Order GONORYNCHIFORMES

CHANIDAE

Milkfish

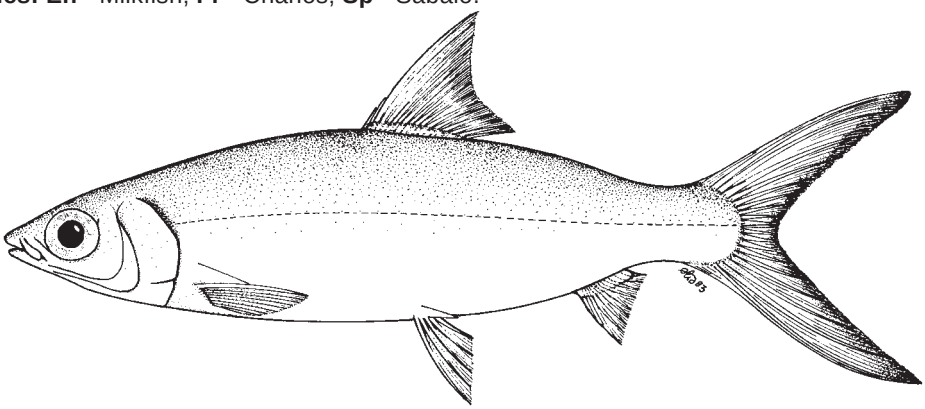
by T. Bagarinao

A single species in this family.

Chanos chanos (Forsskål, 1775) MIL

Frequent synonyms / misidentifications: None / None.

FAO names: En - Milkfish; **Fr** - Chanos; **Sp** - Sabalo.



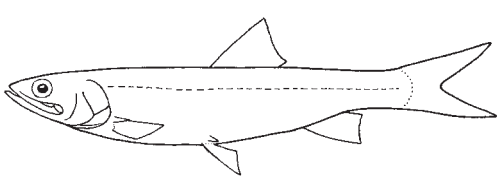
Diagnostic characters: Body elongate, moderately compressed, smooth, and streamlined. Eye covered by adipose tissue. **Mouth small, terminal, without teeth.** Lower jaw with small tubercle at tip, fitting into a notch in upper jaw. **No bony gular plate between arms of lower jaw. Branchiostegal rays only 4.** Gill rakers fine and numerous. Pharyngeal sacs present. Fins without spines; dorsal fin with 13 to 17 rays, about midpoint of body; anal fin short, with 9 to 11 rays, close to caudal fin; caudal fin large and deeply forked, with scale flaps at base in adults; pectoral and pelvic fins with axillary scales. **No scutes along belly.** Scales small and smooth, 75 to 91 on lateral line. Intramuscular bones long and numerous. Esophagus with spiral folds, stomach well developed; intestine very long and convoluted. **Colour:** silvery on belly and sides, grading to olive-green or blue on back; dorsal, anal, and caudal fins with dark margin; peritoneum black.

Size: Maximum total length about 150 cm, wild adults commonly 70 to 100 cm; pond-grown juveniles in markets, 20 to 40 cm; larvae or "fry" commercially collected from shore waters and river mouths, 10 to 17 mm.

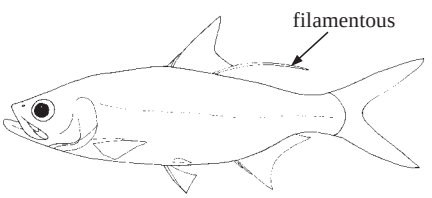
Similar families occurring in the area

Megalopidae (*Megalops cyprinoides*): a bony gular plate present between arms of lower jaw; last dorsal-fin ray filamentous; scales large, 30 to 40 in lateral line.

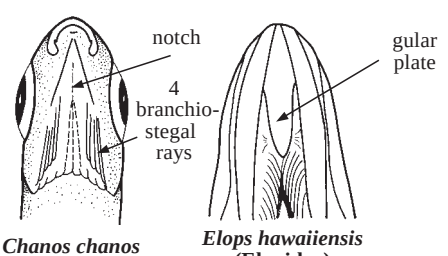
Elopidae (*Elops hawaiiensis*): mouth much larger, maxilla reaching back behind eye; a bony gular plate between arms of lower jaw.



Elopidae (*Elops hawaiiensis*)



Megalopidae (*Megalops cyprinoides*)



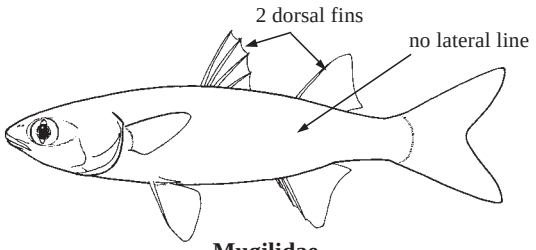
Chanos chanos ***Elops hawaiiensis*** **(Elopidae)**

ventral view of head

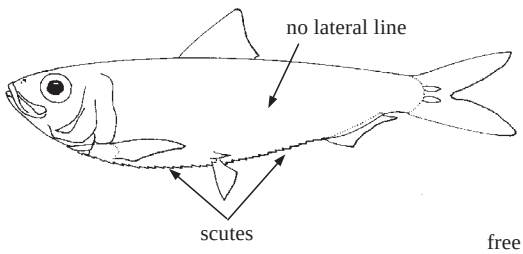
Mugilidae (*Mugil cephalus*, *Lisa* spp., *Valamugil* spp.): 2 short dorsal fins, the first one with IV spines; pectoral fins set high on body; no lateral line.

Clupeidae: size much smaller; usually 6 or 7 branchiostegal rays (only 4 in *Chanos*); no lateral line; scutes usually present along belly.

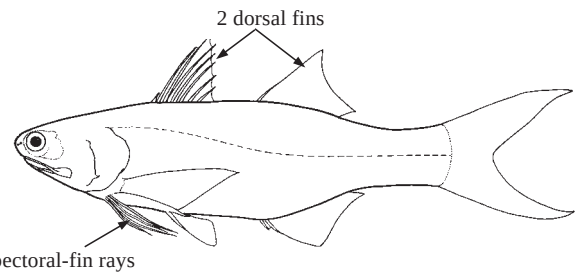
Polynemidae (*Eleutheronema tetradactylum*): mouth large, subterminal; 2 dorsal fins; pectoral fins in 2 parts, the upper with attached rays, the lower with 4 long unattached rays.



Mugilidae



Clupeidae



Polynemidae (*Eleutheronema tetradactylum*)

Habitat, biology, and fisheries: During the breeding season, adult milkfish occur in small to large schools near the coasts or around islands where reefs are well developed. The eggs and larvae are pelagic up to 2 to 3 weeks. Milkfish larvae "migrate" into coastal wetlands, mainly mangrove swamps and lagoons, where they transform into juveniles and grow on the abundant food in relative safety. Occasionally, wild juveniles find themselves in large coastal lagoons, lava ponds, atolls, and fresh-water lakes, where they may stay for several years. Milkfish fail to reach full sexual maturity in fresh-water habitats.

Larvae are visual feeders on zooplankton. The fry in shore waters feed mainly on copepods and diatoms. Juveniles in both natural nursery grounds and traditional culture ponds take food mainly from the bottom, most commonly cyanobacteria, diatoms, and detritus, along with filamentous green algae, small crustaceans, and worms. Adults feed on benthic cyanobacteria, small crustaceans, zooplankton, and larval and juvenile clupeioids.

Adult milkfish are fished in Indonesia, in the Pacific Islands where they are hooked or speared, and in the lagoons in southern Mexico. Juveniles may also be caught by seines and gill nets in or near mangrove swamps and lagoons. The fishery for adult milkfish is banned in the Philippines, but they are occasionally caught by hook-and-line, longlines, gill nets, fish corrals, and other gear in coastal waters. In 1995, FAO's Yearbook of Fishery Statistics reports a total catch of milkfish of about 7 800 t from the Western Central Pacific (Fiji, Kiribati, and mainly the Philippines).

In the Philippines, Indonesia, and Taiwan Province of China, the 10 to 17 mm milkfish larvae or "fry" are collected in large numbers from shore waters, river mouths, and mangrove areas, and are grown in ponds as a major aquaculture industry in these 3 countries. With the use of seines and various forms of bag nets, some 1.35 billion fry were collected in the Philippines in 1974, about 700 to 800 million fry each year in Indonesia, and 130 million a year in Taiwan Province of China. In 1991, 416 445 t of milkfish were produced from culture ponds in these 3 countries, and about 300 t in Thailand and Guam. But in 1996, the total harvest of farmed milkfish was only 364 425 t.

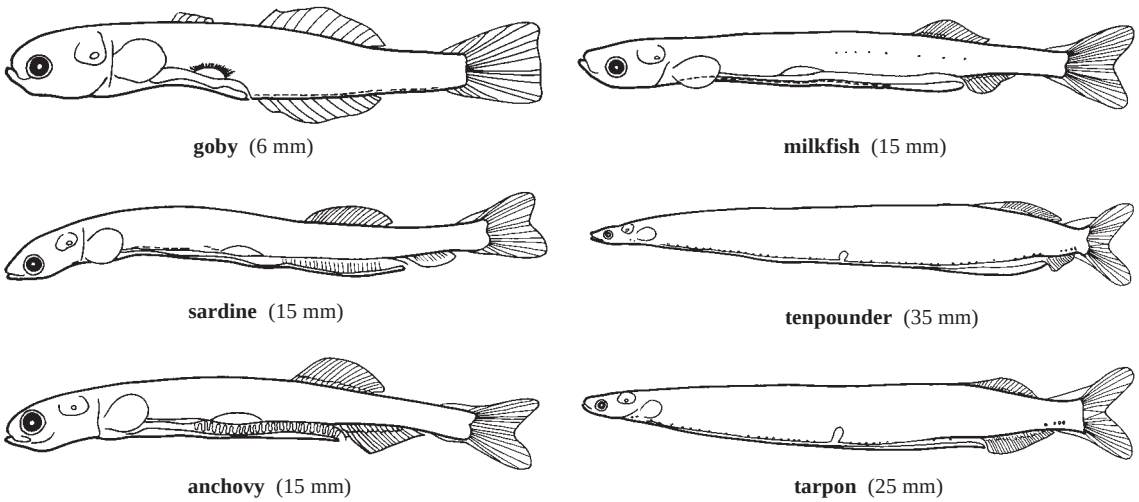
Pond-grown milkfish are marketed fresh, dried, canned, smoked, marinated, chilled, or quick-frozen, whole or deboned. Small pond-grown juveniles with a size of 2 to 10 cm ("fingerlings") are marketed alive for grow-out culture elsewhere, or for use as tuna bait. Adult milkfish from the wild are marketed fresh.

Milkfish fry are now produced in hatcheries from eggs spawned by captive broodstock in floating cages, earthen ponds, and concrete tanks in the Philippines, Taiwan Province of China, Indonesia, and Hawaii. Intensification of the centuries-old milkfish aquaculture is expected.

In shore waters, milkfish fry occur with closely similar fish larvae with transparent elongate bodies. In the collector's basin, milkfish fry can be readily picked out by their energetic movements and their conspicuous eyes. They continuously circle together in the same direction and stay alive long after most other species in the same catch have died.

Milkfish fry may be distinguished by means of size range (10 to 17 mm), the single line of pigments on the ventral edge of the abdomen, the straight gut without transverse foldings of the intestine, the pigments on the caudal fin, and a large liver that could be mistaken for yolk. The tarpon *Megalops cyprinoides* and tenpounder *Elops hawaiiensis* larvae have longer (25 to 35 mm), deeper, ribbon-like bodies, are not as abundant, but are as hardy as milkfish fry. The larvae of the anchovies *Stolephorus* spp. and sardines *Sardinella* spp. have striated-looking intestines and die easily. Goby larvae have 2 short dorsal fins and a prominent swimbladder.

Juvenile milkfish with distinctly elongated fins ("goldfish type"), short hunchback bodies ("shad type"), or of unusual coloration (red head, red fins, and brilliant-blue dorsal surface) have been recorded, but rarely.



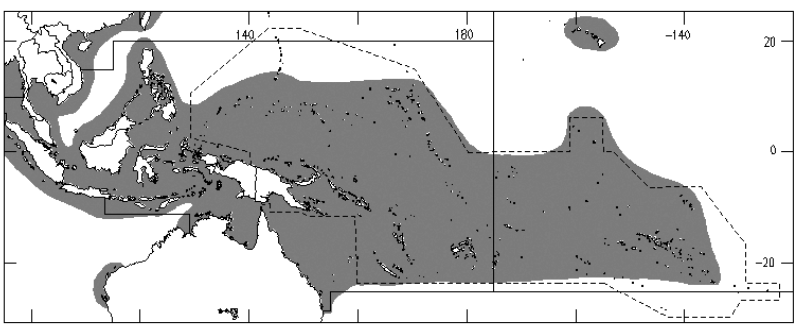
goby (6 mm) **milkfish** (15 mm)

sardine (15 mm) **tenpounder** (35 mm)

anchovy (15 mm) **tarpon** (25 mm)

(after Bagarinao et al., 1987)

Distribution: Indo Pacific, along continental shelves and around islands, in waters with temperatures greater than (20°C). From Southeast Asia north to Japan (35°N), south to Australia (38°N), west to the Red Sea (22°N) and South Africa (34°S) east to Hawaii and the Marquesas Islands, and in the eastern Pacific from California (33°N) to the Galapagos. Populations of milkfish in the Philippines and several Pacific Islands show low genetic divergence and are thought to be potentially interbreeding.



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Bagarinao, T. 1994. Systematics, distribution, genetics, and life history of milkfish *Chanos chanos*. *Env. Biol. Fish.*, 39:23-41.

Bagarinao, T. 1998. Historical and current trends in milkfish farming in the Philippines. In *Tropical Mariculture*, edited by S.S. de Silva. San Diego, Academic Press, pp. 381-422.

Bagarinao, T. 1999. *Ecology and farming of milkfish*. Iloilo, Philippines, SEAFDEC Aquaculture Department, 153 p.

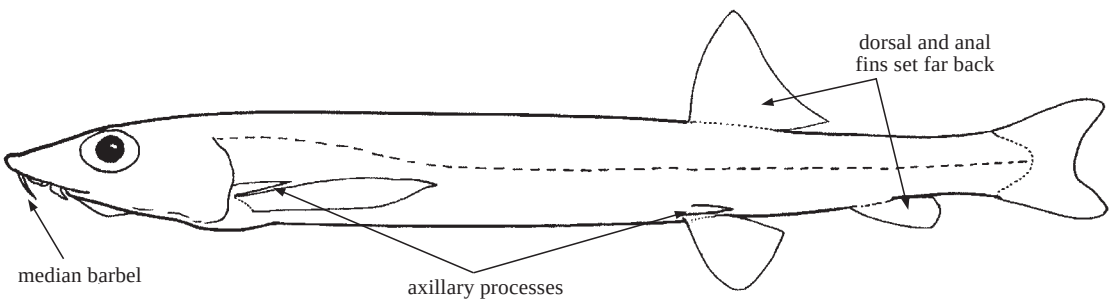
Bagarinao, T., N.B. Solis, W.R. Villaver, and A.C. Villaluz. 1987. *Important fish and shrimp fry in Philippine coastal waters: identification, collection, and handling*. Iloilo, Philippines, Extension Manual No. 10, 52 p.

GONORYNCHIDAE

Beaked sandfish

by C.J. Ferraris

Diagnostic characters: Elongate cylindrical body (to about 50 cm); greatest body depth about 10% of standard length; body tapers gradually from dorsal fin to caudal peduncle. **Body and head completely covered with ctenoid scales**. Head conical, snout tip rounded. Eye ovoid, covered with thick epidermus. Mouth inferior, with fringed lips and toothless jaws. **Snout with a median, scaleless barbel** ventrally, between upper lip and snout tip; barbel shorter than snout. Nostrils midlateral, close together and near snout tip. Gill membranes joined broadly to body. Dorsal and anal fins both short and set on posterior third of body; dorsal-fin origin above or slightly behind vertical from pelvic-fin origin; anal fin posterior to vertical from the dorsal fin; no finlets present; **pectoral and pelvic fins with fleshy axillary process** dorsally at fin origin; caudal fin slightly forked, lobes of equal length with slightly rounded tips. Lateral line midlateral, complete; lateral-line pores emerge from between scales; **no pored scales**; scales surrounding pores either or the same size as, or markedly reduced from, other body scales. Post-flexion larvae elongate with terminal or slightly inferior mouth, and single or double midlateral row of conspicuous melanophores. **Colour:** mousey brown, slightly lighter ventrally; fins and opercular margin with darker markings that vary among species.



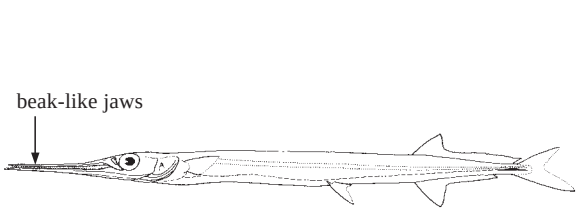
Habitat, biology, and fisheies: Beaked sandfish are of no commercial importance and are caught only rarely in trawls. In Australia and New Zealand, specimens are occasionally observed in shallow waters and in estuaries.

Similar families occurring in the area

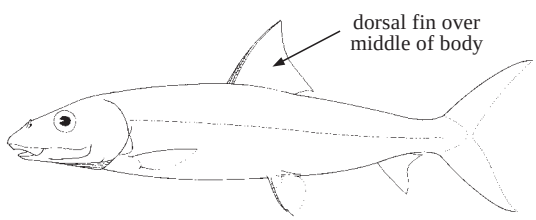
Belonidae (needlefishes) and Hemiramphidae (halfbeaks): all members of these 2 families have terminal mouths with 1 or both jaws prolonged into a beak.

Albulidae (bonefishes): dorsal fin over middle of body; caudal fin deeply forked; no barbel on snout.

Salangidae (noodlefishes, fresh water): head strongly depressed; body scaleless; no barbel on snout.



Belonidae



Albulidae

Key to species of the family Gonorynchidae

Note: species of the Gonorynchidae are placed in a single genus, known at present only from a few post-flexion larval specimens of *Gonorynchus abbreviatus* in the Western Central Pacific. However, the remaining 4 species are known from just outside the area and may in fact occur there. For this reason, a key to all 4 species is presented below, with their distribution indicated in parantheses.

1a. Head large, greater than 25% of standard length; opercular margin heavily pigmented . . . . . → ***2***

1b. Head less than 25% of standard length; opercular margin not darker than surrounding area . . . . . → ***3***

2a. Branched pectoral-fin rays 10 (rarely 9), branched pelvic-fin rays 8 (rarely 7) . . . . . ***Gonorynchus moseleyi*** (Hawaii)

2b. Branched pectoral-fin rays usually 9, branched pelvic-fin rays 7 (rarely 8) . . . . . ***Gonorynchus abbeviatus*** (Southern Japan, Taiwan Province of China, Philippines)

3a. More than 190 scale rows along lateral line . . . . . ***Gonorynchus forsteri*** (New Zealand)

3b. Fewer than 180 scale rows along lateral line . . . . . ***Gonorynchus greyi*** (Australia, northwestern New Zealand)

List of species occurring in the area

A question mark indicates that presence in the area is uncertain.

Gonorynchus abbreviatus Temminck and Schlegel, 1846
? *Gonorynchus forsteri* Ogilby, 1911
? *Gonorynchus greyi* (Richardson, 1845)
? *Gonorynchus moseleyi* Jordan and Snyder, 1923

Reference

Hermes, R. 1987. First of *Gonorynchus larvae* (Pisces, Gonorynchiformes, Gonorynchidae) from Philippines waters. *Fish Res. J. Philipp.*, 12(102):1-8.