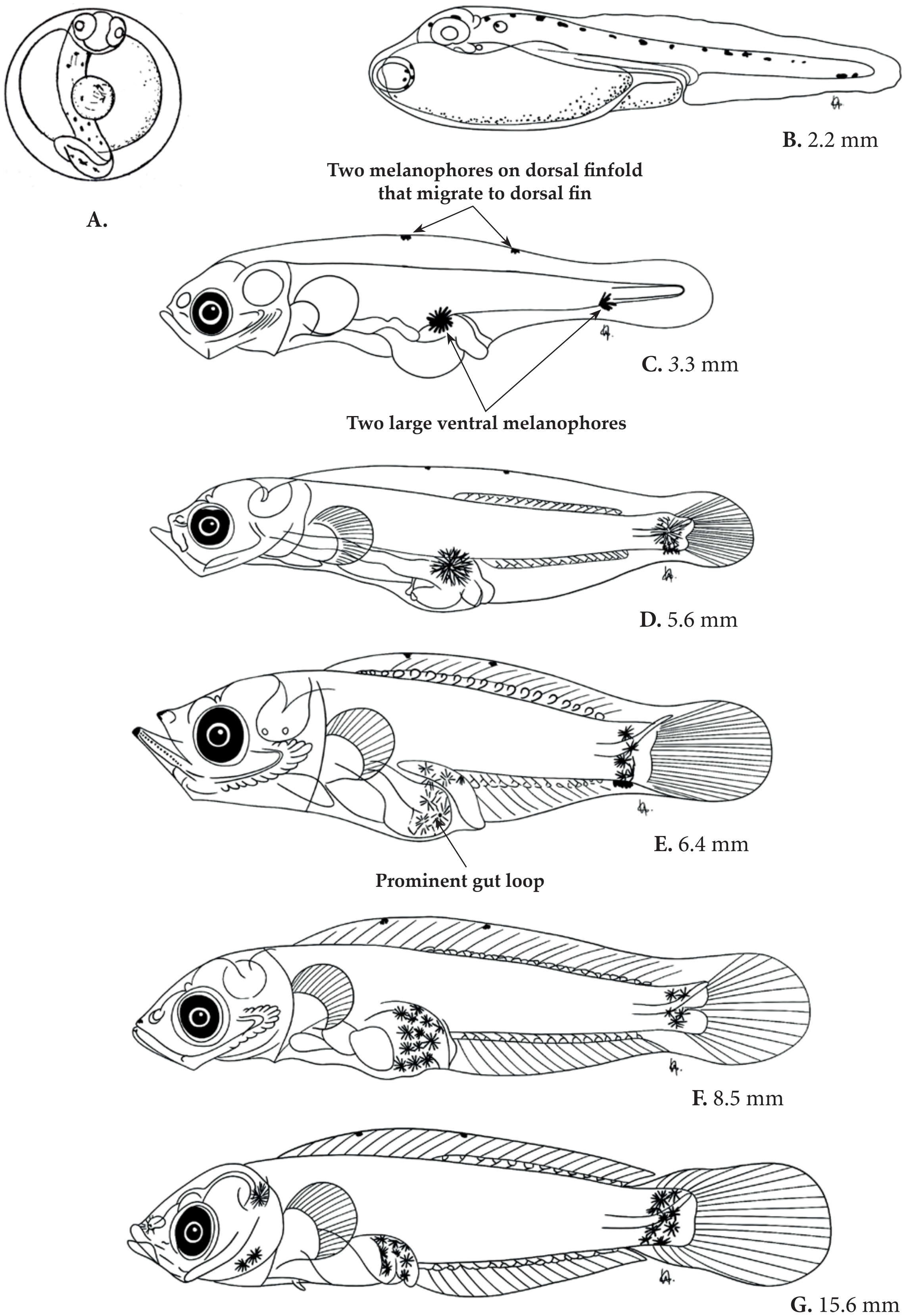
2.7 mm SL



5.6 mm SL

PERCIFORMES

Coris julis (Linnaeus, 1758)



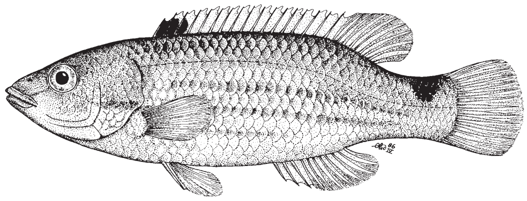
Literature: Alemany (1997), Quignard and Pras (1986a), Sabatés (1988), Sparta (1956a)

Illustrations' sources: A: Sparta (1956a); **B-G:** L. Rodríguez (redrawn from Sparta, 1956a)

Ctenolabrus rupestris (Linnaeus, 1758) — Gold-sinny-wrasse - Rouquié

Habitat: neritic, demersal, from one to 50 m depth
Distribution: eastern Atlantic Ocean, from Morocco to Norway, and the Mediterranean Sea
Spawning season: January to July (Mediterranean Sea)

Meristic characters
Myomeres: 31-35
Vertebrae: 31-35
Dorsal fin: XVI-XIX + 8-10
Anal fin: III-IV + 6-9



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.72-1.01 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: none
Colour: transparent

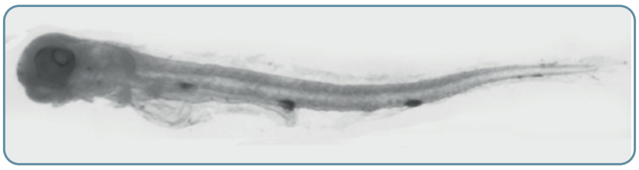
YOLK–SAC LARVAE — Fig. B

Hatch size: 1.95-2.19 mm
Body: short, relatively stocky
Yolk sac: ovoid, projected beyond snout
Anus: detached from yolk sac, reaches finfold border
Preanus length: about 50% SL
Pigmentation: melanophores scattered over most of body in recently hatched larvae; throughout yolk–sac larval development, all melanophores from dorsal side of body disappear, only 4 melanophores remain on ventral side: over gut, terminal gut, mid-tail and caudal region

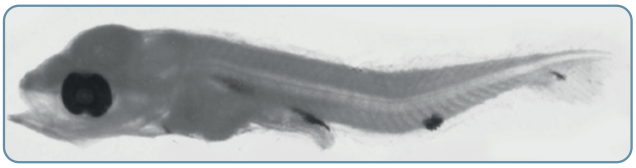
LARVAE — Figs. C-H

Body: laterally compressed; elongate and slender in early larvae, increases in height with development
Head: small, snout pointed; mouth relatively small
Eye: round
Gut: bulging, tapers to a narrow, slightly protruding anus
Preanus length: about 50% SL
Air bladder: absent
Spination: none
Pigmentation: similar to yolk–sac larvae in early larvae; late larvae add 2 melanophores under gut (increasing in number with development), and 2 peritoneal melanophores; melanophores over head; a melanophore at middle of caudal-fin base
Length at flexion: completed at 4.82 mm SL
Length at transformation: unknown

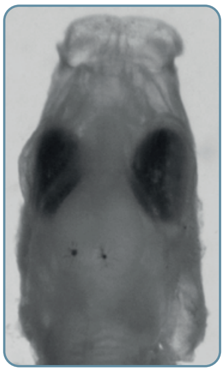
PHOTOS — by J.M. Rodriguez



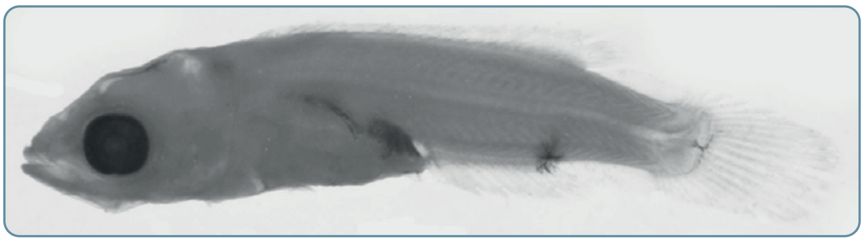
2.6 mm SL



4.4 mm SL

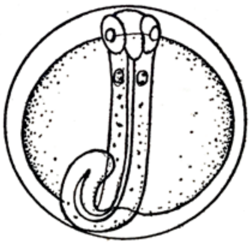


Dorsal view of head

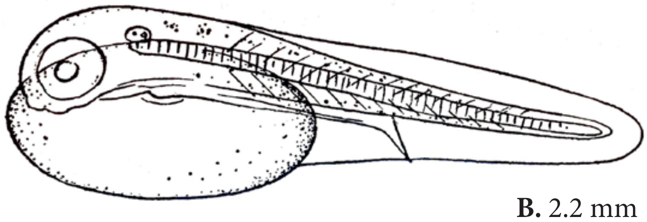


7.1 mm SL

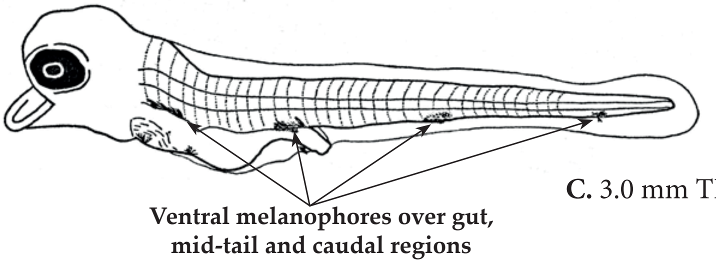
Ctenolabrus rupestris (Linnaeus, 1758)



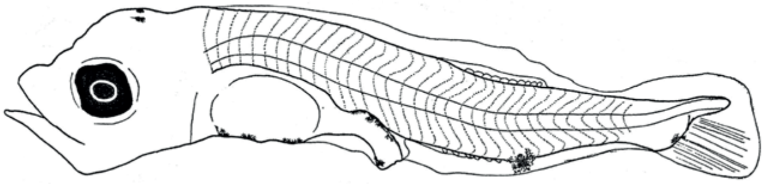
A.



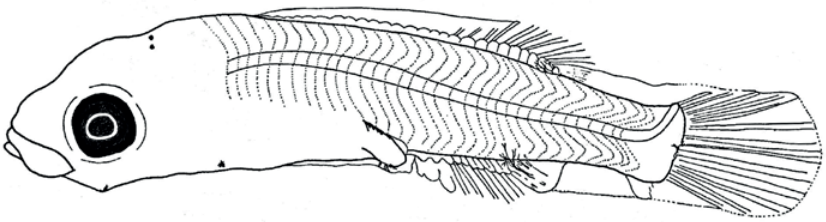
B. 2.2 mm



C. 3.0 mm TL

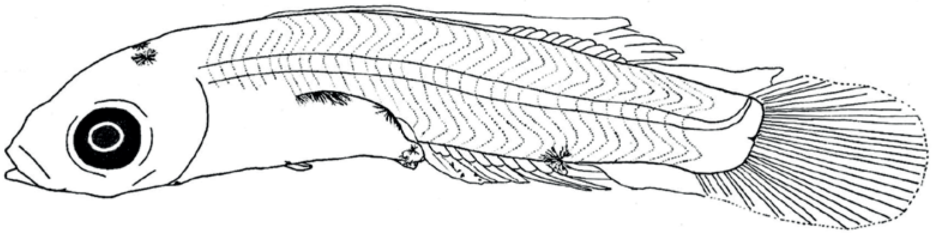


D. 5.0 mm TL

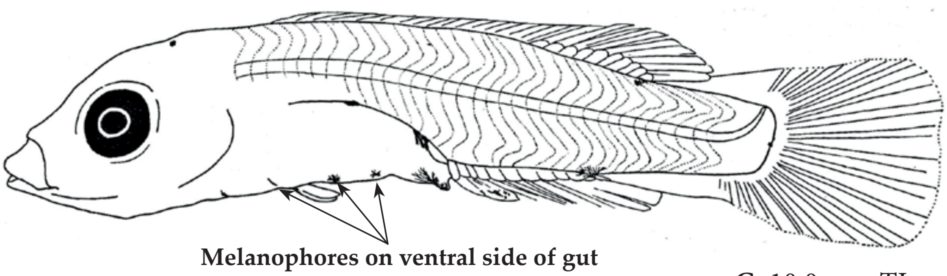


E. 6.9 mm TL

H. Dorsal view of head (7.5 mm TL)



F. 9.0 mm TL



G. 10.0 mm TL

Literature: Fives (1976), Quignard and Pras (1986a), Russell (1976), Sabatés (1988)

Illustrations' sources: A, B: Sparta (1956a); **C-H:** Fives (1976)

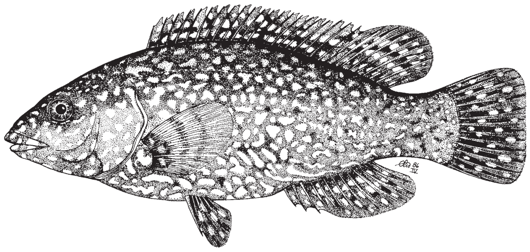
LABRIDAE

Labrus bergylta Ascanius, 1767

Ballan wrasse – Vieille commune

Habitat: neritic, littoral, demersal, down to 20 m depth
Distribution: eastern Atlantic Ocean, from Morocco to Norway. Records from the Mediterranean Sea doubtful
Spawning season: unknown

Meristic characters
Myomeres: 35-40
Vertebrae: 35-40
Dorsal fin: XVIII-XXI + 9-13
Anal fin: III + 8-12



EGGS

The egg descriptions available are doubtful

YOLK–SAC LARVAE

Hatch size: 2.8-3.0 mm
Body: elongate and slender
Yolk sac: elongated
Anus: detached from yolk sac, reaches finfold border
Preanus length: about 55% SL
Pigmentation: melanophores scattered over most of body and yolk sac; posterior mid-tail and caudal regions unpigmented; finfold unpigmented

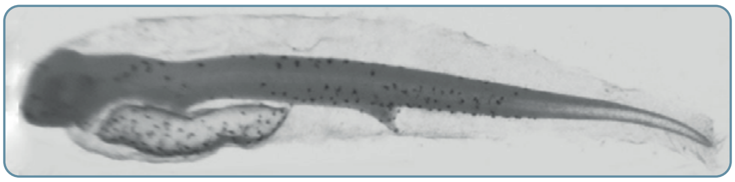
LARVAE

Figs. A-D

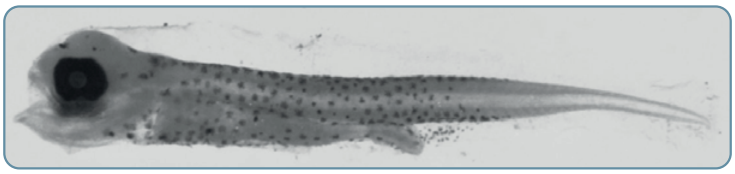
Body: laterally compressed; elongate and slender in early larvae, increases in height with development
Head: relatively small; mouth small and oblique; snout rounded in early larvae becomes pointed throughout development
Eye: round
Gut: elongate, tube-like in early larvae; bulging, tapering to a relatively narrow, slightly protruding anus
Preanus length: about 57% SL
Air bladder: absent
Spination: none
Pigmentation: crescent-shaped groups of melanophores on head; anterior region of anal fin pigmented; snout, lateral side of head, posterior mid-tail and caudal region unpigmented; rest of body pigmented; no changes in pigmentation pattern throughout development
Length at flexion: unknown
Length at transformation: unknown

PHOTOS

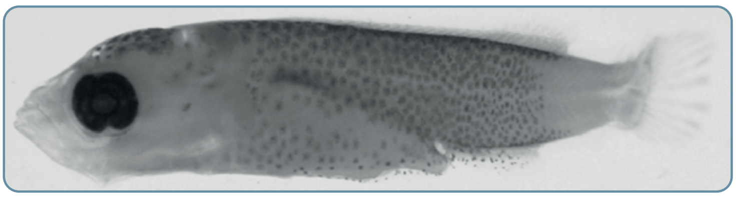
by J.M. Rodriguez



2.9 mm SL



4.1 mm SL

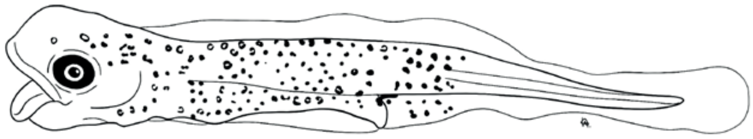


6.5 mm SL

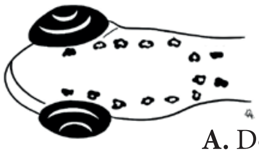
not sized (dorsal view)

PERCIFORMES

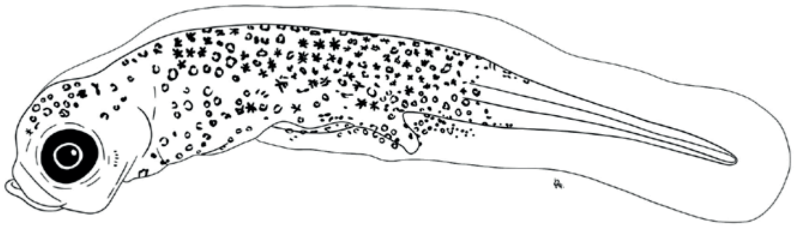
Labrus bergylta Ascanius, 1767



A. 3.0 mm TL

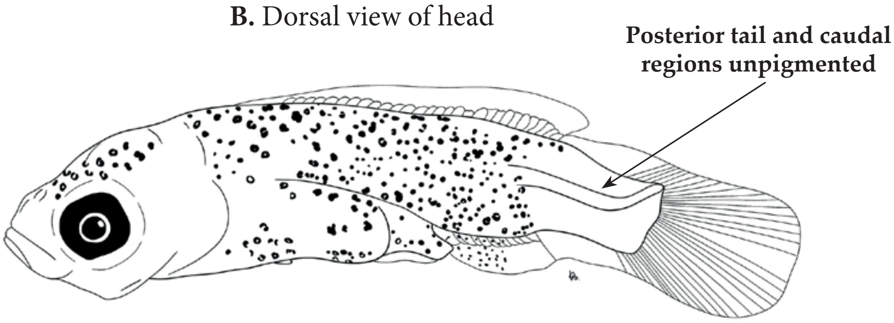


A. Dorsal view of head



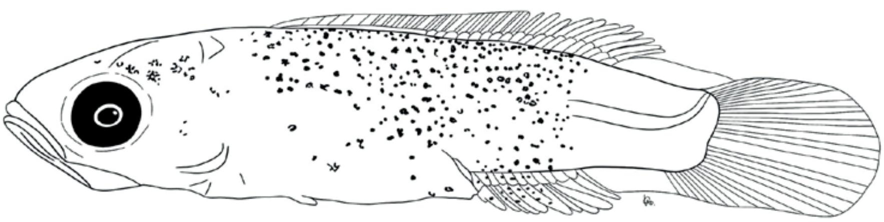
B. 5.5 mm TL

B. Dorsal view of head



C. 8.0 mm TL

C. Dorsal view of head



D. 9.5 mm TL

Literature: Froese and Pauly (2022), Fives (1976), Quignard and Pras (1986a), Russell (1976)

Illustrations' sources: A-D: L. Rodríguez (redrawn from Fives, 1976)

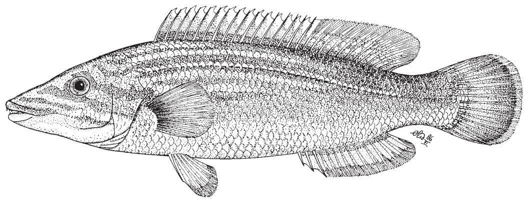
LABRIDAE

Labrus mixtus Linnaeus, 1758

Cuckoo wrasse - Vieille coquette

Habitat: neritic, demersal, between 2 and 200 m depth
Distribution: eastern Atlantic Ocean, from Senegal to Norway, and the Mediterranean Sea
Spawning season: March to June (Mediterranean Sea)

Meristic characters
Myomeres: 38-40
Vertebrae: 38-40
Dorsal fin: XVI-XVIII + 11-14
Anal fin: III + 9-11



EGGS

Undescribed

YOLK–SAC LARVAE

Undescribed

LARVAE

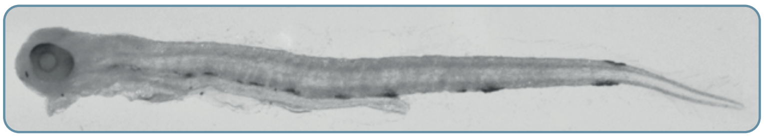
Figs. A-E

Body: laterally compressed; elongate and slender in early larvae, increases in height with development
Head: small; mouth small; snout pointed
Eye: round
Gut: elongate, tube-like in early larvae; bulging, tapering to a relatively narrow, slightly protruding anus in late larvae
Preanus length: about 50% SL
Air bladder: absent
Spination: none

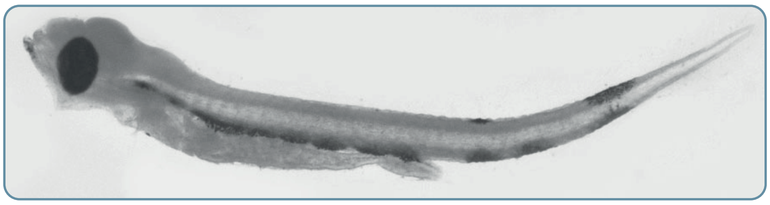
Pigmentation: confined to dorsal and ventral margins of body and gut in early larvae; throughout development, dorsal melanophores increase from one to usually 5, evenly spaced along dorsal contour of body; 3-4 along ventral, postanal region; several melanophores on lower jaw; some melanophores along dorsal and ventral contours of abdomen; single melanophores over head and tip of snout
Length at flexion: unknown
Length at transformation: unknown

PHOTOS

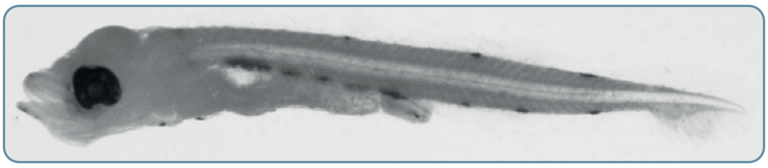
by J.M. Rodriguez



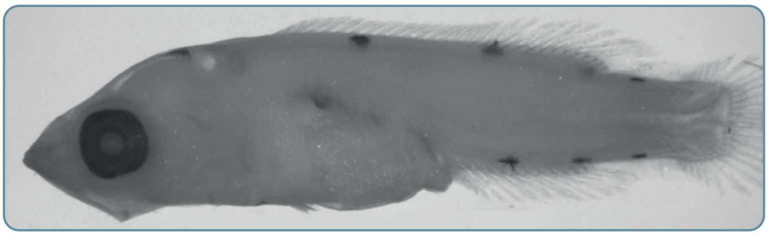
3.0 mm SL



4.3 mm SL



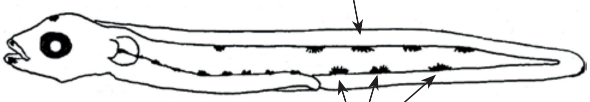
6.7 mm SL



8.8 mm SL

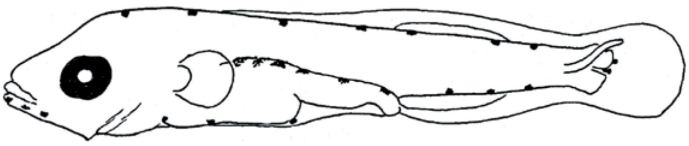
PERCIFORMES

Labrus mixtus Linnaeus, 1758

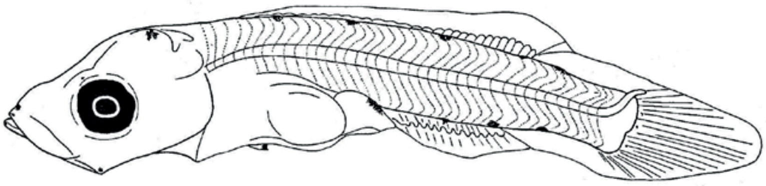


A. 4.7 mm

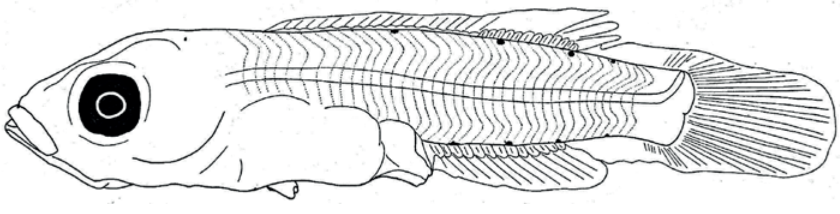
B. 6.5 mm



C. 7.2 mm



D. 9.0 mm TL



E. 10.0 mm TL

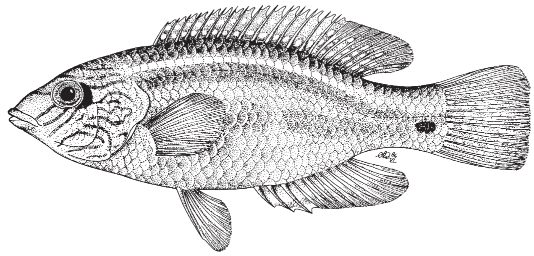
Literature: Froese and Pauly (2022), Fives (1976), Quignard and Pras (1986a), Russell (1976)

Illustrations' sources: A-C: modified from Russell (1976); **D, E:** Fives (1976)

Symphodus melops (Linnaeus, 1758) — Corkwing wrasse - Crénilabre mélops

Habitat: neritic, demersal, from one and 30 m depth
Distribution: eastern Atlantic Ocean, from Morocco to Norway, and the Mediterranean Sea
Spawning season: March to May (northwestern Mediterranean Sea)

Meristic characters
Myomeres: 33
Vertebrae: 33
Dorsal fin: XV-XVIII + 8-10
Anal fin: III + 8-10



EGGS

Habitat: demersal, attached to seaweeds in nests
Shape: spherical
Ch: no information; diam. 0.80-0.85 mm
Perivitelline space: no information
Yolk: unsegmented; pigmented
Oil globules: none
Colour: no information

YOLK–SAC LARVAE — Fig. A

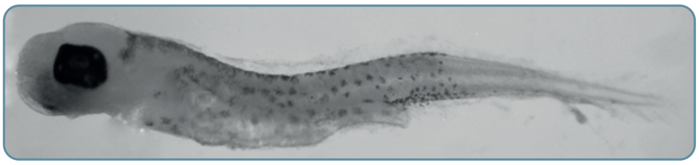
Hatch size: 2.40-2.85 mm SL
Body: elongate
Yolk sac: ovoid, pigmented
Anus: detached from yolk sac, reaches finfold border
Preanus length: about 50% SL
Pigmentation: 2 rows of dorsal melanophores from behind eye to about mid tail; a row of melanophores above, another below notochord and another along gut; melanophores on primordial fin, behind anus; 3 ventral melanophores at end of tail; yolk sac pigmented; dorsal side of head unpigmented

LARVAE — Figs. B-D

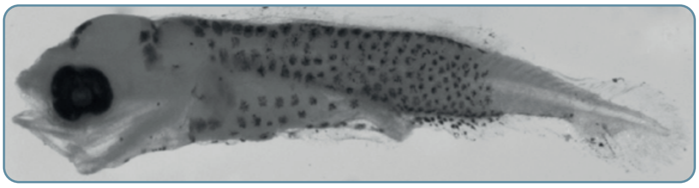
Body: laterally compressed; elongate and relatively slender in early larvae, increases in height with development
Head: small and rounded; mouth small
Eye: round and large
Gut: elongate, tube-like in early larvae, bulging, tapers to a relatively narrow protruding anus in late larvae
Preanus length: about 50% SL
Air bladder: absent
Spination: none

Pigmentation: a small number of melanophores on head; 2 parallel rows of dorsal melanophores to about mid tail; lower jaw pigmented; lateral sides of body (except posterior mid-tail region) and anal fin pigmented; 3 or 4 melanophores between anal and caudal fins; a row of melanophores along interspinous area of anal fin
Length at flexion: probably begins at about 4.0 mm SL
Length at transformation: unknown

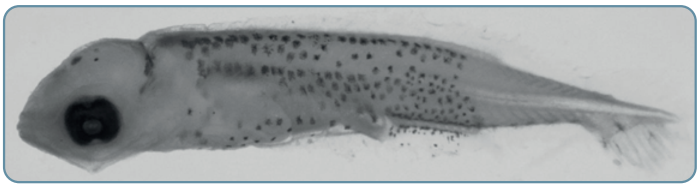
PHOTOS — by J.M. Rodriguez



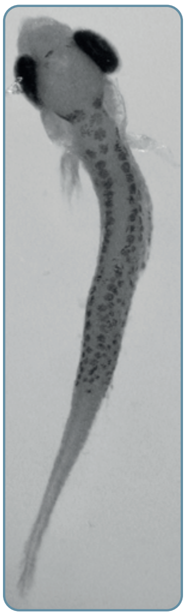
2.1 mm SL



3.8 mm SL

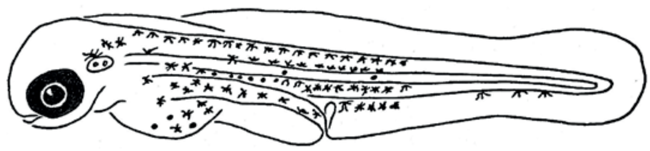


4.9 mm SL

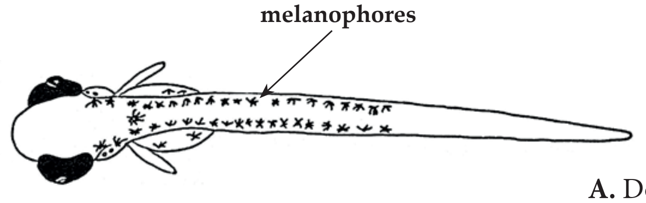


3.0 mm SL (dorsal view)

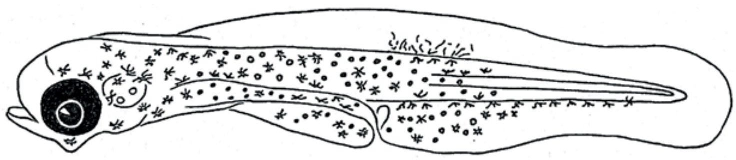
Symphodus melops (Linnaeus, 1758)



A. 2.9 mm SL

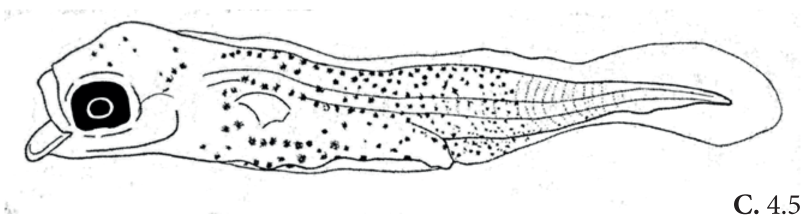


A. Dorsal view

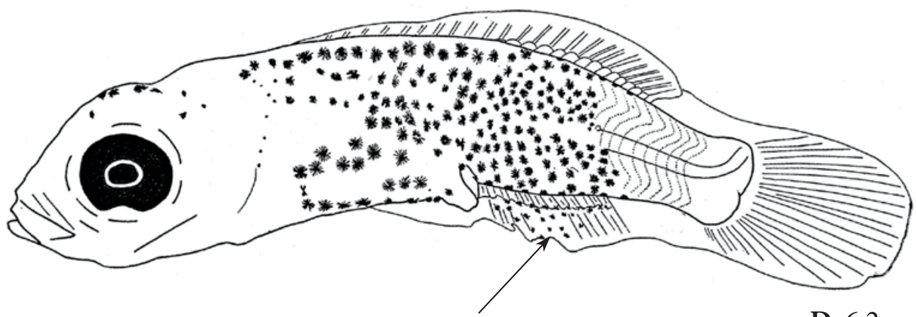


B. 3.2 mm SL

C. Dorsal view of head



C. 4.5 mm TL



D. 6.2 mm TL

Literature: Fives (1976), Froese and Pauly (2022), Quignard (1967), Quignard and Pras (1986a), Russell (1976)

Illustrations' sources: A, B: Quignard (1967); **C, D:** Fives (1976)

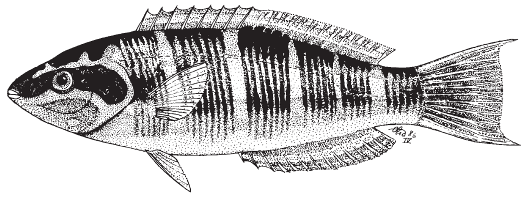
LABRIDAE

Thalassoma pavo (Linnaeus, 1758)

Ornate wrasse - Girelle paon

Habitat: neritic, demersal, to 150 m depth
Distribution: Eastern Atlantic, from Gabon to Portugal, and the Mediterranean Sea
Spawning season: June and July (Mediterranean Sea)

Meristic characters
Myomeres: 25
Vertebrae: 25
Dorsal fin: VIII + 12-13
Anal fin: III + 10-12



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.62-0.64 mm
Perivitelline space: small
Yolk: unsegmented; unpigmented
Oil globules: one; diam. 0.16 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

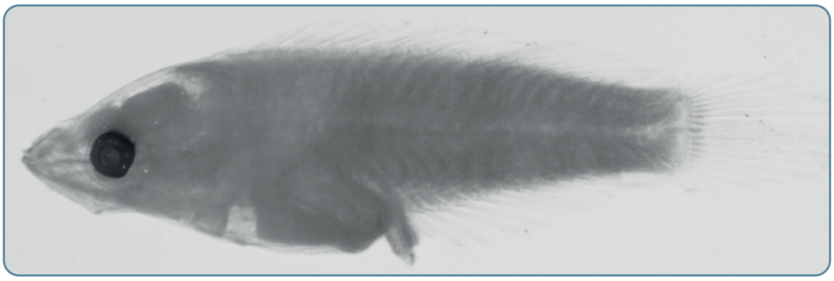
Hatch size: about 1.8 mm SL
Body: elongate and slender
Yolk sac: elongate, projected beyond snout
Oil globule location: at anterior end of yolk sac
Anus: close behind yolk sac, reaches finfold border
Preanus length: about 69% SL
Pigmentation: 7 melanophores over dorsal profile of trunk, close to each other; some dotty melanophores over ventral profile of trunk; oil globule pigmented

LARVAE — Figs. C-F

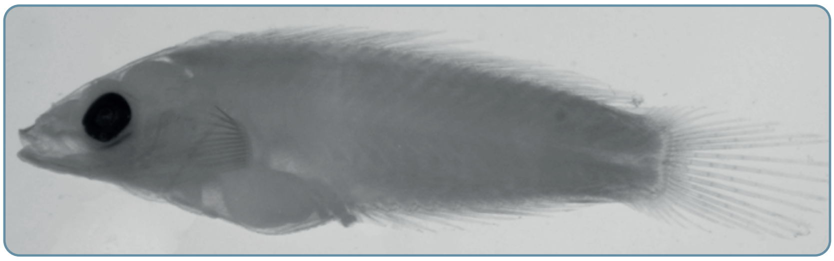
Body: elongate, laterally compressed, deeper through pectoral region
Head: small, pointed, with relatively short snout; mouth very small
Eye: almost round
Gut: initially straight, becomes coiled after flexion
Preanus length: decreases from about 59% SL in early larvae to about 52% in late larvae
Air bladder: absent
Spination: none
Pigmentation: early larvae, reduced to two melanophores, one over terminal gut and another close to ventral tail end; late larvae, body unpigmented; pigmentation restricted to pectoral-fin rays
Length at flexion: unknown
Length at transformation: unknown

PHOTOS

by J.M. Rodriguez



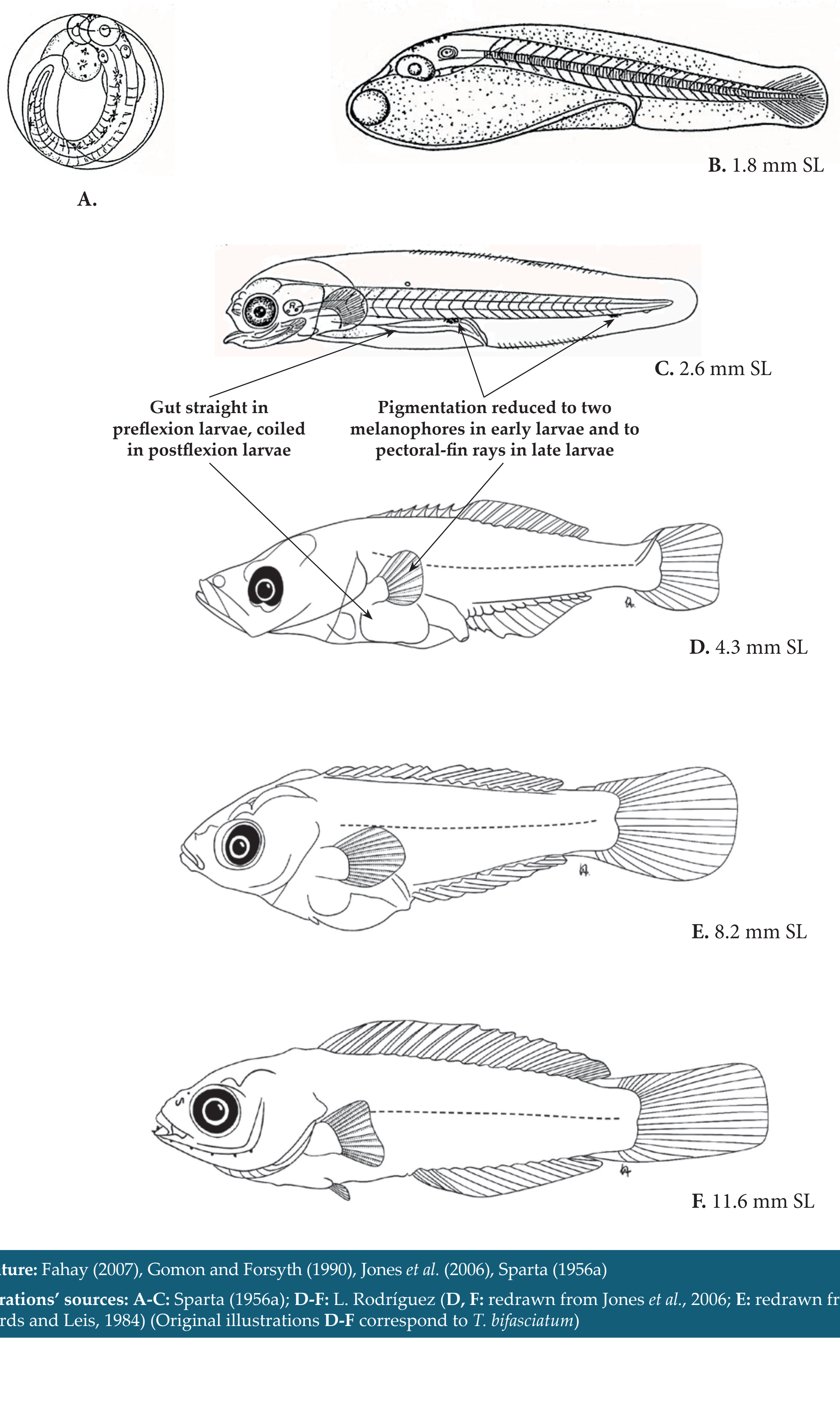
6.2 mm SL



9.3 mm SL

PERCIFORMES

Thalassoma pavo (Linnaeus, 1758)



Literature: Fahay (2007), Gomon and Forsyth (1990), Jones *et al.* (2006), Sparta (1956a)

Illustrations' sources: A-C: Sparta (1956a); **D-F:** L. Rodríguez (**D, F:** redrawn from Jones *et al.*, 2006; **E:** redrawn from Richards and Leis, 1984) (Original illustrations **D-F** correspond to *T. bifasciatum*)

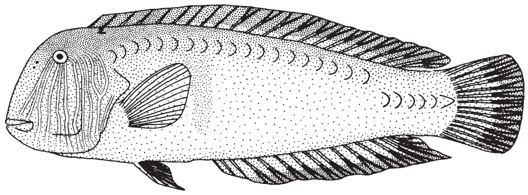
LABRIDAE

Xyrichthys novacula (Linnaeus, 1758)

Pearly razorfish - Donzelle lame

Habitat: neritic, demersal, to 150 m depth
Distribution: Atlantic Ocean. Eastern Atlantic, from Angola to France, and the Mediterranean Sea
Spawning season: late summer

Meristic characters
Myomeres: 25
Vertebrae: 25
Dorsal fin: IX-X + 11-12
Anal fin: III + 11-13



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.60 mm
Perivitelline space: small
Yolk: unsegmented; unpigmented
Oil globules: one; diam. 0.12-0.16 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

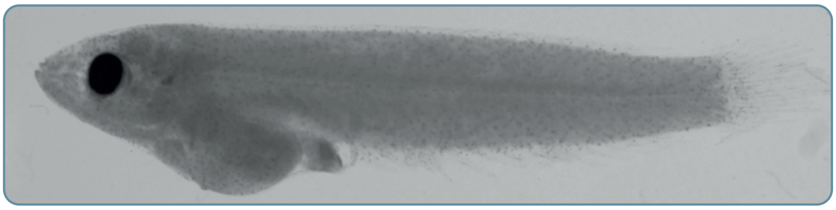
Hatch size: 1.6 mm SL
Body: elongate and slender
Yolk sac: elongated, projected beyond snout
Oil globule location: at anterior end of yolk sac
Anus: detached from yolk sac, reaches finfold border
Preanus length: about 62% SL
Pigmentation: several stellate melanophores along dorsum of body, from head to end of tail; there may be 1-2 melanophores on lateral sides of body and one on mid-ventral tail

LARVAE — Figs. C-F

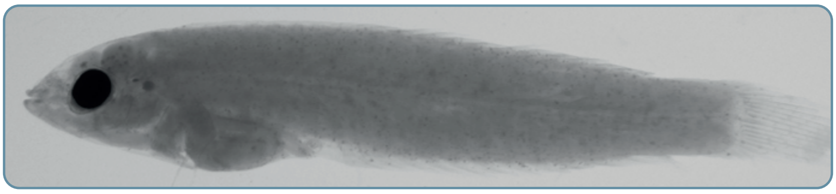
Body: laterally compressed; elongate, with dorsal and ventral margins almost parallel
Head: small, pointed, with short snout; mouth very small
Eye: oblique with a mass of ventral choroid tissue, becomes rounded in very late larvae
Gut: tubular and long in early larvae, shortens and becomes coiled after flexion
Preanus length: decreases from about 50% SL in early larvae to about 45% SL after coiling
Air bladder: absent
Spination: none
Pigmentation: unpigmented; late larvae (about 12.0 mm SL) rarely have a few melanophores on lateral sides of caudal peduncle
Length at flexion: < 5.0 mm SL
Length at transformation: unknown

PHOTOS

by S. Isari



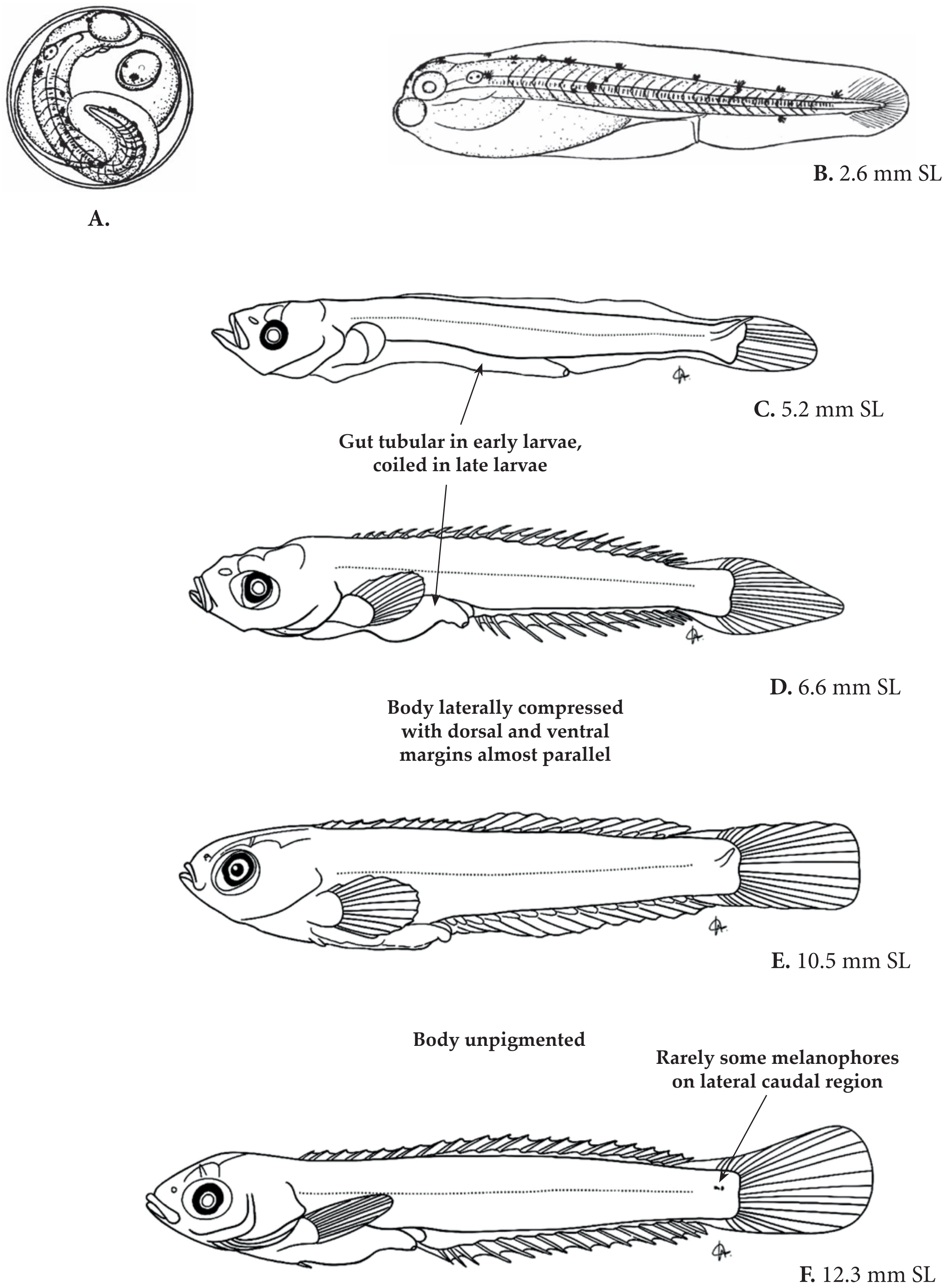
10.5 mm SL



14.5 mm SL

PERCIFORMES

Xyrichthys novacula (Linnaeus, 1758)



Literature: Fahay (2007), Jones *et al.* (2006), Quignard and Pras (1986a), Richards and Leis (1984), Sparta (1956a)

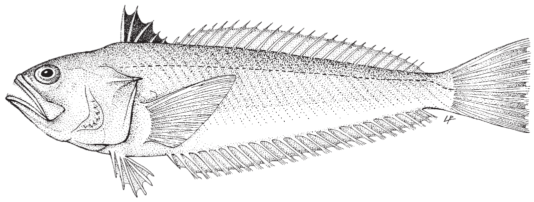
Illustrations' sources: A, B: Sparta (1918a), **C-F:** L. Rodríguez (C, D, F: redrawn from Jones *et al.*, 2006, **E:** redrawn from Richards and Leis, 1984)

Echiichthys vipera (Cuvier, 1829)

Lesser weever - Petite vive

Habitat: neritic, demersal from a few to about 150 m depth
Distribution: eastern Atlantic Ocean, from Morocco to the North Sea, and the Mediterranean Sea
Spawning season: unknown

Meristic characters
Myomeres: 23-24
Vertebrae: 23-24
1st dorsal fin: V-VIII
2nd dorsal fin: 21-24
Anal fin: I + 24-26



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth, with inner membrane; diam. 1.00-1.37 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: 6-30; unpigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

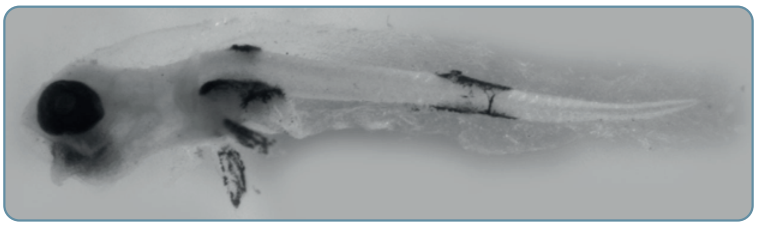
Hatch size: about 3.3 mm
Body: relatively elongate; pelvic fins well developed
Yolk sac: ovoid
Oil globules location: ventral in yolk sac
Anus: close behind yolk sac, reaches finfold border
Preanus length: about 45% SL
Pigmentation: dorsal and ventral rows of melanophores extending posteriorly a little beyond mid–tail in newly hatched larvae; pigmentation soon becomes characteristic with melanophores on snout, head and peritoneum and two bars of melanophores, one at level of anus and another at mid-tail

LARVAE — Figs. C-F

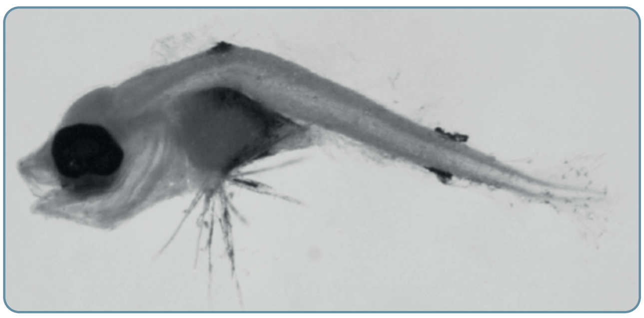
Body: relatively elongate and slender in early larvae, becomes stout and deep (mainly through pectoral and abdominal regions) with development; pelvic fins well developed from early larvae
Head: moderately large; mouth small
Eye: round
Gut: triangular and bulky
Preanus length: about 45% SL
Air bladder: absent
Spination: 3 preopercular spines in early larvae, 4 in late larvae; one opercular spine in early larvae, 2 in late larvae
Pigmentation: tail bars of pigment disappear at about 4.5 mm; 3-4 melanophores appear on ventral tail-caudal region that reduce to one in late larvae; melanophores on head and on shoulder; pelvic fins, peritoneum and lateral side of gut strongly pigmented in late larvae; dorsal fin pigmented
Length at flexion: it begins at about 6.0 mm SL
Length at transformation: unknown

PHOTOS

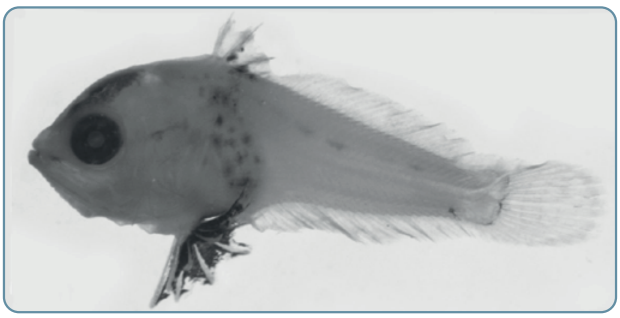
by J.M. Rodriguez



2.7 mm SL

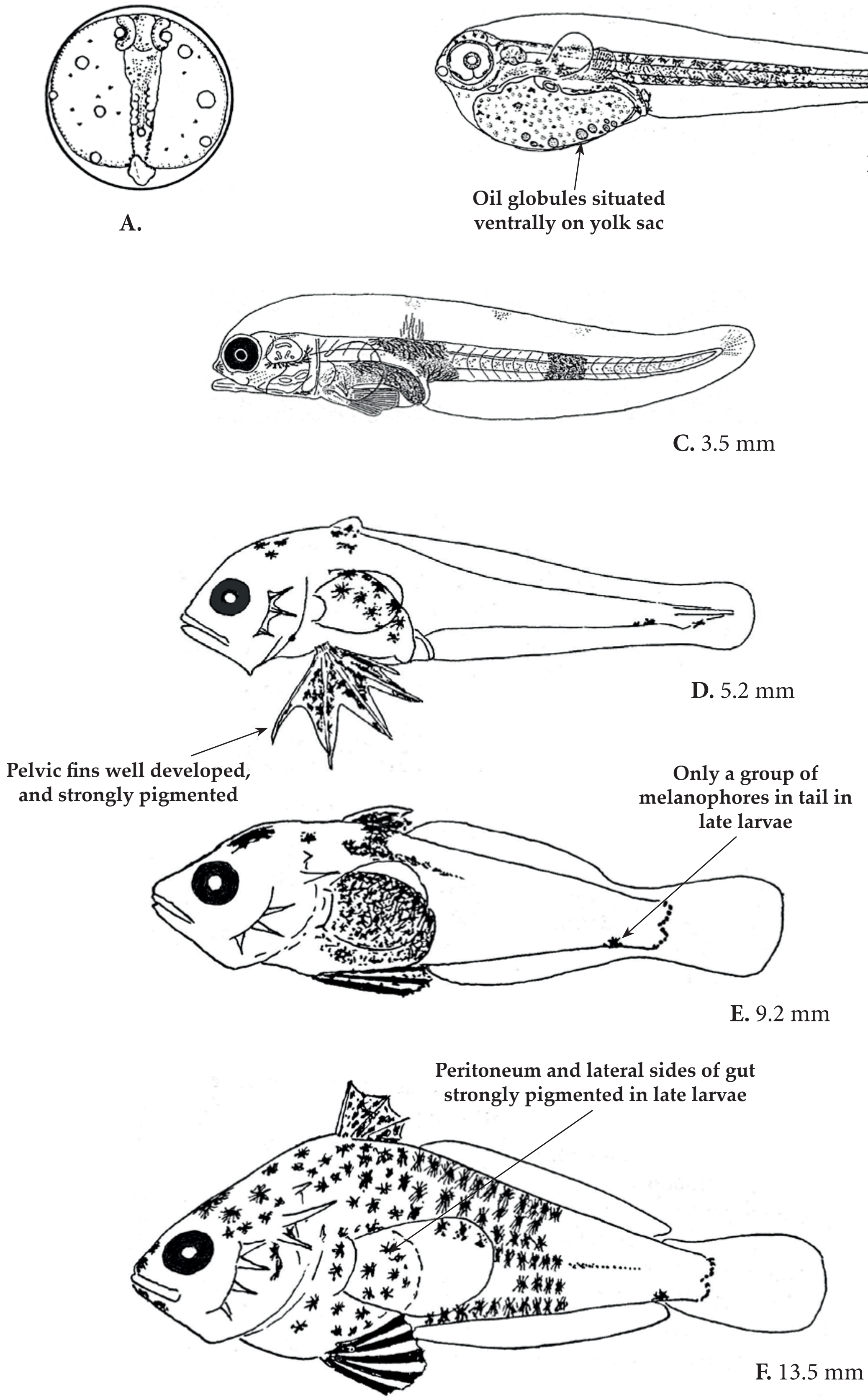


3.5 mm SL



7.7 mm SL

Echiichthys vipera (Cuvier, 1829)



Literature: Alemany (1997), Froese and Pauly (2022), Padoa (1956r), Russell (1976), Tortonese (1986e)

Illustrations' sources: A-C: Padoa (1956r); **D-F:** modified from Russell (1976)

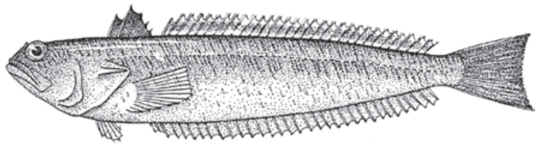
TRACHINIDAE

Trachinus draco Linnaeus, 1758

Greater weever - Grande vive

Habitat: neritic, demersal, from a few to about 150 m depth
Distribution: eastern Atlantic Ocean, from Morocco to North Sea, and the Mediterranean Sea
Spawning season: unknown

Meristic characters
Myomeres: 42
Vertebrae: 42
1st dorsal fin: V-VII
2nd dorsal fin: 29-32
Anal fin: II + 28-34



EGGS Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth with inner membrane; diam. 0.96-1.11 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: one; diam. 0.19-0.23 mm; pigmented
Colour: transparent

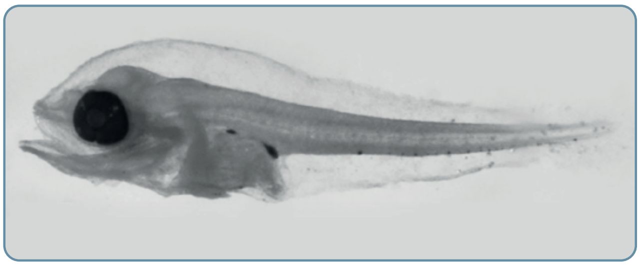
YOLK–SAC LARVAE Fig. B

Hatch size: about 3.0 mm
Body: elongate; primordial fin, globose, reaches snout
Yolk sac: ovoid
Oil globule location: anterior, ventral in yolk sac
Anus: close behind yolk sac, reaches finfold border
Preanus length: > 37% SL
Pigmentation: dorsal melanophores on anterior part of body, on snout and 2 behind eye; row of postanal ventral melanophores; a bar of melanophores at mid-tail; a melanophore over anus; melanophores in dorsal region of body disappear during yolk sac development

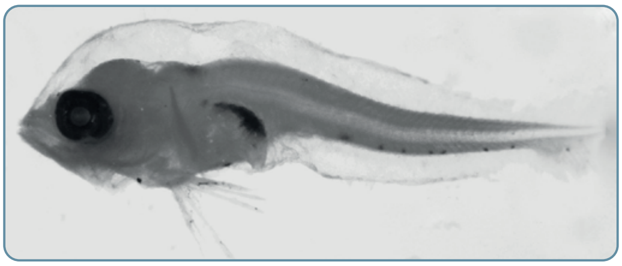
LARVAE Figs. C-F

Body: relatively elongate and slender, becoming stout and deep (mainly through pectoral region) with development; pelvic fins appear at about 4.0 mm SL; primordial fin globose, reaching snout in early larvae
Head: moderately large; mouth relatively large
Eye: round and large
Gut: triangular
Preanus length: about 40% SL
Air bladder: absent
Spination: one supraorbital and 5 preopercular spines
Pigmentation: early larvae similar to yolk–sac larvae; during development postanal bar disappears, peritoneal pigment increases, origin of postanal-ventral row of melanophores moves backwards and melanophores decrease in number; pelvic fins strongly pigmented
Length at flexion: between 5.0 and 7.5 mm SL
Length at transformation: unknown

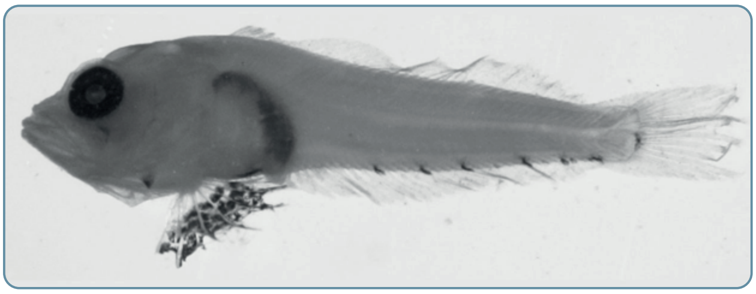
PHOTOS by J.M. Rodriguez



3.3 mm SL



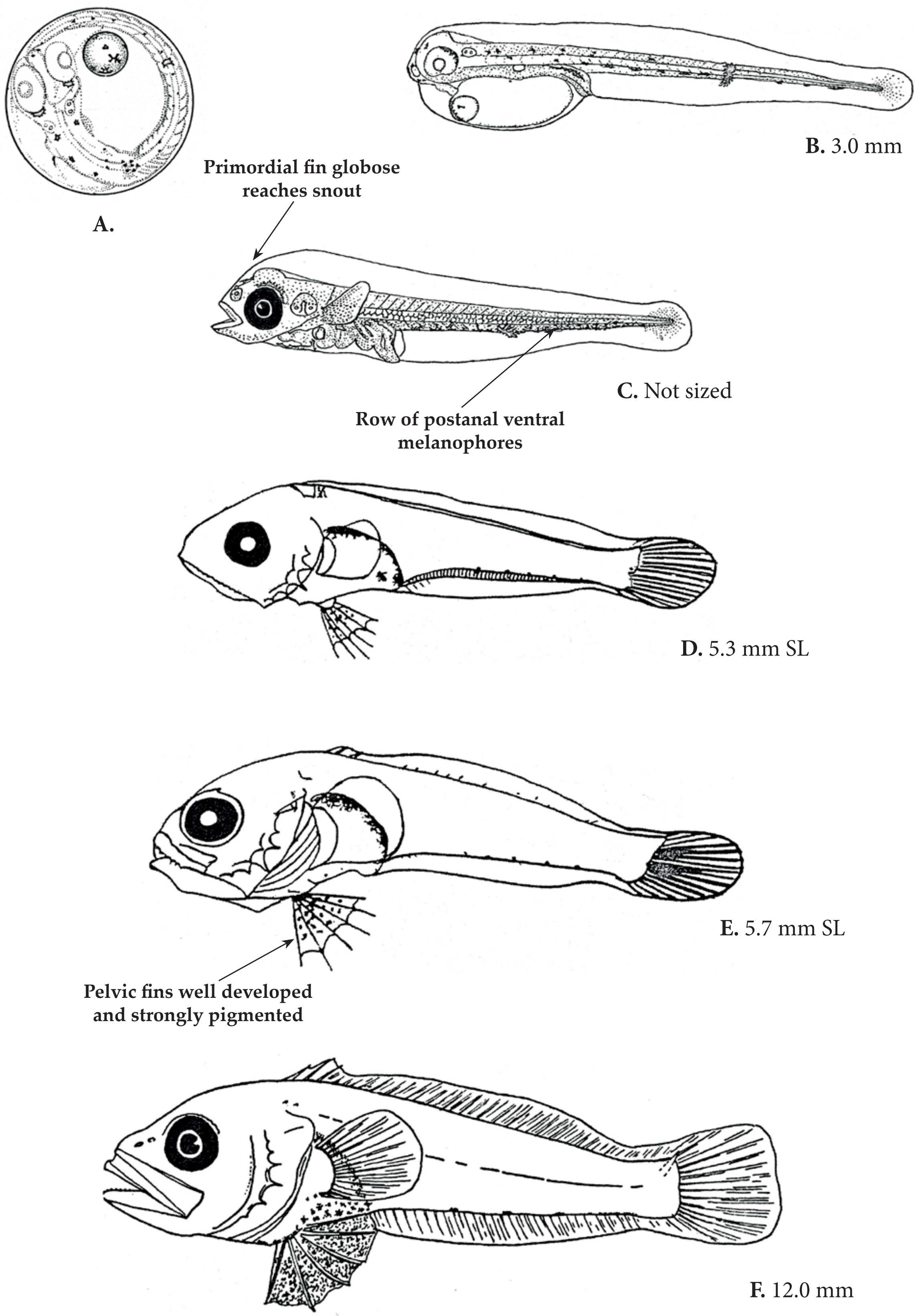
4.3 mm SL



8.6 mm SL

PERCIFORMES

Trachinus draco Linnaeus, 1758



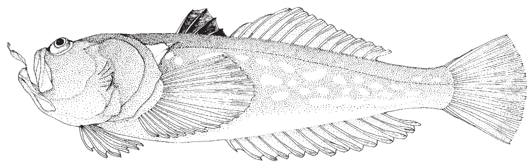
Literature: Alemany (1997), Froese and Pauly (2022), Munk and Nielsen (2005), Padoa (1956r), Russell (1976), Sabatés (1988)

Illustrations' sources: A-C: Padoa (1956r); **D, E:** Alemany (1997); **F:** Fage (1918)

Uranoscopus scaber Linnaeus, 1758 — Stargazer - Uranoscope

Habitat: neritic and upper slope, demersal, between 15 and 400 m depth
Distribution: eastern Atlantic Ocean, from Morocco to the Bay of Biscay, and the Mediterranean Sea
Spawning season: April to August

Meristic characters
Myomeres: NA
Vertebrae: NA
1st dorsal fin: III-IV
2nd dorsal fin: 13-21
Anal fin: I + 12-13



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: sculptured with hexagonal structures; diam. 1.6-2.0 mm
Perivitelline space: small
Yolk: ovoid; pigmented
Oil globules: none
Colour: relatively opaque and white

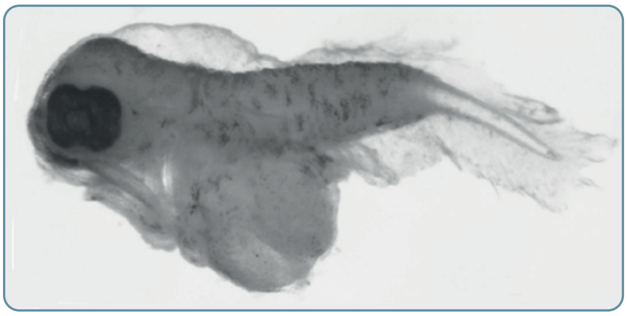
YOLK–SAC LARVAE — Fig. B

Hatch size: about 4.0 mm
Body: relatively elongate
Yolk sac: ovoid, relatively small
Anus: close behind yolk sac, reaches finfold border
Pigmentation: body, except caudal region, strongly pigmented; tail-end of dorsal and ventral regions of finfold pigmented; yolk sack pigmented
Preanus length: about 60% SL

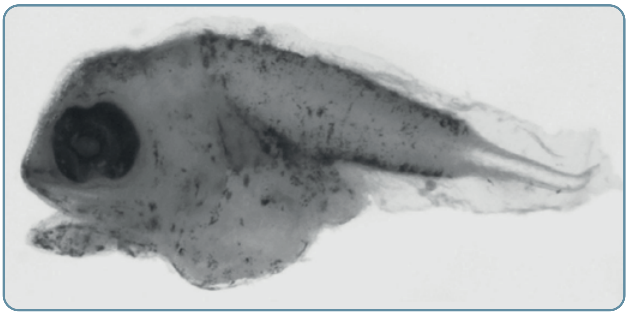
LARVAE — Figs. C-E

Body: short, stocky with an extremely high preanal region
Head: large; mouth large, oblique; snout blunt
Eye: round and large; migrates to dorsum of head in juvenile stage
Gut: rounded and bulky
Preanus length: about 60% SL
Air bladder: absent
Spination: a supraorbital crest and 4 protuberances looking like blunt spines on head
Pigmentation: body, except caudal peduncle, covered by small melanophores
Length at flexion: unknown
Length at transformation: unknown

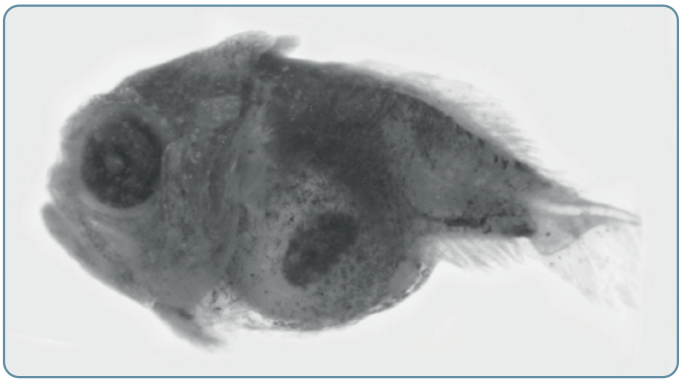
PHOTOS — by J.M. Rodriguez



2.4 mm SL

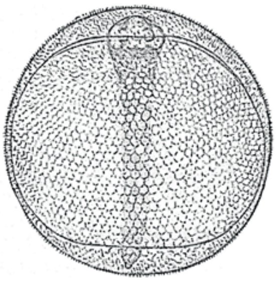


2.6 mm SL

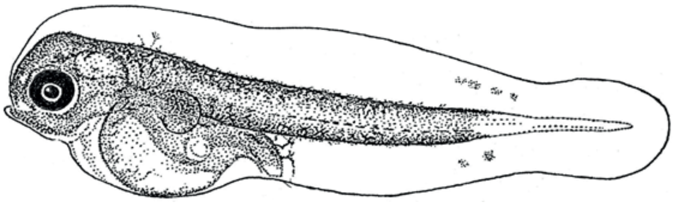


4.8 mm SL

Uranoscopus scaber Linnaeus, 1758

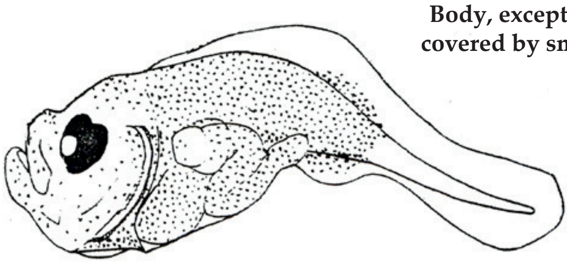


A.



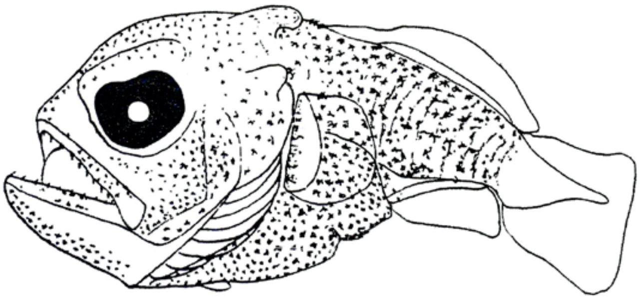
B. ca. 4.0 mm

Body, except caudal peduncle, covered by small melanophores



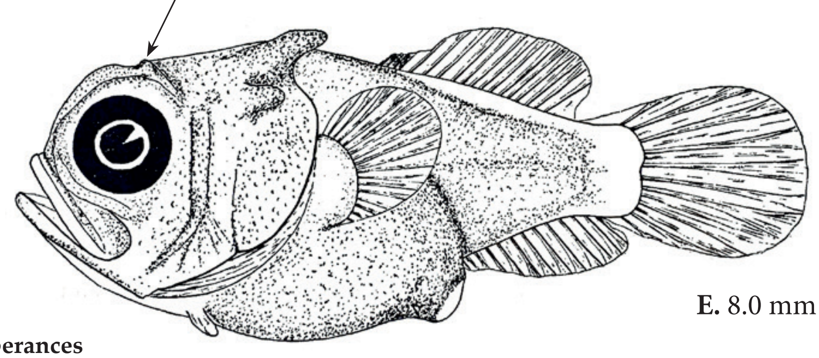
C. 3.2 mm SL

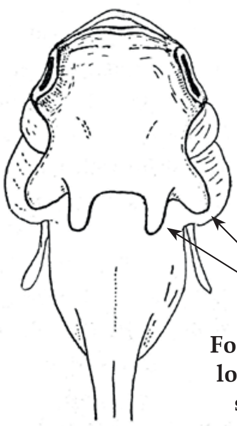
Body short with extremely high preanus region



D. 3.3 mm SL

A supraorbital crest





Four protuberances looking like blunt spines on head

E. 8.0 mm

E. Dorsal view

Literature: Fage (1918), Hureau (1986c), Padoa (1956s), Sabatés (1988)

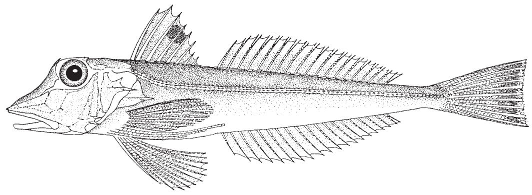
Illustrations' sources: A, B: Padoa (1956s); **C, D:** Alemany (1997); **E:** Fage (1918)

Eutrigla gurnardus (Linnaeus, 1758)

Grey gurnard - Grondin gris

Habitat: neritic, demersal, between 0 and 100 m depth
Distribution: eastern Atlantic Ocean, from Morocco to Norway, and the Mediterranean Sea
Spawning season: January to June

Meristic characters
Myomeres: 37-39
Vertebrae: 37-39
1st dorsal fin: VII-X
2nd dorsal fin: 18-20
Anal fin: 17-20



EGGS

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 1.27-1.55 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: one; diam. 0.25-0.33 mm; pigmented
Colour: transparent

YOLK–SAC LARVAE Fig. A

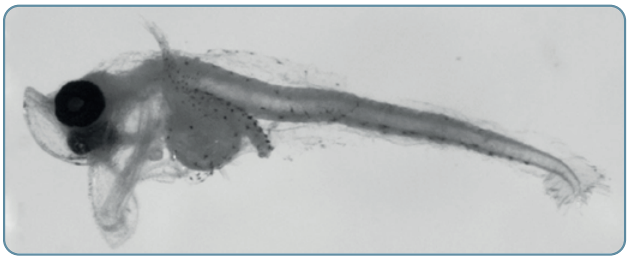
Hatch size: 3.0-4.0 mm
Body: relatively elongate
Yolk sac: large, ovoid
Oil globule location: at posterior edge of yolk sac
Anus: close behind yolk sac reaches finfold border
Preanus length: about 40% TL
Pigmentation: melanophores over body (except tail end) and finfold; yolk sac and oil globule pigmented

LARVAE Figs. B -E

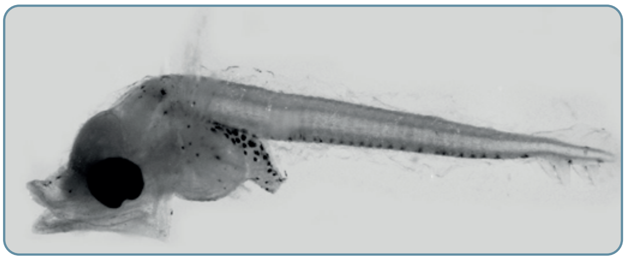
Body: relatively large compared to other Triglidae species; pectoral fins very large
Head: large, deep, strongly concave (duck-billed shaped)
Eye: round and relatively large
Gut: triangular
Preanus length: increases from about 38% to about 50% TL
Air bladder: absent

Spination: none in early larvae, develops at about 7.0 mm; a double supraorbital and occipital crest; 3 opercular spines; spination increases with development
Pigmentation: peritoneum strongly pigmented; a postanal ventral row of melanophores; several melanophores on head, upper jaw and ventral abdominal region; pelvic fins and border of pectoral–fin rays pigmented
Length at flexion: unknown
Length at transformation: unknown

PHOTOS by J.M. Rodriguez



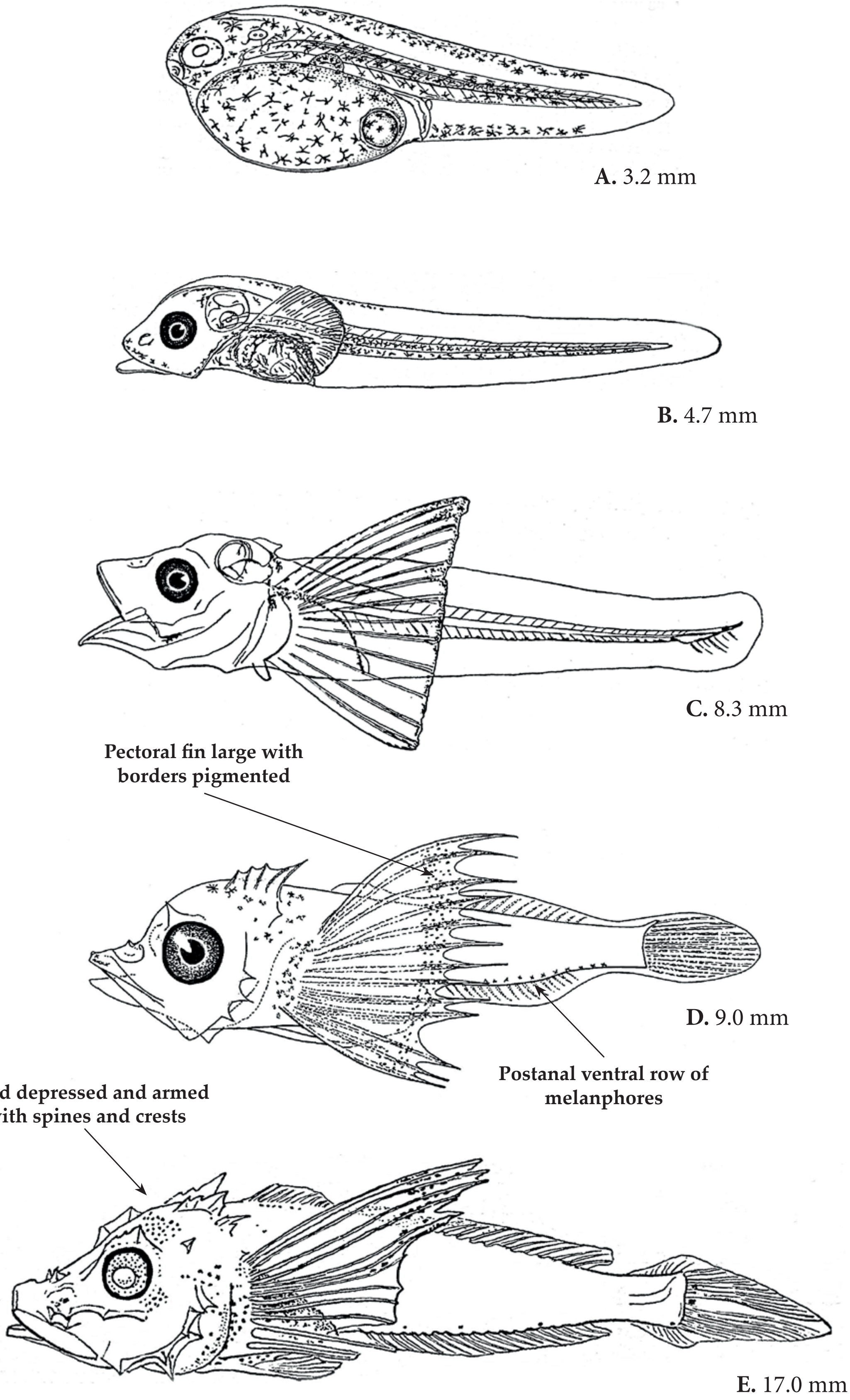
3.5 mm SL



5.5 mm SL

7.0 mm SL

Eutrigla gurnardus (Linnaeus, 1758)



Literature: Froese and Pauly (2022), Hureau (1986b), Padoa (1956p), Russell (1976), Sabatés (1988)

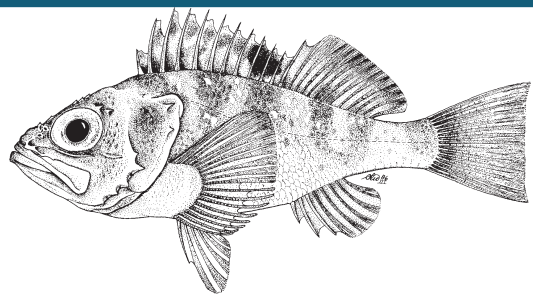
Illustrations' sources: A-C, E: Padoa (1956p); **D:** modified from Russell (1976)

Helicolenus dactylopterus (Delaroche, 1809)

Blackbelly rosefish – Sébaste chèvre

Habitat: slope, demersal, between 200 and 1 000 m depth
Distribution: Atlantic Ocean and the Mediterranean Sea. Eastern Atlantic, from South Africa to Norway
Spawning season: January to March

Meristic characters
Myomeres: 23-25
Vertebrae: 23-25
Dorsal fin: XII + 11-12
Anal fin: III + 5



EGGS — Fig. A

Habitat: pelagic
Shape: ovoid
Chorion: smooth; size 0.92–0.98 × 0.88–0.93 mm
Perivitellne space: small
Yolk: segmented; unpigmented
Oil globules: one; diam. 0.2 mm; pigmented
Colour: unpigmented

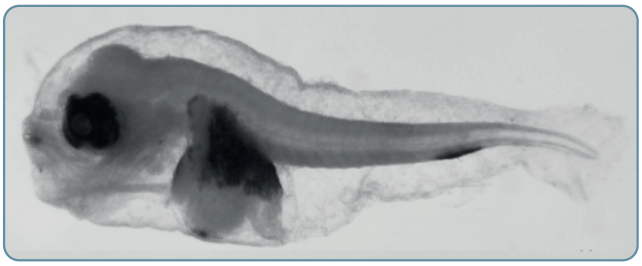
YOLK–SAC LARVAE — Fig. B

Hatch size: 1.9-2.6 mm
Body: moderately elongate, in a jelly matrix
Yolk sac: ovoid
Oil globule location: at ventral, posterior edge of yolk sac
Anus: slightly detached from yolk sac, reaches finfold border
Preanus length: about 50% SL
Pigmentation: oil globule, dorsum of body and finfold pigmented

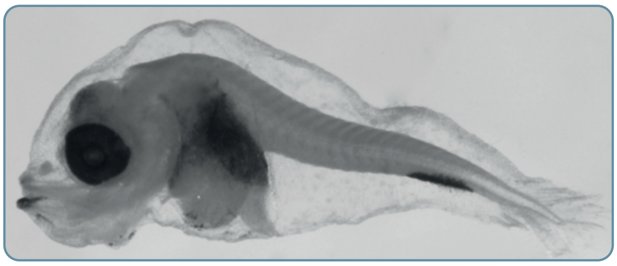
LARVAE — Figs. C-F

Body: relatively short; primordial fin prolonged to snout in early larvae; a mass of spongy tissue appears in spiny dorsal region at 4.0 mm
Head: large; mouth small in early larvae
Eye: round and relatively large
Gut: triangular
Preanus length: increases from about 50% SL to < 65% SL during development
Air bladder: absent
Spination: 3-4 stout spines along preopercular edge, and a few small spines on lateral ridge; supraocular ridge with a small, simple spine; parietal spine well developed with secondary serrations; small pteroptic and post-temporal spines
Pigmentation: peritoneum, ventral side of gut, lower-jaw tip and cleithral region pigmented; 3 melanophores form a ventral patch close to caudal region; some dotted melanophores on head and behind eye; pectoral–fin border pigmented
Length at flexion: 4.5-6.6 mm
Length at transformation: between 19.0 and 35.0 mm

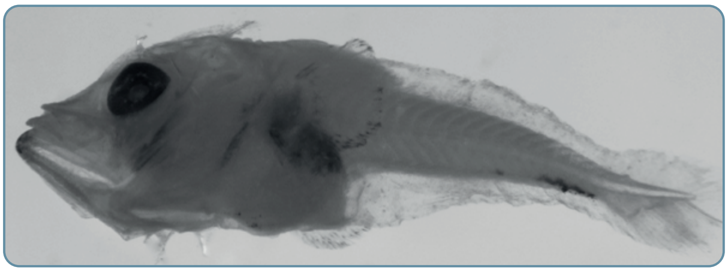
PHOTOS — by J.M. Rodriguez



2.4 mm SL

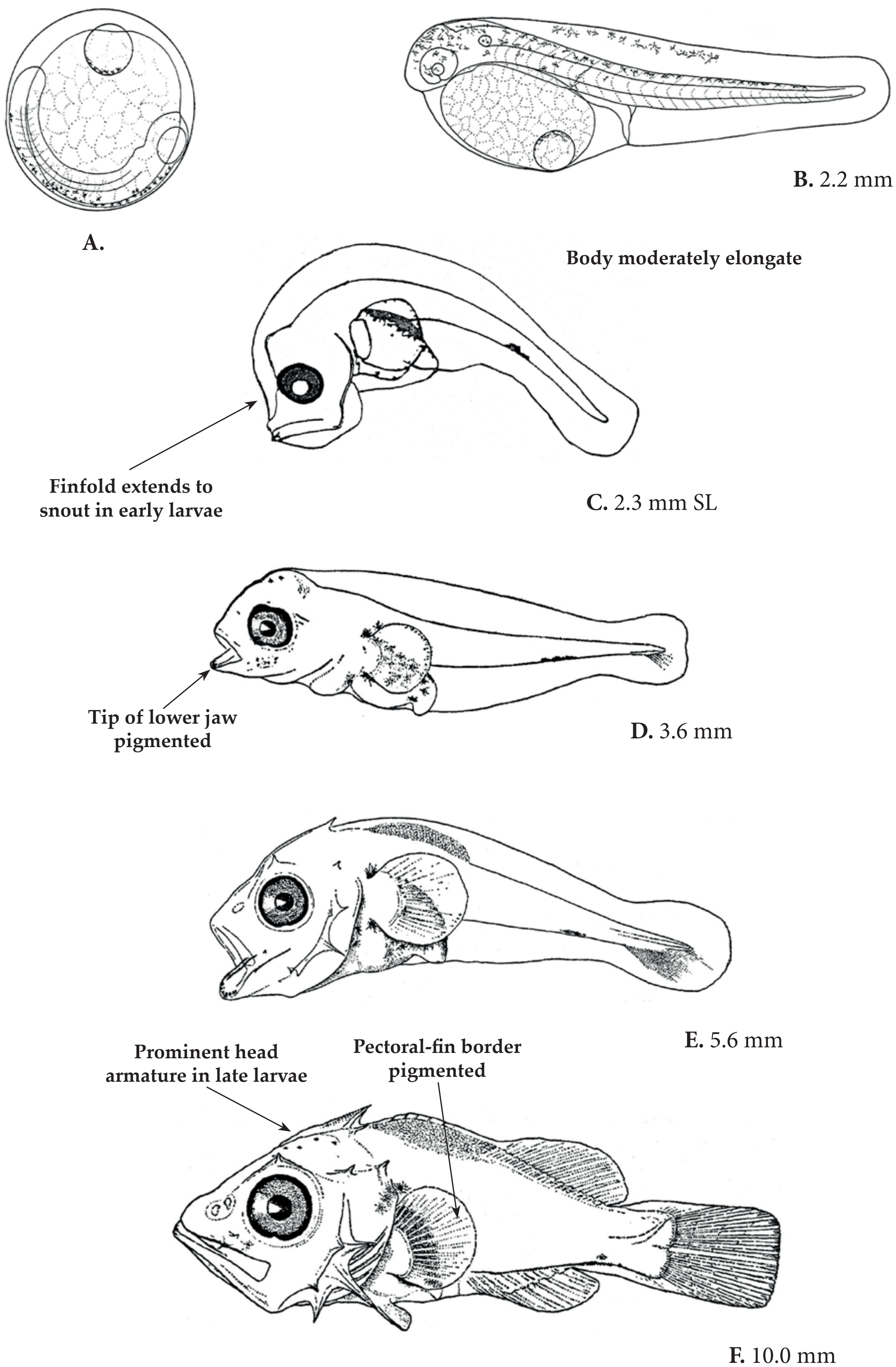


3.5 mm SL



5.9 mm SL

Helicolenus dactylopterus (Delaroche, 1809)



Literature: Alemany (1997), Fahay (2007), Froese and Pauly (2022), Hardy (2006), Hureau and Litvinenko (1986), Sparta (1956b), Tåning (1961)

Illustrations' sources: A, B: Brownell (1979); **C:** Alemany (1997); **D-F:** Tåning (1961)

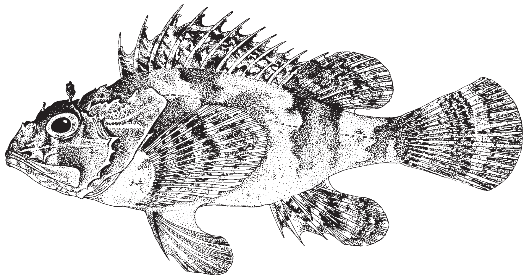
SCORPAENIDAE

Scorpaena porcus Linnaeus, 1758

Black scorpionfish - Rascasse brune

Habitat: neritic and upper slope, demersal, to 800 m depth
Distribution: eastern Atlantic Ocean, from Senegal to the British Isles, and the Mediterranean Sea
Spawning season: May to August (Mediterranean Sea)

Meristic characters
Myomeres: 24
Vertebrae: 24
Dorsal fin: XII + 9
Anal fin: III + 4-5



EGGS — Fig. A

Habitat: pelagic
Shape: ovoid
Chorion: smooth; size 0.92 × 0.84 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: none
Colour: transparent

YOLK–SAC LARVAE — Fig. B

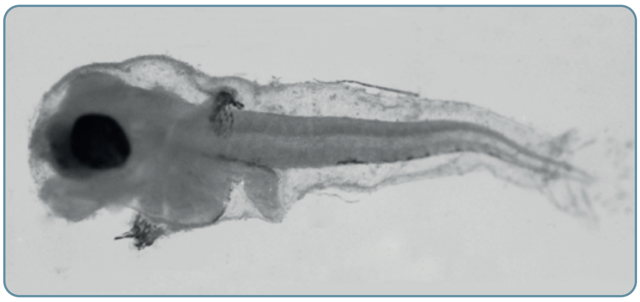
Hatch size: about 1.4 mm
Body: short and stout
Eye: ellipsoid
Yolk sac: large, ovoid
Anus: close behind yolk sac, does not reach finfold border
Preanus length: > 60% SL
Pigmentation: body, yolk sac and finfold covered with dotty melanophores

LARVAE — Figs. C-H

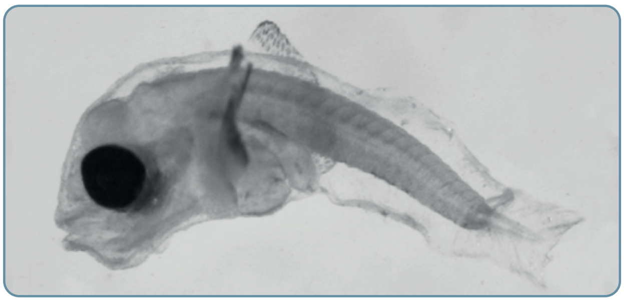
Body: short, increases in height during development; primordial fin prolonged to snout in early larvae; pectoral fins very large
Head: large and concave; mouth relatively large, reaches middle of eye
Eye: round
Gut: triangular
Preanus length: about 50% SL
Air bladder: absent
Spination: cephalic, preopercular and opercular spines; occipital and supraoccipital crests; supraoccipital crests with 2 strong spines finely denticulated
Pigmentation: peritoneum strongly pigmented; a postanal ventral row of melanophores in early larvae, decreasing in number (to 2-4) during development; pectoral–fin borders strogngly pigmented
Length at flexion: almost completed at 3.4 mm SL
Length at transformation: unknown

PHOTOS

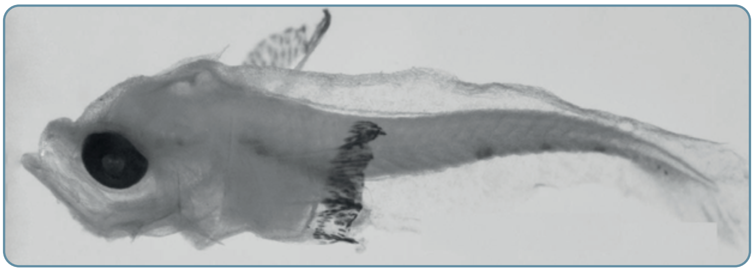
by J.M. Rodriguez



2.5 mm SL



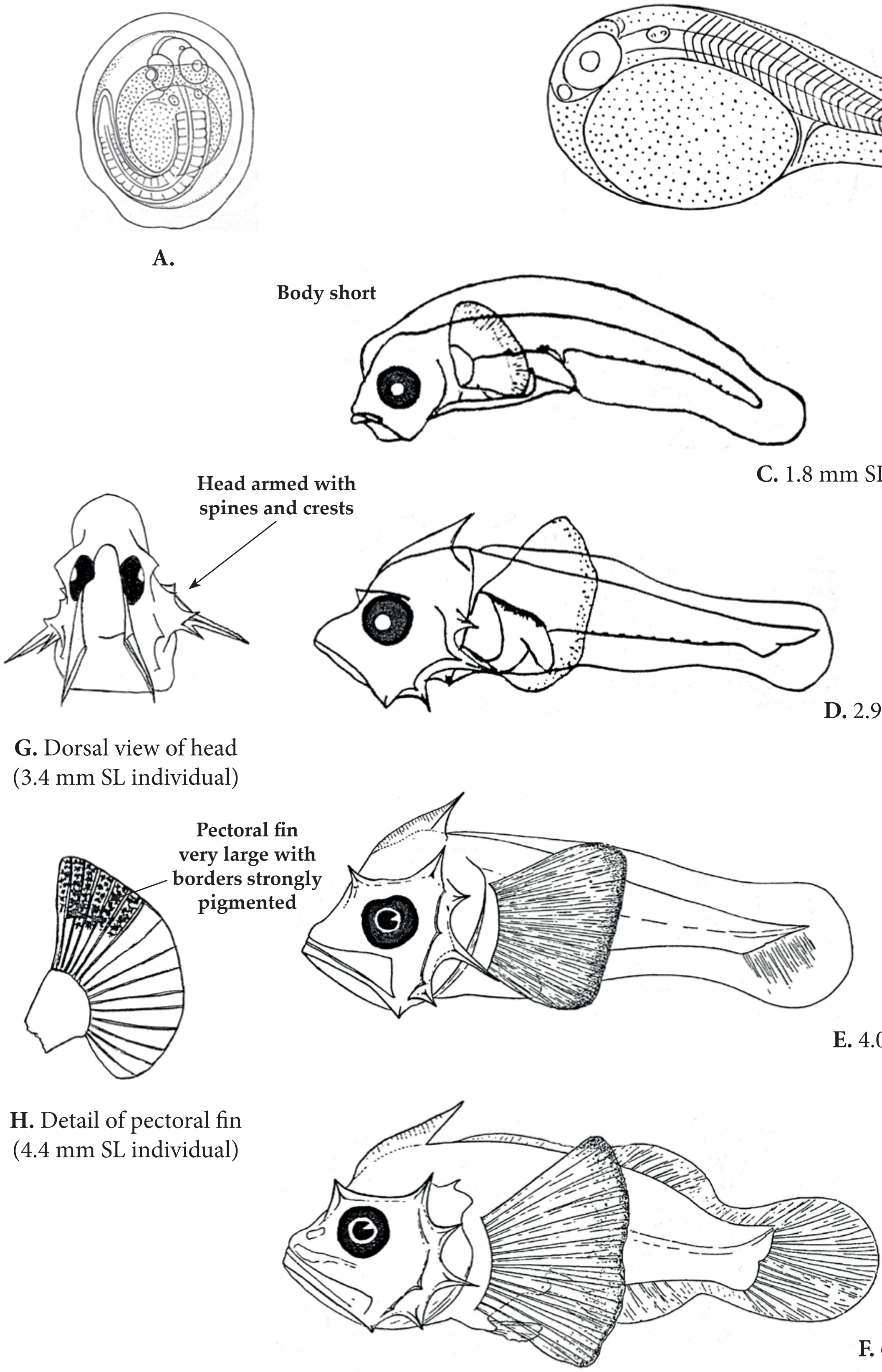
2.9 mm SL



3.5 mm SL

SCORPAENIFORMES

Scorpaena porcus Linnaeus, 1758



A.

B. 1.4 mm

C. 1.8 mm SL

D. 2.9 mm SL

E. 4.0 mm

F. 6.5 mm

G. Dorsal view of head (3.4 mm SL individual)

H. Detail of pectoral fin (4.4 mm SL individual)

Literature: Alemany (1994), Froese and Pauly (2022), Hureau and Litvinenko (1986), Sparta (1956b)

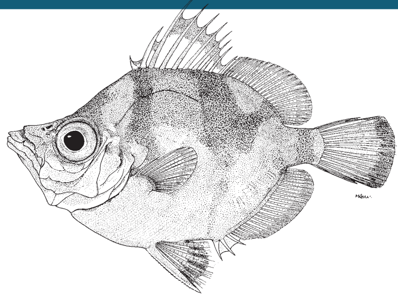
Illustrations' sources: A, B: Sparta (1956b); **C, D, G, H:** Alemany (1997); **E, F:** Fage (1918)

CAPROIDAE

Capros aper (Linnaeus, 1758) — Boarfish - Sanglier

Habitat: neritic, demersal, between 40 and 600 m depth
Distribution: eastern Atlantic Ocean, from Senegal to Norway, and the Mediterranean Sea
Spawning season: spring and summer (Mediterranean Sea)

Meristic characters
Myomeres: 21-23
Vertebrae: 21-23
Dorsal fin: IX-X + 23-25
Anal fin: III + 22-24



EGGS — Fig. A

Habitat: pelagic
Shape: spherical
Chorion: smooth; diam. 0.90-1.01 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: one; diam. 0.15-0.17 mm; unpigmented
Colour: transparent

YOLK–SAC LARVAE — Fig. B

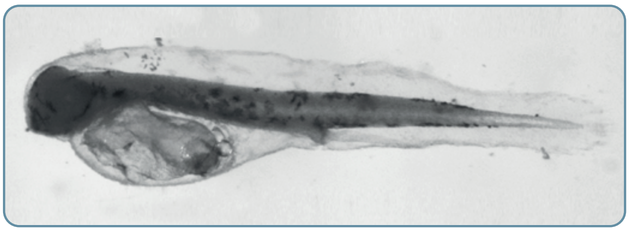
Hatch size: about 2.0-2.5 mm
Body: elongated
Yolk sac: large, ovoid
Oil globule location: at posterior edge of yolk sac
Anus: detached from yolk sac, reaches finfold border
Preanus length: about 67% SL
Pigmentation: body, except caudal region, covered with large stellate melanophores; back side of yolk sac pigmented (close to oil globule)

LARVAE — Figs. C-F

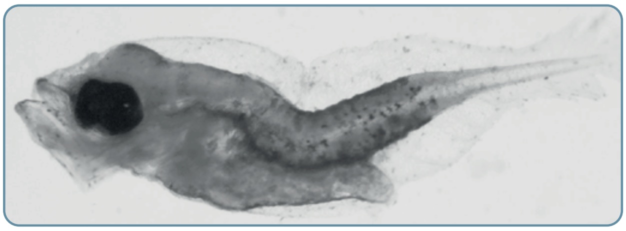
Body: elongate and slender in early larvae, acquires a rhomboid shape at about 3.0 mm
Head: large and high; mouth becomes almost vertical with development and protractile, in postflexion larvae
Eye: round
Gut: almost tube-like in early larvae becomes globose and triangular with development
Preanus length: about 50% SL
Air bladder: apparent in late larvae
Spination: opercular spines and a spinous crest over head appear during development; anterior part of dorsal fin spinous; body covered with small spines in late larvae

Pigmentation: early larvae, a row of ventral melanophores above gut to about middle of tail; dorsal row of 6 large melanophores extending from above mid–gut to level of ventral row end; row of melanophores along ventral surface of gut; some melanophores on head and on mid–lateral side of body; upper and lower jaw tips pigmented; late larvae, body covered with very numerous stellate melanophores, only caudal peduncle remains free of pigment; air bladder pigmented
Length at flexion: completed at 6.0 mm
Length at transformation: unknown

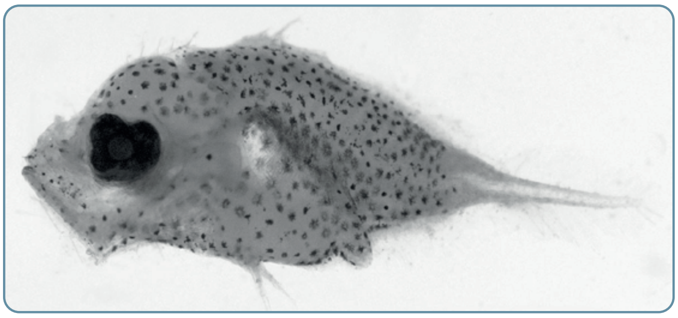
PHOTOS — by J.M. Rodriguez



2.2 mm SL



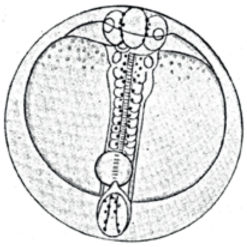
2.5 mm SL



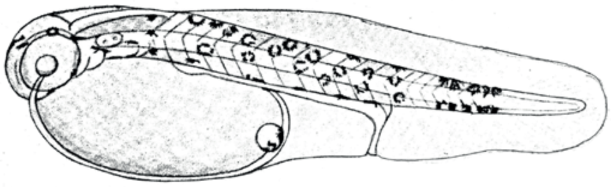
3.0 mm SL

ACANTHURIFORMES

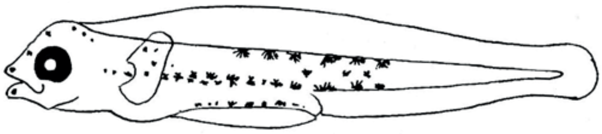
Capros aper (Linnaeus, 1758)



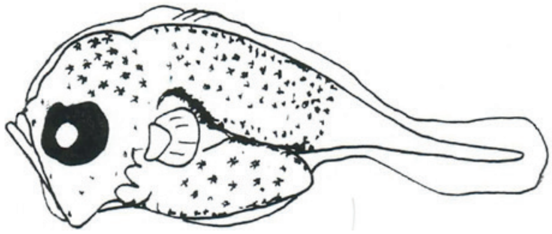
A.



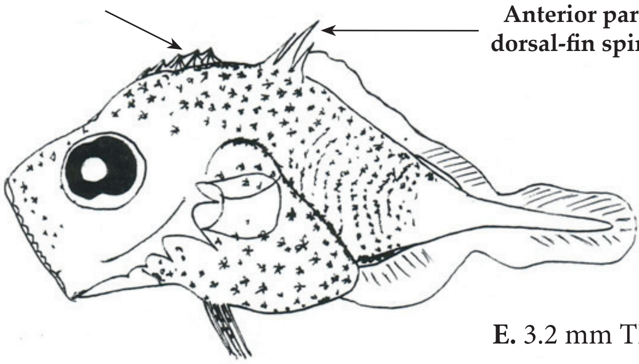
B. 2.9 mm



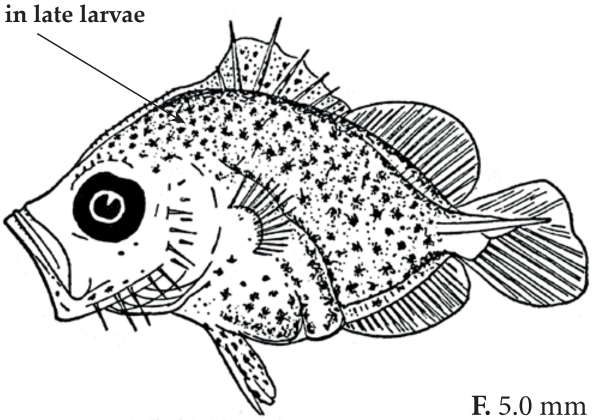
C. 2.9 mm



D. 2.4 mm SL



E. 3.2 mm TL



F. 5.0 mm

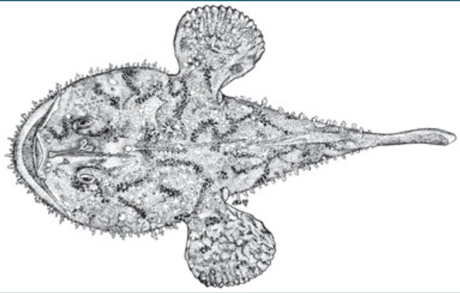
Literature: Froese and Pauly (2022), Quero (1986a), Russell (1976), Sanzo (1956b)

Illustrations' sources: A, B: Sanzo (1956b); **C:** modified from Russell (1976); **D, E:** Alemany (1997); **F:** Fage (1918)

Lophius piscatorius Linnaeus, 1758 — Angler (=Monk) - Baudroie commune

Habitat: neritic and upper slope, demersal, from inshore waters to 500 m depth
Distribution: eastern Atlantic Ocean, from Mauritania to the Barents Sea, and the Mediterranean Sea
Spawning season: February to July

Meristic characters
Myomeres: NA
Vertebrae: NA
Dorsal fin: VI + 11-12
Anal fin: 9-10



EGGS

Habitat: pelagic
Shape: slightly oval, embedded in gelatinous ribbon
Chorion: smooth; diam. 2.3-3.1 mm
Perivitelline space: small
Yolk: unsegmented; pigmented
Oil globules: 1-9; diam. 0.51-0.88 mm; pigmented
Colour: pale straw or yellow

YOLK–SAC LARVAE Figs. A-B

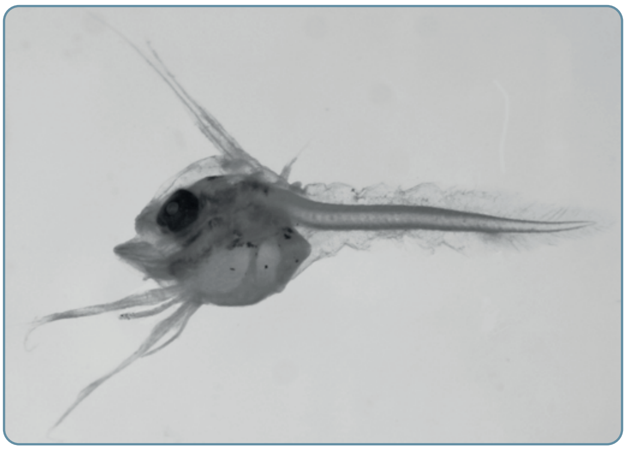
Hatch size: about 4.5 mm
Body: relatively elongate and slender; rudiments of pelvic fins apparent, as well as rudiment of first dorsal-fin ray as a hump-like projection into primordial fin
Yolk sac: spherical and very large
Oil globule location: ventral, posterior in yolk sac
Anus: close behind yolk sac, reaches finfold border
Preanus length: < 50% SL
Pigmentation: large and branched melanophores on head and shoulder region and on gut; yolk sac, oil globules, eyes and pelvic fins pigmented; postanal region unpigmented

LARVAE Figs. C-F

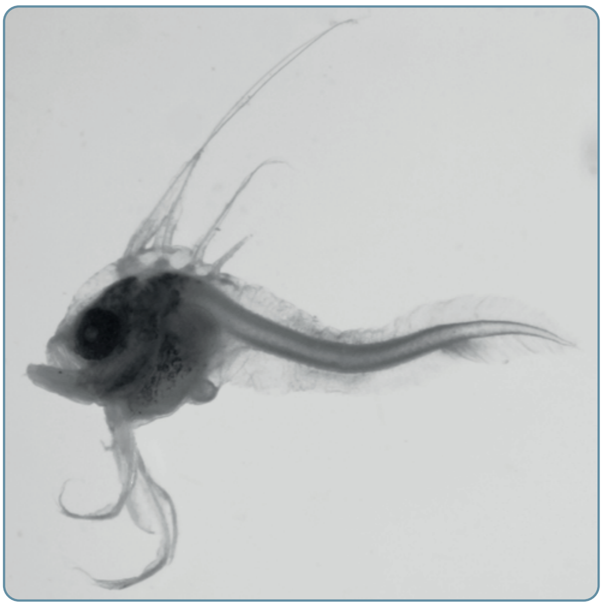
Body: head and trunk globose; dorsal fin formed by 5 rays that develop in a sequential way, from anterior to posterior, and pelvic fins formed by 4 rays strongly developed
Head: moderately large; mouth small and ventral
Eye: round and relatively large
Gut: bulky and rounded
Preanus length: around 50% SL
Air bladder: absent
Spination: none
Pigmentation: early larvae similar to yolk-sac larvae; two postanal bars of melanophores develop in larvae larger than 11.0-12.0 mm
Length at flexion: unknown
Length at transformation: unknown

PHOTOS

by J.M. Rodriguez

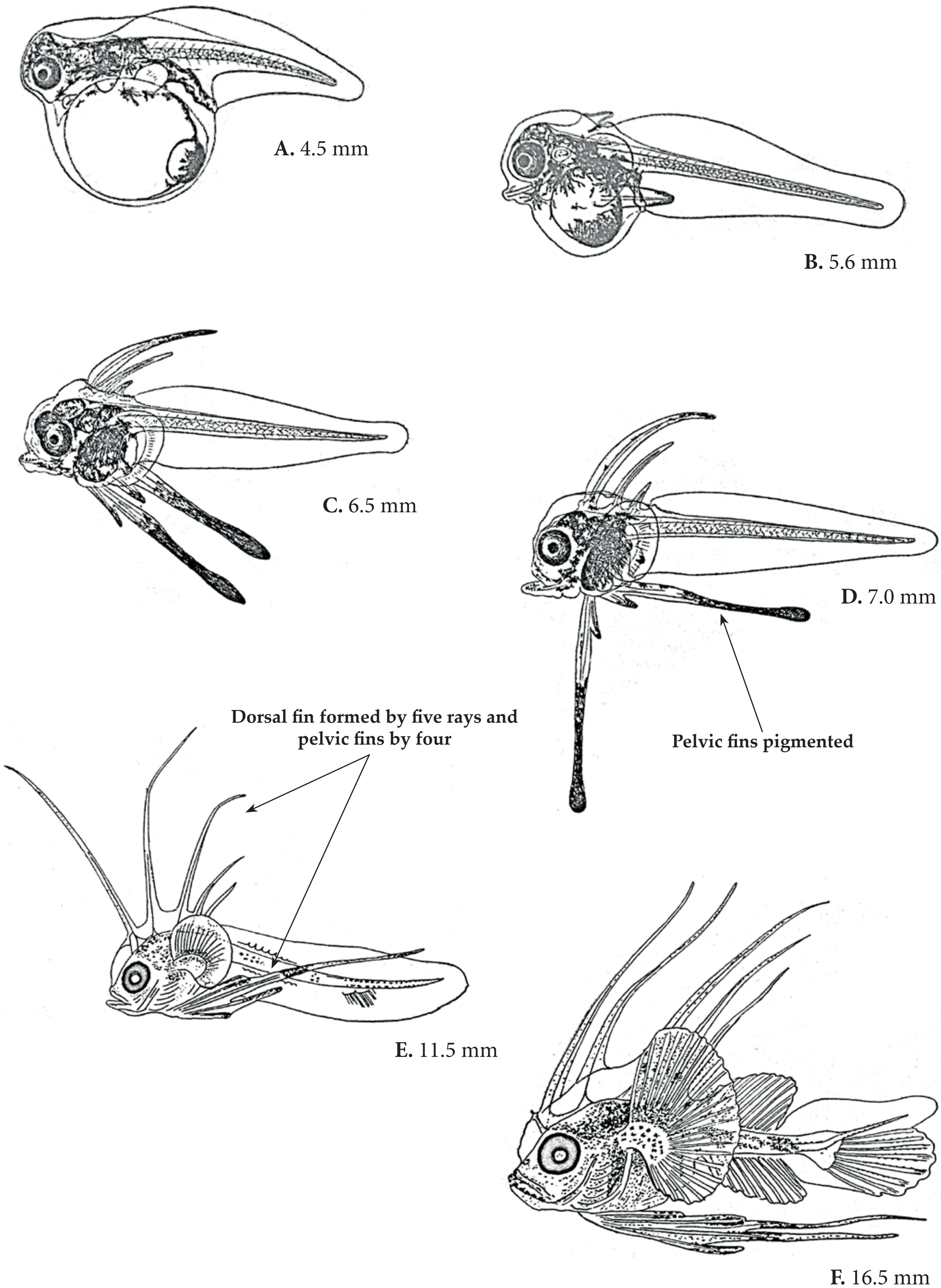


5.4 mm SL



7.0 mm SL

Lophius piscatorius Linnaeus, 1758



Literature: Caruso (1986), Padoa (1956j), Russell (1976)

Illustrations' sources: A-D: Lebour (1925); **E, F:** Taning (1923)

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5. GLOSSARY

Anal fin: Fin (usually single but double in some gadiforms) located on the ventral margin of the tail, behind the anus.

Anus: Orifice and surrounding tissue at end of the gut.

Bathypelagic: Pelagic zone between 1 000 and 4 000 m depth. Bathypelagic fish are those inhabiting the bathypelagic region.

Benthic: Referring to the sea bottom. Benthic species are those living on or in the bottom (substrate).

Benthopelagic: Living and feeding near the bottom as well as in midwater or even near the surface.

Body clupeid shaped: Body elongate and slender and long, tube-like gut

Caudal fin: Median fin situated at the posterior end of the fish.

Caudal peduncle: Narrow part of the tail located between the posterior end of dorsal or anal fin and the base of the caudal fin.

Chorion/shell: Outer membrane of a fish egg.

Choroid tissue: Mass of vascular tissue on the ventral side of the eye in larvae of some myctophids and other meso– and bathypelagic fishes, usually associated with elliptical eyes.

Cleithrum: Vertical bone in the pectoral girdle, at the junction of head and body of the larva.

Cleithral symphysis: Ventral junction of the cleithral bones.

Chromatophore: Cell containing pigment that reflects the light.

Continental shelf: The flattened edge of the continental land mass, between the coast and the continental slope (generally, the continental subtidal zone to a depth of about 200 m).

Continental slope: The sloping edge of the continental land mass, generally beginning at depth of around 200 m.

Demersal: Living on or near the bottom of the sea.

Dorsal fin: Median fin or fins located on the dorsal margin of the body.

Early life history: The early life stages of fishes spanning from egg to juvenile.

Embryo: Early stage of development, from fertilisation to hatching

Epipelagic: The illuminated, uppermost layer of the ocean (from 0 to 200 m depth).

Eye stalks: Movable peduncles of varying length bearing the eyes.

Finfold/primordial fin: Median fold of skin surrounding the body of young larvae, within which the dorsal, caudal and anal fins are developed.

Flexion: Larval stage during which the urostyle bends dorsally.

Gut: Alimentary tube and associated organs.

Gut loop: Loop, fold, or curve found along the axis of the gut.

Head length: Distance from the tip of the snout to the posterior margin of the cleithrum.

Hindgut: Posterior part of the gut.

Homogeneous: Uniform composition throughout; opposite to segmented in referring to egg yolk.

Ichthyoplankton: Zooplankton fraction including eggs and larval stages of fishes.

Isthmus: Ventral region of the head separating the gill openings of a fish.

Juvenile: A young fish, fundamentally resembling the adult in meristic characters (excluding squamation) but smaller and reproductively inactive.

Larva: Early life–history stage of fishes between the egg and juvenile stages.

Leptocephalus: The flat, transparent, and often large larvae of fishes in the orders Anguilliformes, Elopiformes and Notacanthiformes, characterized by small heads and prominent teeth

Melanophore: A cell containing melanin; a black or brown pigment cell.

Meristic characters: Countable structures occurring in series (e.g. myomeres, vertebrae, fin rays).

Mesopelagic: Occurring in the open ocean at middle depths, usually between 200 and 1 000 m.

Metamorphosis: A marked change in form or structure at the end of the larval stage involving acquisition of adult characters and loss of larval characters; synonymous of transformation.

Myomeres: Muscle segments occurring in series, the number is approximately equal to the number of vertebrae in adults.

Myosepta: Connecting tissue between adjacent myomeres.

Nekton: Motile, marine organisms living in the water column and capable of swimming against currents.

Neritic: Pelagic coastal zone extending from the low tide mark to the edge of the continental shelf.

Neural crest: Region of the neural ridge of the developing embryo that differentiates into many kinds of tissue and cells, including melanophores.

Neustonic: Occurring close to the surface of the ocean.

Notochord: Longitudinal flexible cartilaginous rod of cells forming the supporting axis of the body.

Notochord length (NL): The distance from the tip of the snout to the posterior tip of the notochord.

Occipital crest: A median, bony ridge, usually serrated, located on top of the head, posteriorly.

Oceanic: Open sea region beyond the edge of the continental shelf.

Oil globule: Spheres of fatty material within the yolk of some fish eggs.

Opercular: Relative to the operculum.

Operculum or Opercle: The bony plate of the gill cover.

Ovoviviparous: Producing eggs that develop within the maternal body.

Pectoral fin: Paired lateral (sometimes ventrolateral) fins located behind the head.

Peduncle: A narrow part or stalk that connects a structure to the body (e.g. caudal peduncle connecting the caudal fin to body).

Pelagic: Free living in the water column, away from the sea bottom.

Pelvic fins: Paired fins, usually located on the ventral edge of the body, in the abdominal region.

Peritoneal: Region of the body associated with the gut or the membrane of the peritoneum.

Peritoneum: The membrane and associated tissue lining the gut cavity.

Perivitelline space: Fluid–filled space between the embryo and chorion or shell of an egg.

Photophores: Luminous organs on some marine (mostly deep–sea) fish larvae.

Plankton: Small free–living organisms, passively floating or weakly swimming that drift with currents.

Pigmentation: Deposition of pigment in body tissues.

Planktonic: Passively floating, drifting, or weakly swimming with prevailing currents.

Postanal: posterior to the anus.

Postflexion stage: A stage in the development of larvae after the completion of flexion.

Preanal/preanus: Located anterior to the anus; preanal length (synonymous of snout–anus distance) measured from the tip of the snout to the posterior margin of the anus.

Preflexion stage: Larval stage before the beginning of the process of flexion.

Preopercle: Upper anterior bone of the gill cover.

Preopercular: Relative to the preopercle.

Recruitment: The amount of fish added to the exploitable stock each year due to growth and/or migration into the fishing area.

Sculptured: Egg chorion with ornamentations or surface features of different shapes and textures.

Segmented: Particulate or divided; opposite of homogeneous in referring to egg yolk.

Shell: The membrane that encloses an egg; generally, equivalent to chorion.

Shrinkage: The act or fact of shrinking, to contract or lessen in size.

Swimbladder: Sac filled with air or other gases located in the abdominal region, beneath the backbone.

Snout: Forward part of the head, anterior to the eye.

Stalked eye: Eye situated on a stalk or peduncle.

Standard length (SL): The distance from the tip of the snout to the tip of urostyle.

Stellate melanophore: Star–like pigment spot.

Stock (Fish): A group of individuals in a species occupying a well–defined spatial range independent of other stocks of the same species.

Supraorbital spine: Occurring above the eye.

Tail: The portion of the body posterior to the anus, the postanal region.

Telescopic eye: Elongate, cylindrical eye that protrudes forward or upward within an envelope of skin.

Tentacle: Any of various slender, flexible appendages in larvae.

Total length (TL): Measurement from the tip of the snout to the most posterior part of a larva, including the caudal finfold or caudal fin.

Transformation: The process (synonymous of metamorphosis) at the end of the larval stage, characterized by a marked change in form or structure and involving the acquisition of juvenile or adult characters and the loss of larval characters.

Trunk: Portion of the body between the head and the anus.

Urostyle: The last vertebral elements in fishes, formed by fusion or loss of several vertebrae.

Year class: All of the fish in a stock that were spawned in a particular year, such as all those spawned in 1990. Also referred to as a “cohort”.

Yolk: Nutritive material of the egg forming a sac–like mass (yolk sac) below the abdominal region of a newly hatched larva.

Yolk–sac larva: Newly hatched larva with yolk sac.

6. INDEX

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This guide presents the egg and larval descriptions of 150 species of fishes belonging to 57 families, which are most likely to be present in plankton samples collected in the continental shelf and oceanic waters off northwest Africa. The guide is structured in two parts. The first introductory part describes the different applications of ichthyoplankton studies in fisheries research and management, and fish population ecology, the main sampling strategies, methods and gears, and the problems related to sample representativeness. It also describes the early life history of fishes, and how to identify them. A brief description of the hydrography of the study area is also presented. The second part of the guide features the species identification sheets. Each species sheet includes the following information: an illustration of the adult fish and information on its distribution, habitat, spawning season, and meristic characters; a description of the main features useful towards identifying the egg, yolk-sac and larval stages; and illustrations and photos of different larval stages. Finally, the guide provides a comprehensive list of references.

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