

**Local Names** : AUSTRALIA: Blue grenadier; GERMANY: Langschwanz-Seehecht; ITALY : Nasello azzurro; JAPAN : Hoki; NEW ZEALAND : Blue hake, Hoki, Whiptail; SPAIN : Merluza azul; USA : New Zealand whiptail.

**Literature** : Armitage *et al.* (1981); Ayling & Cox (1982); Last *et al.* (1983).

**Remarks** : Some specimens of *Macruronus* recently caught off western North Australia ( $18^{\circ}$  S) might represent an undescribed species (N. Sinclair, pers. comm.).

### ***Merluccius* Rafinesque, 1810**

### **MERLU Merlu**

**Genus with Reference** : *Merluccius* Rafinesque, 1810:25. Type-species; *Merluccius smiridus* Rafinesque, 1810 (= *Gadus merluccius* Linnaeus, 1758) by monotypy.

**Diagnostic Features** : Head large, about 1/3 to 1/4 of body length. Mouth large and oblique; maxillary reaching below middle of eye or behind it, almost half the length of head; lower jaw projecting below the upper; snout long and depressed, its length 1.3 to 3.2 times the eye diameter, its tip broad and rounded; eye large, its length 1/2 to 1/5 of upper jaw length; interorbital space broad, slightly elevated, its width 1.0 to 2.4 times the eye diameter; teeth in both jaws well developed, sharp, in two irregular rows; outer teeth fixed; inner ones larger and inwardly depressible; vomer with a biserial row of smaller teeth; no teeth on palatines; gill rakers well developed, varying in shape and number by species. Two separate dorsal fins, the first short, higher and triangular; the second long and partially divided by a notch at midlength; anal fin similar to second dorsal; pectoral fins long, slender and high in position, their relative length becoming smaller with growth; pelvic fins with 7 rays, placed in front of pectorals; caudal fin smaller than head and becoming progressively forked with growth; caudal skeleton possessing a set of X-Y bones. Scales cycloid, thin and small; dorsal surface of head scaled, except anterior tip of snout. Lateral line more or less straight, with 101 to 171 scales. Total number of vertebrae 48 to 58. **Colour** : usually silvery when alive, steel greyish on back, lighter on sides and silvery whitish on belly; some species are more blackish or almost black, with a white-margined caudal fin; iris golden, pupil blue-black.

**Geographical Distribution** : Hakes are distributed in the waters of both sides of the Atlantic Ocean, the eastern Pacific Ocean and the southern New Zealand waters.

**Habitat and Biology** : Benthic species living in the shelf zone and the upper slope. In some seasons they enter estuary regions and/or very deep waters over the lower slope. They produce pelagic eggs; the larvae are pelagic and juveniles descend to the bottom in shallow coastal waters. Almost all hakes undertake diel vertical migrations, during which they move away from the seabed at night to feed. They also exhibit seasonal migrations; generally, they move to higher latitudes and into inshore areas in warm seasons (spring to summer) and back to lower latitudes into deeper waters during the cold season (autumn to winter). Males grow slower than females, which live longer than males. Cold-water species grow larger (exceeding 1 m) than do tropical species (to 32 cm) in general. The main spawning season is spring to summer in most species. Hakes are carnivorous in general, but their food preferences change during growth. Juveniles feed on planktonic organisms such as small crustaceans and small fishes. Adults feed chiefly on fishes including small hakes and squids.

**Interest to Fisheries** : Most hake fisheries have developed recently, and eleven species are now being heavily exploited. Worldwide catches of hakes reported to FAO amounted to 1 558 473 t in 1987. The Argentine hake is now yielding the largest quantities (434 472 t in 1987) and Argentina catches the largest quantity (314 220 t in 1987) in the world. The global standing stock of hakes is not exactly known, but is estimated to be at least 10 million t. Most species are marketed fresh, but some are also reduced to fishmeal. Freezing has also developed recently, especially on board factory ships operating on distant fishing grounds.

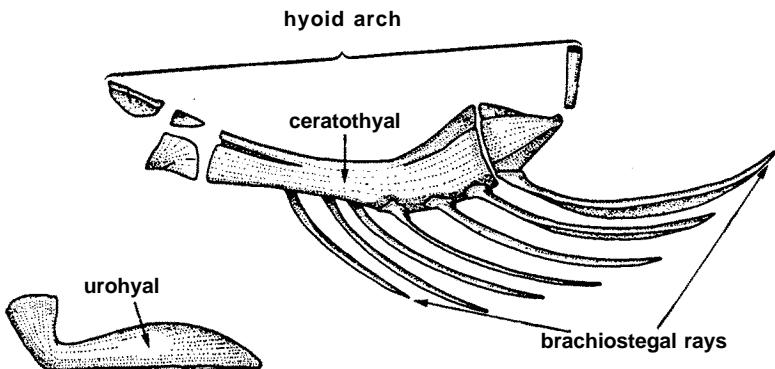
**Literature** : Svetovidov (1948); Grinols & Tillman (1970); Boerema (1977); Inada (1981a)

**Remarks** : Mathews (1985) has described a new species of *Merluccius* (*M. hernandezi*), the status of which is still under discussion. (See introductory remarks to key to species.)

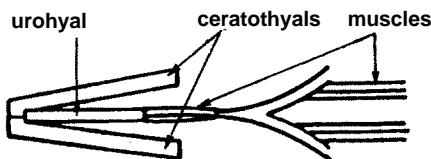
**Key to species :**

For the identification of the species in this genus, the use of counts (fin rays, scales, gillrakers and vertebrae) is unavoidable. Furthermore, an important diagnostic feature of one species (*M. hubbsi*) is the thickness of the urohyal, a median bone within the heavy muscles lying between the arms of the lower jaw (see Fig. 722)

The recently described *Merluccius hernandezi* Mathews, 1985 from the Gulf of California requires further study and can therefore not be included in the present key. It is a small species, similar to *M. angustimanus*, but differs from it by the caudal fin which has a central lobe in juveniles and is truncate in adults, while it is emarginate in *M. angustimanus*; the pectoral fin projects well beyond the anus in *M. hernandezi*, but not so in *M. angustimanus*.



a. lateral view of hyoid arch and branchiostegals in *Merluccius*  
(urohyal out of place) (from Inada, 1981)



b. diagram of bones and muscles of underside of head  
showing position of urohyal (from Gosline, 1971)

Fig. 722

Many of the species are entered more than once in the following key

1a. Total number of gill rakers on first arch fewer than 13

2a. Body blackish, scales along lateral line 102 to 127 ..... *M. pollis*  
E.C. Atlantic (Fig. 741)

2b. Body silvery

3a. Scales large; scales along lateral fewer than 120 ..... *M. albidus*  
W.C. Atlantic (Fig. 723)

3b. Scales small; scales along lateral line more than 119

4a. Urohyal thickly ossified; combined total number of gill rakers and anal fin rays 49 to 55; scales on lateral line 120 to 142 ..... *M. hubbsi*  
S.W. Atlantic (Fig. 735)

4b. Urohyal thin, combined total number of gill rakers and anal fin rays 44 to 51; scales on lateral line 127 to 156 ..... *M. merluccius*  
N.E. Atlantic (Fig. 737)

4c. Urohyal thin, combined total number of gill rakers and anal fin rays 52 to 60; scales on lateral line 144 to 171 ..... *M. australis*  
New Zealand, Patagonia (Fig. 727)

1b. Total number of gill rakers 13 to 15

5a. Urohyal thickly ossified ..... *M. hubbsi*

5b. Urohyal thin

- 6a.** Total number of gill rakers mostly 13 to 16 (range 13 to 18), total number of vertebrae usually 52 to 55 (range 51 to 56); anal fin rays 37 to 40, gill rakers relatively longer ..... *M. senegalensis*  
E.C. Atlantic (Fig. 745)
- 6b.** Total number of gill rakers mostly 16 to 20 (range 15 to 20); total number of vertebrae usually 49 to 52 (range 49 to 53); anal fin rays 37 to 41, gill rakers relatively longer ..... *M. capensis*  
SE. Atlantic (Fig. 731)
- 6c.** Total number of gill rakers mostly 12 to 14 (range 11 to 15); total number of vertebrae usually 55 to 57 (range 53 to 58); anal fin rays mostly 41 to 45 (range 40 to 46); gillrakers short ..... *M. australis*
- 1c.** Total number of gill rakers more than 15
- 7a.** Combined total number of gill rakers and anal fin rays fewer than 57
- 8a.** Total number of vertebrae fewer than 53
- 9a.** Total number of gill rakers usually 13 to 16 (range 13 to 18), number of abdominal vertebrae 25 to 28, total number of vertebrae usually 52 to 55 (range 51 to 56) ..... *M. senegalensis*
- 9b.** Total number of gill rakers 16 to 18, number of abdominal vertebrae 21 to 23, scales on lateral line fewer than 131; maximum size of fish 39 cm ..... *M. angustimanus*  
E.C. Pacific (Fig. 725)
- 9c.** Total number of gill rakers usually 16 to 20 (range 15 to 20), total number of vertebrae usually 49 to 52 (range 49 to 53). scales on lateral line more than 131 ..... *M. capensis*
- 9d.** Total number of gill rakers usually 19 to 23 (range 18 to 25), abdominal vertebrae 21 to 24, scales on lateral line fewer than 131 ..... *M. gayi*  
S.E. Pacific (Fig. 733)
- 8b.** Total number of vertebrae more than 52
- 10a.** Total number of gill rakers usually 13 to 16 (range 13 to 18), abdominal vertebrae 25 to 28; scales on lateral line more than 123, total number of vertebrae usually 52 to 55 (range 51 to 56) ..... *M. senegalensis*
- 10b.** Total number of gill rakers usually 16 to 20 (range 15 to 20); scales on lateral line more than 131; total number of vertebrae usually 49 to 52 (range 49 to 53) ..... *M. capensis*
- 10c.** Abdominal vertebrae 26 to 29; scales on lateral line fewer than 111 ..... *M. bilinearis*  
N.E. Atlantic (Fig. 729)
- 10d.** Abdominal vertebrae 21 to 24; scales on lateral line fewer than 131, total number of gill rakers usually 19 to 23 (range 18 to 25) ..... *M. gayi*
- 7b.** Combined total number of gill rakers and anal fin rays more than 56
- 11a.** Total number of vertebrae fewer than 54
- 12a** Scales on lateral line fewer than 111;abdominal vertebrae 26 to 29 ..... *M. bilinearis*
- 12b.** Abdominal vertebrae 21 to 24; total number of vertebrae usually 50 to 52 (range 48 to 53); scales on lateral line fewer than 131 ..... *M. gayi*
- 12c.** Scales on lateral line more than 124; abdominal vertebrae 23 to 25; total number of vertebrae 53 or 54 ..... *M. productus*  
N.E. Atlantic (Fig. 743)
- 12d.** Scales on lateral line more than 131; total number of vertebrae usually 49 to 52 (range 49 to 53); abdominal vertebrae 23 to 26 ..... *M. capensis*
- 11 b.** Total number of vertebrae more than 53

- 13a. Abdominal vertebrae 26 to 28; scales on lateral line more than 120 ..... *M. paradoxus*  
SE. Atlantic (Fig. 739)
- 13b. Scales on lateral line fewer than 111; abdominal vertebrae 26 to 29 ..... *M. bilinearis*
- 13c. Scales on lateral line more than 124; abdominal vertebrae 23 to 25 ..... *M. productus*

List of species:

- Merluccius albidus* (Mitchill, 1818)  
*Merluccius angustimanus* Garman, 1899  
*\*Merluccius australis* (Hutton, 1872)  
*Merluccius bilinearis* (Mitchill, 1814)  
*Merluccius capensis* Castelnau, 1861  
*Merluccius gayi* (Guichenot, 1848)  
*\*\* Merluccius hernandezi* Mathews, 1985  
*Merluccius hubbsi* Marini, 1933  
*Merluccius merluccius* (Linnaeus, 1758)  
*Merluccius paradoxus* Franca, 1960  
*Merluccius pollii* Cadenat, 1950  
*Merluccius productus* (Ayres, 1855)  
*Merluccius senegalensis* Cadenat, 1950

**Merluccius albidus** (Mitchill, 1818)

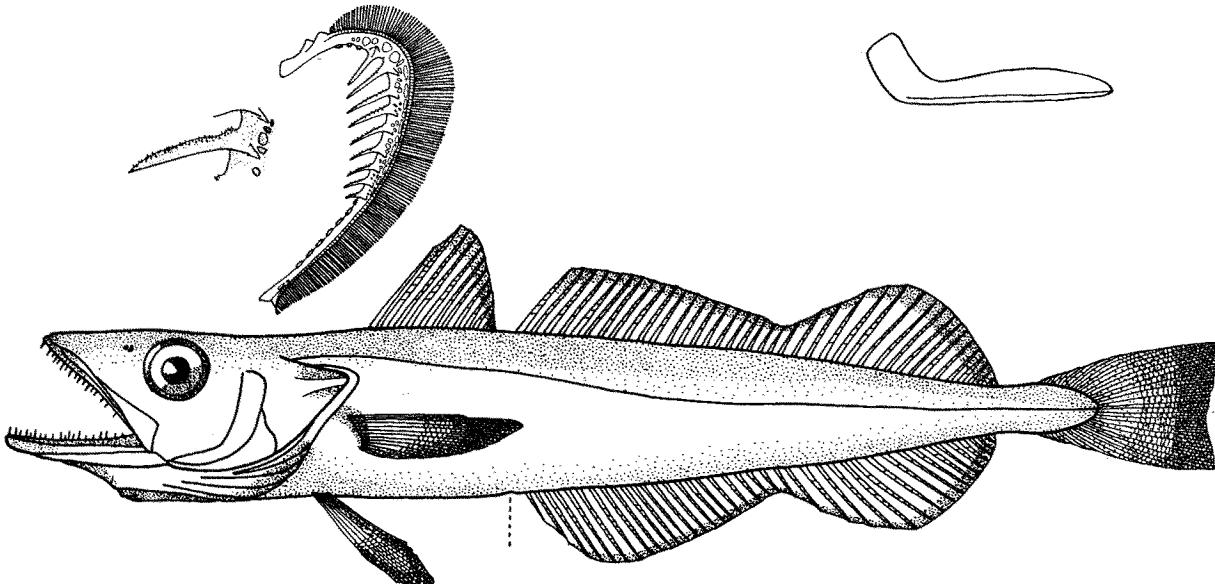
Fig. 723

**MERLU Merlu 2**

Scientific Name with Reference : *Gadus albidus* Mitchill, 1818, J.Acad.Nat.Sci.Philad., 1:409 (New York)

Synonyms : *Merluccius vulgaris* (nec Fleming, 1828) Günther, 1862; *Merluccius bilinearis* (nec Mitchell, 1814); Norman, 1937; *Merluccius magnoculus* Ginsburg, 1954.

FAO Names : En - Offshore hake; Fr - Merlu argenté du large (de l'Atlantique NO); Sp- Merluza blanca de altura



**Diagnostic Features** : Head rather long, 26.8 to 31.7% of standard length. Measurements in relation to head length: eye diameter 15.4 to 22.9%; upper jaw length 48.5 to 55.2%; snout length 31.0 to 37.2%; interorbital width 20.8 to 26.5%. Gill rakers short and thick, with blunt tips; total number on first arch 8 to 11. First dorsal fin with 1 spine and 10 to 12 rays; second dorsal with 35 to 39 rays; anal fin with 35 to 41 rays; tips of pectoral fins reaching origin of anal fin in small fish but not in larger individuals; caudal fin margin truncate (small fish) to concave (larger specimens). Scales rather large, 104 to 119 along lateral line. Total number of vertebrae 51 to 55. **Colour**: silvery white.

\* Includes *M. polylepis*

\*\* Taxonomic status uncertain

**Geographical Distribution :** Atlantic coast of USA, Gulf of Mexico and Caribbean Sea; ranges from Georges Bank, New England ( $40^{\circ} 46'N$ ) to Surinam and French Guiana ( $5^{\circ} N$ ) (Fig. 724).

**Habitat and Biology :** The offshore hake inhabits the outer part of the continental shelf and upper part of the slope (between 80 and 1 170 m depth) and is most abundant between 160 and 640 m. Spawning takes place in summer and occurs near the bottom, in depths between 330 m and 550 m from April to July in New England, and from late spring to early autumn in the Gulf of Mexico and the Caribbean Sea. Fecundity is estimated at 340 000 eggs per female. Feeds at night when it comes up towards the surface. Preys most heavily on fishes (particularly lantern-fishes, sardines and anchovies) and, to a lesser extent, crustaceans and squids. Juveniles feed primarily on shrimps.

**Size :** The largest recorded male and female measured 40 and 70 cm respectively; common to 30 cm (males) and 45 cm (females).

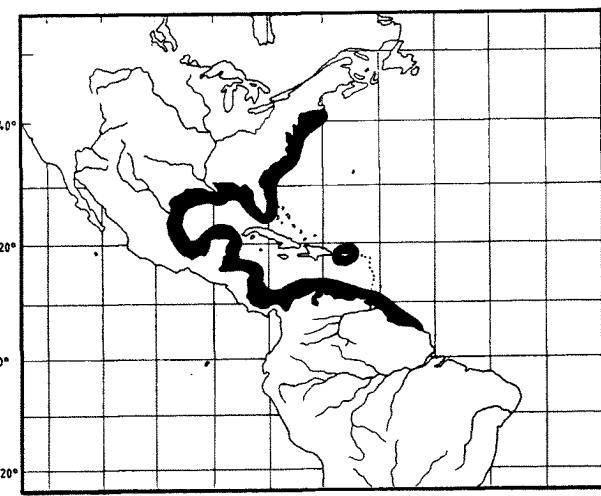


Fig. 724

**Interest to Fisheries :** The offshore hake is the object of minor local fishing and negligible catch statistics were formerly reported only by Cuba and USA. It does not appear to be a targeted species in the North western Atlantic, where it is taken as bycatch by bottom otter trawls in the silver-hake fishery.

**Local Names :** FRENCH GUIANA: Merlu; MEXICO, VENEZUELA: Merluza; USA: Offshore silver hake.

**Literature :** Ginsburg (1954); Rohr & Gutherz (1977); Vergara (1978); Inada (1981a).

***Merluccius angustimanus* Garman, 1899**

Fig. 725

**MERLU Merlu 5**

**Scientific Name with Reference :** *Merluccius angustimanus* Garman, 1899, Mem.Mus.Comp. Zool., 24:183 (Gulf of Panama).

**Synonyms :** *Merluccius gayi* (nec Guichenot, 1848); Norman, 1937; *Merluccius angusticeps*: Hildebrand, 1946

**FAO Names :** En - Panama hake; Fr - Merlu du Panama; Sp -Merluza panameña.

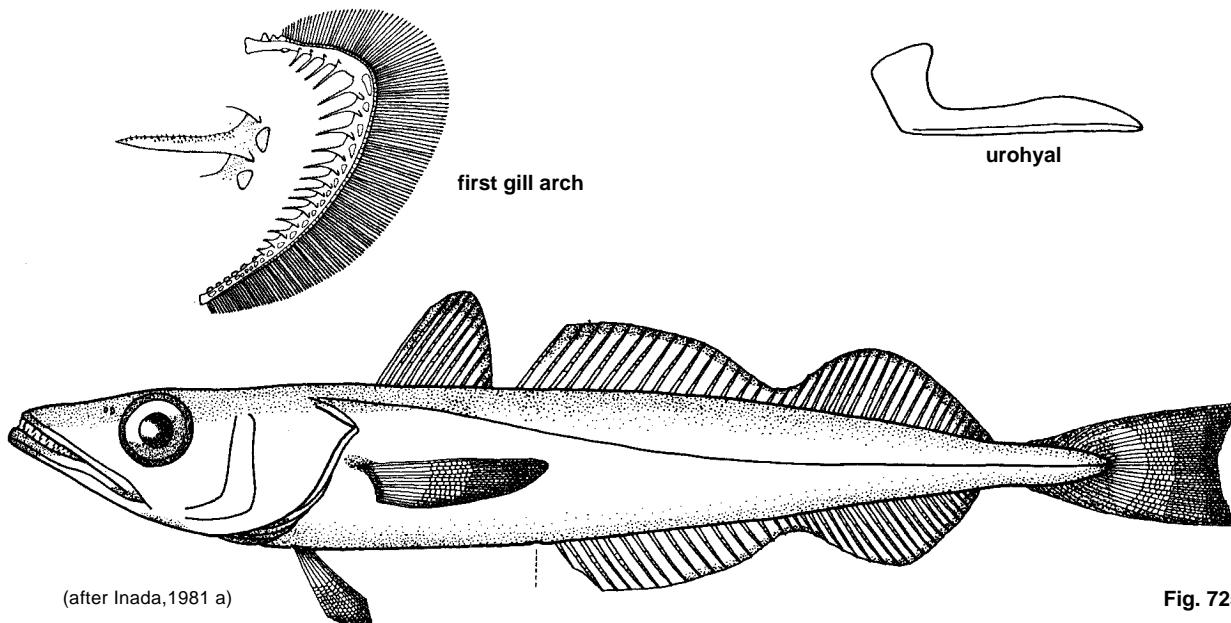


Fig. 725

**Diagnostic Features :** A relatively small fish usually under 30 cm standard length. Head rather long, 30.1 to 33.5% of standard length. Measurements in relation to head length: upper jaw 44.4 to 48.5%; snout 27.8 to 32.7%; eye diameter 16.0 to 21.2%; gill rakers long and slender, with pointed tips, total number on first arch 16 to 18. First dorsal fin with 1 spine and 9 to 12 rays; second dorsal fin with 36 to 40 rays; anal fin with 36 to 39 rays; pectoral fins long, their tips always reaching to or beyond origin of anal fin; caudal fin margin truncate or concave. Scales along lateral line 121 to 134. Total number of vertebrae 49 to 52. **Colour:** silvery on back, whitish on belly.

**Geographical Distribution :** Off the west coast of the Americas from Del Mar, California (33° N) to Ensenada de Tumaco, Colombia (2° N) (Fig. 726).

**Habitat and Biology :** The Panama hake occurs from the shallow continental shelf (80 m) to the upper continental slope (500 m), and in the mid-waters of the open sea and on sea-mounts (Uncle Sam Bank). The spawning season extends from April to June or later. Length at first maturity is 18 to 19 cm for both sexes.

**Size :** Maximum recorded length 40 cm; common to 32 cm.

**Interest to Fisheries :** This hake is only exploited locally with trawls, because of its small size and apparently low abundance.

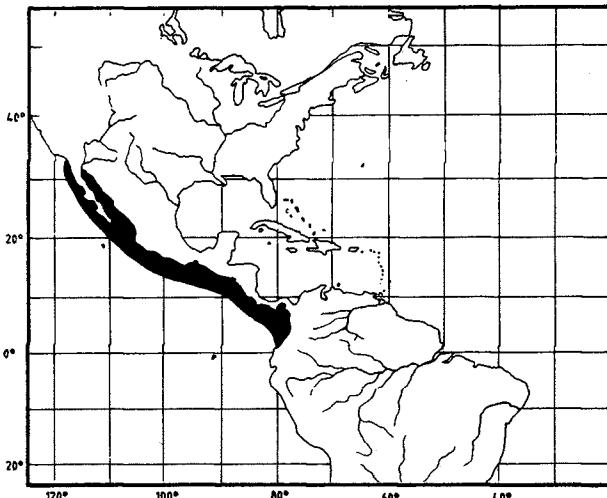


Fig. 726

**Local Names :** COLUMBIA, MEXICO, PANAMA : Merluza; USA: Dwarf hake

**Literature :** Ginsburg (1954); Mathews (1975); Inada (1981a)

**Remarks :** The dwarf hake off the coast of Baja California reported by Vrooman & Paloma (1970) has been described recently as a different species, *M. hernandezi* Mathews, 1985.

### Merluccius australis (Hutton, 1872)

Fig. 727

### MERLU Merlu 6

**Scientific Name with Reference :** *Gadus australis* Hutton, 1872, Fish New Zealand:45 (Cook Strait of New Zealand).

**Synonyms :** *Merluccius gayi* (nec Guichenot, 1848): Günther, 1880; *Merlangius (Huttonichthys) australis* Whitley, 1937; *Merluccius polylepis* Ginsburg, 1954; *Merluccius gayi australis*:Mann, 1954; *Merluccius gayi hubbsi* (nec Marini, 1933): Mann, 1954; *Merluccius gayi polylepis*: Angelescu et al., 1958.

**FAO Names :** En - Southern hake; Fr - Merlu austral; Sp - Merluza austral

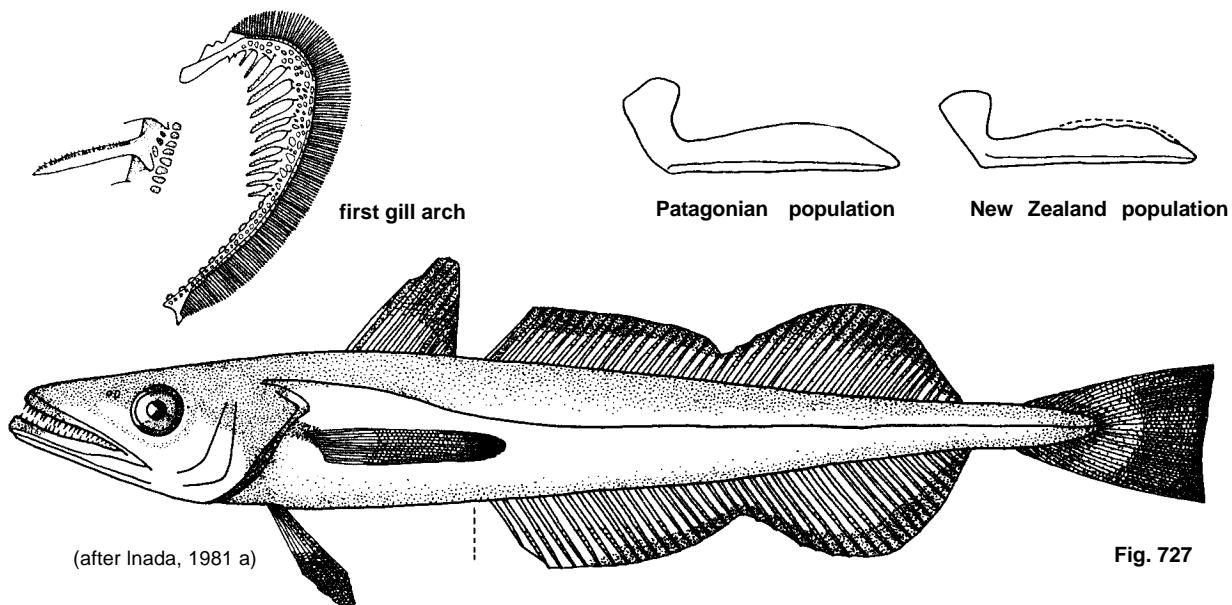


Fig. 727

**Diagnostic Features** : Body more slender than that of other hakes. Head short, 24.9 to 28.3% of standard length. Measurements in relation to head length: snout 33.2 to 39.0%; interorbital space 24.7 to 30.4%; upper jaw 48.2 to 55.9%; gill rakers short and thick with blunt tips, total number on first arch 11 to 15 (mostly 12 to 14). First dorsal fin with 1 spine and 9 to 12 rays; second dorsal fin with 39 to 45 rays; anal fin with 40 to 46 rays; pectoral fins long and slender, but their tips not reaching origin of anal fin in fishes larger than 50 cm standard length; caudal fin margin usually truncate, but sometimes convex in small fishes. Scales small, 144 to 171 along lateral line. Total number of vertebrae 53 to 58. **Colour**: steel grey on back, lighter on sides and silvery white on belly.

**Geographical Distribution** : Two distinct geographical populations are recognized, one from New Zealand (New Zealand population) and the other from southern South America (Patagonian population). The New Zealand population occurs around Chatham Rise, Campbell Plateau and South Island northward to the East Cape. The Patagonian population extends from 40° S (Chile Island) in the Pacific, southward around the southern tip of South America, to the continental shelf north to 49° S and the slope north to 38° S in the Atlantic (Fig. 728).

**Habitat and Biology** : Found in depths between 415 and 1 000 m (bottom temperatures of 5.8 to 8.0° C) in New Zealand waters, and 62 to 800 m (bottom temperatures 3.8 to 9.0° C) in South American waters. The adults probably migrate southward during the southern summer for feeding, and return to the north in winter for spawning.

Off the Patagonian shelf south of 47° S, spawning extends from May to August. First maturity is reached around 65 cm length for males and 85 cm for females. The ratio of females is much higher than that of males. Adults feed on southern blue whiting, whiptail, nototheniids and squids. The New Zealand population spawns from July to August off the west coast of South Island at depths between 800 and 1 000 m, and feeds mainly on fishes (especially gadoids), squids, euphausiids and benthic organisms.

**Size** : Maximum recorded length: 126 cm; common from 60 to 100 cm in both populations.

**Interest to Fisheries** : The two populations of this species are reported separately under different species names (*M. polylepis*) for the Patagonian population in the FAO Yearbook of Fisheries Statistics. The New Zealand population is exploited at present (3 800 metric tons in 1987), but its biomass has been estimated at 64 000 t. The Patagonian population has been fished for the last 25 years, especially by Argentina and Chile (110 993 t in 1987). The standing stock of the Patagonian population is estimated at 115 to 127 400 t between 40° S and 57° S off the southern Chile and between 670 and 210 000 t off Argentina. Caught with trawls and marketed fresh, frozen, and as fishmeal.

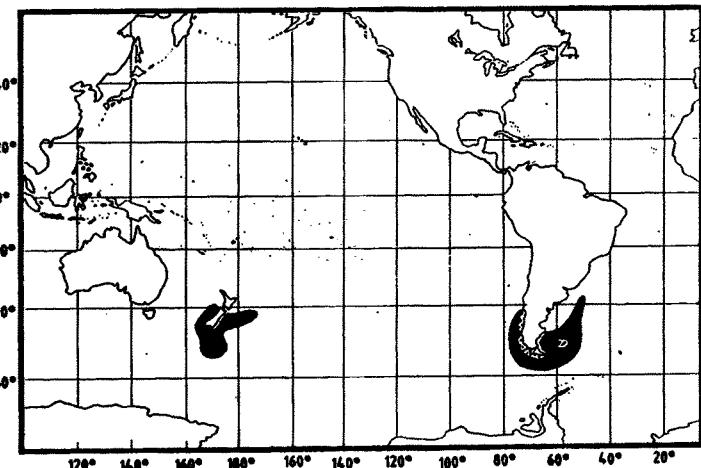


Fig. 728

**Local Names :** ARGENTINA, CHILE: Maltona, Merluza austral, Merluza del sur, Merluza española, Pescada de los canales; NEW ZEALAND : Haddock, Hake.

**Literature :** Norman (1937); Inada (1981a).

***Merluccius bilinearis* (Mitchill, 1814)**

Fig. 729

**MERLU Merlu 7**

**Scientific Name with Reference :** *Stomodon bilinearis* Mitchill, 1814, Trans.Lit.Phil.Soc., I:7 New York).

**Synonyms :** *Merluccius vulgaris* (nec Fleming, 1828); Günther, 1862.

**FAO Names :** En - Silver hake; Fr - Merlu argenté; Sp - Merluza Norteamericana.

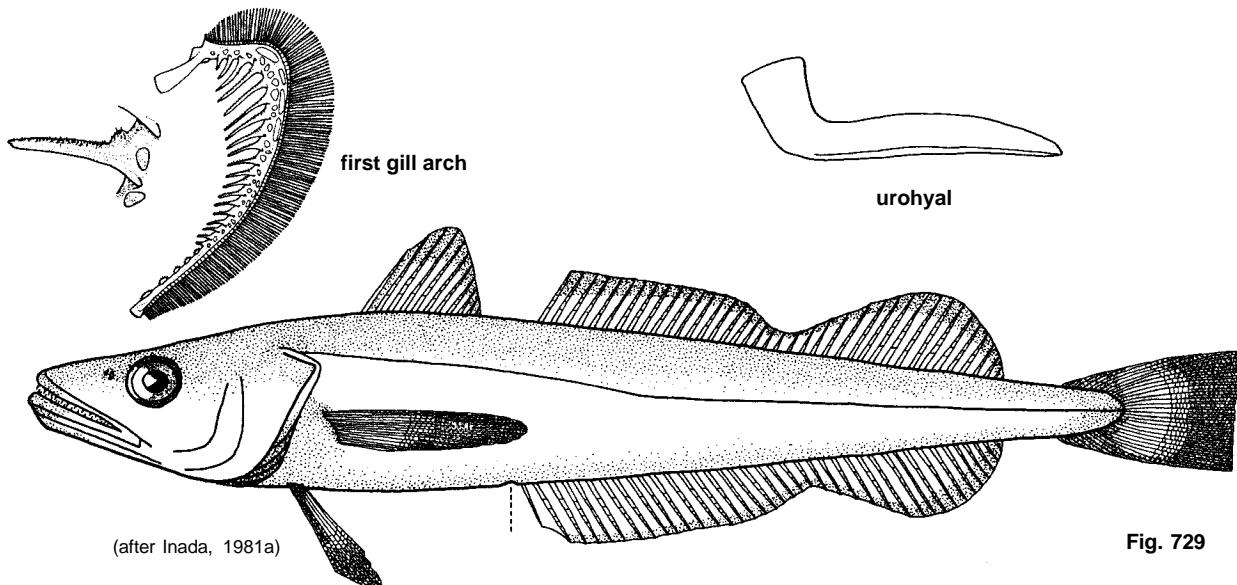


Fig. 729

**Diagnostic Features :** Head rather short, 24.4 to 27.4% of standard length. Measurements in relation to head length: upper jaw 50.0 to 54.4%; snout 31.2 to 35.1%; interorbital width 24.0 to 29.8%; gill rakers long and slender, total number on first arch 16 to 20; first dorsal fin with 1 spine and 10 to 12 rays; second dorsal with 37 to 42 rays; anal fin with 37 to 42 rays; tips of pectoral fins reaching origin of anal fin in young fishes; caudal fin margin truncate in smaller fishes but slightly concave in larger individuals. Scales rather large, 101 to 110 along lateral line. Number of vertebrae 26 to 29 ( precaudal) + 27 to 29 (caudal) = 53 to 57 (total). **Colour:** silvery white.

**Geographical Distribution :** Atlantic coast of Canada and USA from Bell Isle Channel (52° N) to the Bahamas (24° N), most common from southern Newfoundland to South Carolina (Fig. 730).

**Habitat and Biology :** Abundant on the continental shelf in depths from 55 m to 300 m on sandy grounds but can be found up to 914 m depth; sometimes strays into shallower waters. Females grow faster than males; intensive spawning occurs from June to July on the southeastern and southern slopes of Georges Bank, from June to September on the Scotian shelf, and from August to September off Sable Island Bank. Spawning appears to be strongly influenced by water temperature, and annual variations occur both in the peak and the range of the spawning period, which may influence considerably the growth of juveniles. This hake exhibits a seasonal onshore-offshore migration: spawning adults and feeding juveniles move inshore during spring and, when

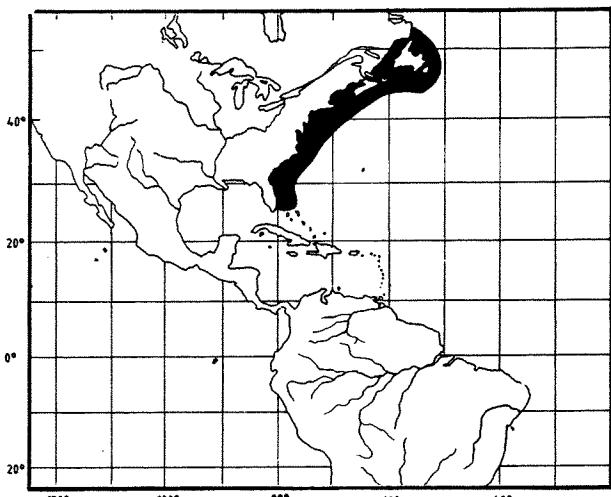


Fig. 730

winter cooling occurs on the shelf, they migrate to warmer waters on the continental edge and slope. Growth is rapid; maximum age is about 12 years. A voracious predator with cannibalistic habits: individuals over 40 cm total length prey on fishes such as gadoids and herring, while smaller ones feed on crustaceans, i.e. euphausiids and pandalids.

**Size :** Maximum recorded length 76 cm (2.3 kg weight); common: 37 and 65 cm for males and females respectively.

**Interest to Fisheries :** The total catch reported to FAO in 1987 amounted to 77 975 metric tons (435 000 t in 1973); of which 41 329 were taken by the USSR (an important constituents of their fisheries since 1962), 20 277 t by Cuba, and 15 714 by the USA. The main fishery for this hake takes place off the coast of Nova Scotia, in the Gulf of Maine and on the Georges Bank in depths up to 220 m. The estimated catch potential of this hake in the Northwest Atlantic is estimated to be 350 000 to 500 000 t. The flesh is firm-textured and very tasty. Marketed filleted, frozen, hot-smoked and boiled, and fried.

**Local Names :** USA: Silver hake

**Literature :** Leim & Scott (1966); Grinols & Tillman (1970); Hunt (1980); Inada (1981a);

***Merluccius capensis* Castelnau, 1861**

Fig. 731

**MERLU Merlu 8**

**Scientific Name with Reference :** *Merluccius capensis* Castelnau, 1861, Mem.poiss.Af.austr.:68 (South Africa).

**Synonyms :** *Merluccius merluccius capensis* : Franca, 1962.

**FAO Names :** En - Cape hake; Fr - Merlu du Cap; Sp - Merluza del Cabo

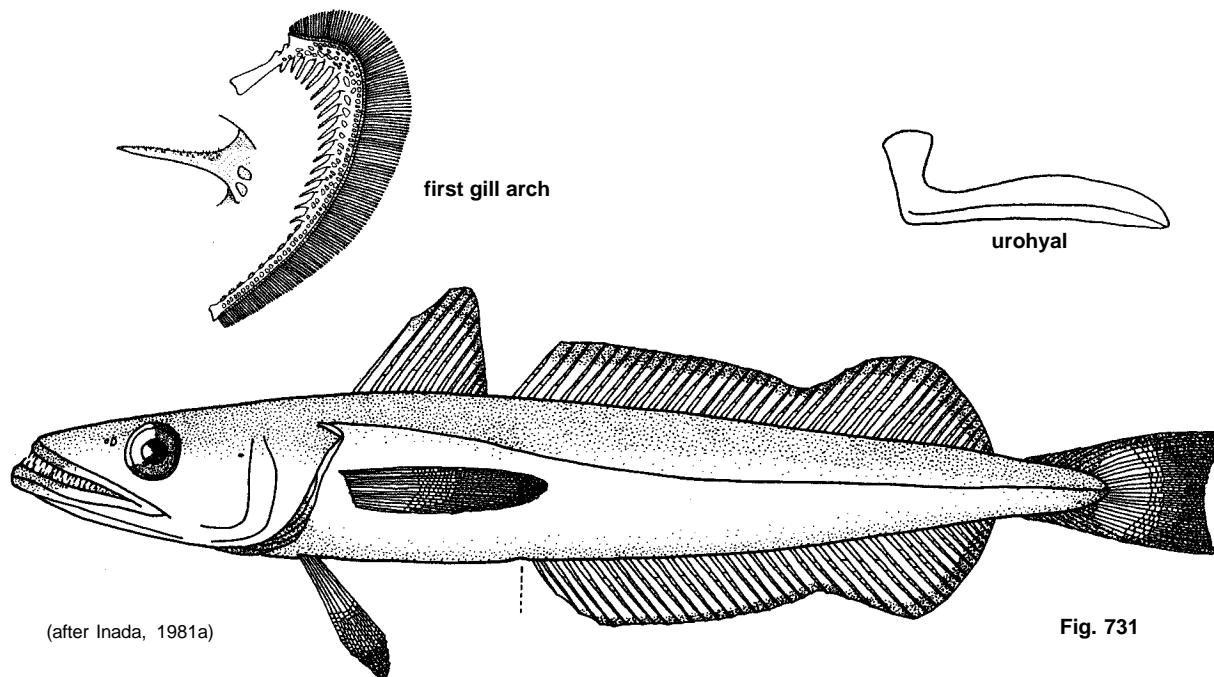


Fig. 731

**Diagnostic Features :** Head large, 27.3 to 30.2% of standard length. Measurements in relation to head length: upper jaw 48.2 to 54.7%; snout 31.9 to 36.5%; interorbital width 24.1 to 28.6%; total number of gill rakers on first arch 15 to 20 (usually 16 to 20). First dorsal fin with 1 spine and 9 to 11 rays; second dorsal fin with 38 to 43 rays; anal fin with 37 to 41 rays; tips of pectoral fins usually reaching origin of anal fin; posterior margin of caudal fin truncate or slightly concave. Scales small, 132 to 149 along lateral line. Number of vertebrae 23 to 26 (precaudal) + 24 to 28 (caudal) = 49 to 53 (total). **Colour:** silvery, somewhat brownish on back, whitish on belly.