

THE MARINE FISHES (TELEOSTEI) OF SOUTHERN CALIFORNIA†

(Continued from the May-June Issue of the Bulletin)

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- CC. Ventral fins with or without spine, the number of soft rays fewer than 5.
- J. Gill opening before the pectoral fin.
- K. Anal fin present; caudal fin not directed upward.
- L. Upper jaw not prolonged into a sword.
- M. Dorsal fin with some spines or simple rays.
- N. Dorsal fin without soft rays, composed of spines only **Blenniidae**
- NN. Dorsal fin with soft rays anteriorly, with spines posteriorly; gill membranes joined to isthmus. **Zoarcidae**
- NNN. Dorsal fin or spines anteriorly, with soft rays posteriorly.
- O. Dorsal spines connected by membrane.
- P. Suborbital with a bony stay, extending across the cheek, to or toward the preopercle, the cheek sometimes entirely covered with a coat of mail.
- Q. Pectoral fin not divided.
- R. Body entirely covered with an armour of bony plates; head bony. **Agonidae**
- RR. Body naked, or more or less rough or scaly, not entirely covered by bony plates.
- S. Gill opening large, extending downward nearly or quite the lowest pectoral ray. **Cottidae**
- PP. Suborbital without bony stay.
- T. Dorsal spines 2 to 4 only; head very broad, depressed; gills 3; gill membranes broadly united to the isthmus.
- U. Ventrals not reduced each to a single spine. **Batrachoididae**
- TT. Dorsal spines numerous; gills 4.
- V. Gill membranes separate, free from the isthmus.
* Body greatly elongate; lower jaw with a slit at base to permit free motion; lips not fringed. Soft dorsal and anal without anterior lobe; continuous with spinous part **Lepidopidae (Trichiuridae)**
- VV. Gill membranes broadly united, attached to the isthmus or not.
- W. Gill openings moderate or large. **Blenniidae**
- MM. Dorsal fins of soft rays only.

- X. Breast with a large sucking disk between ventral fins...
.....**Gobiesocidae**
- XX. Breast without sucking disk.
- Y. Body covered with a coat of mail; dorsal very short...
.....**Agonidae**
- YY. Body not mailed; dorsal many-rayed.
- Z. Lateral line and base of dorsal beset with prickles; skeleton very soft; body compressed.....**lcosteidae**
- ZZ. Lateral line unarmed.
 - a. Tail isocercal, the vertebral column pointed behind, the last vertebrae very small; hypercoracoid not perforate; no pseudobranchiae.
 - b. Caudal fin wanting.....**Macrouridae**.
 - aa. Tail not isocercal, truncate at base of caudal; hypercoracoid perforate.
 - c. Gill membranes joined to the isthmus; pseudobranchiae present.
 - d. Ventral fins under shoulder girdle.....**Zoarcidae**.
 - cc. Gill membranes free from the isthmus.
 - e. Ventral fins inserted below or before the eyes; pseudobranchiae generally well developed.....**Ophidiidae**
 - ee. Ventral fins inserted below shoulder girdle; no pseudobranchiae**Brotulidae**
- LL. Upper jaw prolonged into a bony sword; dorsal fin long and high; size large.....**Istiophoridae**
- KK. Anal fin wanting; caudal fin distorted or directed upward; body ribbon-like.
 - f. Ventral fins each reduced to a long slender filament...
.....**Regalecidae**
- JJ. Gill openings behind the pectoral fins.
 - g. Gill openings below and behind pectorals; mouth large, nearly vertical.....**Antennariidae**

4. Ventral Fins Wholly Wanting.

- A. Premaxillary and maxillary wanting or grown fast to the palatines; body greatly elongate, eel-shaped; gill openings restricted to the sides; scales minute or wanting; scapular arch not attached to the skull. Eels.
- B. Gill openings not very far behind cranium; gape not inordinately distensible; gill arches 4 pairs.
- C. Gill openings well developed, leading to large interbranchial slits; tongue present; opercles and branchial bones well developed; scapular arch present.
- D. Scales wholly wanting; eggs (so far as known) of moderate size, much as in ordinary fishes.
- E. Tip of tail with a more or less distinct fin, the dorsal and anal fins confluent around it; the tail sometimes ending in a long filament. Coloration almost always plain, brownish, blackish, or silvery, the fins often black-margined.
- e. Pectoral fins wholly wanting; snout and jaws much produced, the upper longer; jaws straight; skin thin and skeleton weak; tail ending in a filiform tip; gill openings small, subinferior; teeth sharp, subequal, recurved, a long series on the vomer. Deep-sea eels, soft in body, black in color. **Nettastomatidae (Nettasomidae)**

- EE. Tip of tail without rays, projecting beyond the dorsal and anal fins (not filiform); posterior nostril on the edge of the upper lip; anterior nostril near tip of snout, usually in a small tube; tongue usually adnate to the floor of the mouth; coloration frequently variegated. **Ophichthyidae**
- CC. Gill openings small, roundish, leading to restricted inter-branchial slits; tongue wanting; pectoral fins (typically) wanting; opercles feebly developed; fourth gill arch modified, strengthened, and supporting pharyngeal jaws.
 - F. Scapular arch obsolete or represented by cartilage; heart not far back; pectorals wanting; (skin thick; coloration often variegated) **Muraenidae**
- AA. Premaxillary and maxillary present, often immovably united to rest of cranium.
 - G. Gill openings not united in a longitudinal slit.
 - H. Dorsal fin present.
 - I. Body not truly eel-shaped.
 - J. Gill openings far behind pectoral fins; mouth oblique, very large; spinous dorsal represented by fleshy tentacles **Ceratiidae**
 - JJ. Gill openings before pectoral fins.
 - K. Gill membranes broadly united to the isthmus, restricting the gill openings to the sides.
 - L. Snout tubular, bearing the short, toothless mouth at the end; body mailed. **Syngnathidae**
 - LL. Snout not tubular.
 - M. Breast without sucking disk.
 - N. Dorsal fin single, of spines or undivided rays only.
 - O. Jaws and vomer with coarse molar teeth. **Anarhichadidae**
 - OO. Jaws and vomer without molars.
 - P. Mouth not nearly vertical; dorsal spines moderate or low, some or all of them usually pungent. **Blenniidae**
 - NN. Dorsal fins 2, the anterior of spines, the posterior of soft rays; body short and deep.
 - Q. Spinous dorsal of 2 or 3 spines; scales rather large, rough or bony. **Balistidae**
 - NNN. Dorsal fin continuous, of soft rays only.
 - R. Body oblong or elongate, the back not elevated; dorsal and anal joined to caudal.
 - S. Pectoral rather narrow, the lower rays similar to the others **Zoarcidae**
 - SS. Pectorals very broad, the lower rays procurrent and produced at tip. **Liparididae**
 - RR. Body short, not elongate; dorsal and anal free from caudal.
 - T. Teeth in each jaw confluent into 1.
 - U. Body compressed, rough. **Molidae**
 - UU. Body not compressed, spinous. **Diodontidae**
 - TT. Teeth in each jaw confluent into 2. Back broadly rounded **Tetraodontidae**
 - MM. Breast with a sucking disk; skin perfectly smooth; dorsal continuous or slightly notched. **Liparididae**

- KK. Gill membranes free from the isthmus.
 - V. Vent posterior, not at the throat.
 - W. Caudal fin present.
 - X. Upper jaw prolonged into a sword; size very large...
.....**Xiphiidae**
- XX. Upper jaw not prolonged into a sword.
 - Y. Belly with a series of bony scutes along its edge; body much compressed.....**Clupeidae**
 - Z. Body ovate, much compressed.
 - a. Scales small, cycloid, silvery.....**Stromateidae**
 - aa. Scales wanting; caudal peduncle very slender.....
.....**Icosteidae**
- ZZ. Body oblong or elongate, much longer than deep.
 - b. Gill membranes broadly united; teeth present.
 - c. Dorsal fin of spines only.....**Blenniidae**
 - cc. Dorsal fin single, the posterior half of soft rays, the anterior of spines; body elongate, covered with small scales**Blenniidae**
 - ccc. Dorsal fins 2, the anterior of slender spines, posterior soft, body naked.....**Cottidae**
 - bb. Gill membranes separate.
 - d. Jaws with teeth. Body naked, without folds of skin; no pseudobranchiae.....**Lycodapodidae**



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