

A REVIEW OF THE SAND LANCES OR AMMODYTIDÆ OF THE WATERS OF JAPAN.

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In this paper is given a review of the species of fishes constituting the family of Ammodytidae, known to inhabit the waters of Japan.

Family AMMODYTIDÆ.

Body elongate, lanceolate, compressed, naked or covered with small, cycloid or sculptured scales. Head long, the lower jaw produced, the mouth rather large; teeth in jaws small or wanting. Vomer prominent, sometimes with horny appendages. Gill openings very wide, the membranes separate or united, free from the isthmus. Pseudo-branchiæ large, lamellate. Gill rakers long and slender. Gills 4, a slit behind the fourth. Opercles well developed, the bones thin, unarmed. Premaxillaries very protractile, the maxillaries long and slender. Lateral line median or dorsal. Dorsal fin continuous, of soft rays only. Caudal fin small, forked, free from dorsal and anal. Vent behind middle of body; anal fin similar to dorsal but usually of fewer rays. Pectorals moderate, inserted low. Ventrals jugular, of a slender spine and three soft rays, or else altogether wanting. Lower pharyngeals very small, separate. No air bladder. Pyloric cæcum usually single.

Small, silvery carnivorous fishes living on sandy shores and swimming in schools, often burying themselves in the sand. They are excellent as food. They belong to the subarctic fauna and to the fauna of India.

The recent discovery of the genus *Embolichthys*, provided with jugular ventral fins shows that these fishes have no affinity with the Percosces, but that they should be relegated to the neighborhood of *Ophidion* and *Fierasfer*, the association assigned to them by Cuvier and Günther.

The Ammodytidae are divisible into five genera. These constitute three well-marked subfamilies, each of which might without violence be conceded family rank. The group is not rich in species, not more than 8 to 10 being clearly defined.

- a. Dorsal fin much longer than anal; body scaly; lateral line along side of back; dorsal and anal not elevated anteriorly; gill membranes separate.
- b. BLEEKERINÆ. Tropical species, with the dorsal rays and the vertebrae in relatively small number, the dorsal rays being about 40, the vertebrae probably about the same; body covered with ordinary scales, finely sculptured, without oblique transverse folds of skin; no fold of skin along side of belly.
- c. Ventral fins present, jugular, the rays 1, 3; jaws with small teeth. *Embolichthys*
- cc. Ventral fins wanting; jaws toothless. (*B. kallolepis* of India; *B. gilli* of unknown locality) *Bleekeria*
- bb. AMMODYTINÆ. Arctic species, with the dorsal rays and the vertebrae in relatively large number, each about 60; body covered with oblique transverse folds of skin; jaws toothless; a fold of skin along each side of belly.
- d. Vomer prominent, but unarmed. *Ammodytes*
- dd. Vomer with a bicuspid, tooth-like prominence anteriorly. (*H. lancea* of Europe) *Hyperoplus*
- aa. HYPOPTYCHINÆ. Dorsal fin opposite anal and similar in size; body naked; lateral line along middle of side; a fold of skin along middle line of belly; gill membranes united, free from isthmus *Hypoptychus*

EMBOLICHTHYS Jordan and Evermann.

EMBOLICHTHYS JORDAN and EVERMANN, Proc. U. S. Nat. Mus., XXVI, 1903, p. 693 (*mitsukurii*).

This genus includes sand lances with developed ventral fins, jugular position, with one spine and three soft rays. Dorsal rays about 40;

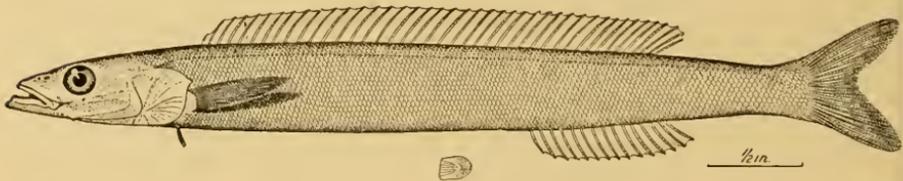


FIG. 1.—EMBOLICHTHYS MITSUKURII.

anal rays 15. Scales very small, finely sculptured, about 115; body without dermal folds. Vomer unarmed. Lateral line along side of back; no ventral fold. One species known. This genus differs from *Bleekeria* (*kallolepis*), an Indian genus, in the presence of ventral fins.

(ἔμβολος, key, ἰχθύς, fish, this species giving the clue to the affinities of the group).

1. EMBOLICHTHYS MITSUKURII (Jordan and Evermann).

Bleekeria mitsukurii JORDAN and EVERMANN, Proc. U. S. Nat. Mus., XXIV, 1902, p. 333; Giran, Formosa.

Embolichthys mitsukurii JORDAN, Proc. U. S. Nat. Mus., XXVI, 1903, p. 693; Giran.

Habitat.—Kagoshima to Formosa.

Head, 4.6 in length; depth, 8.5. Eye, 5.2 in head. Snout, 3.8. D. 42. A. 15. Scales, 115. Mouth, large, the lower jaw-much project-

ing. the symphysis prominent; maxillary thin, reaching to opposite front of orbit; jaws with small teeth. Scales small, firm, well sculptured; lateral line running along side of back, two scales below dorsal, suddenly dropping to the median line on posterior part of caudal peduncle; anal short, ending under last ray of dorsal; caudal well forked; pectorals pointed, about half length of head; ventrals inserted in front of pectoral, about as long as eye; opercular bones very thin and papery. Color plain whitish. Length, $4\frac{1}{4}$ inches.

Coasts of Formosa and southern Japan, the original types, two specimens, from Giran; a specimen taken at Kagoshima, Japan, by Dr. Hugh M. Smith.

(Named for Dr. Kakichi Mitsukuri.)

AMMODYTES (Artedi) Linnæus.

Ammodytes (ARTEDI) LINNÆUS, Syst. Nat., 10th ed., X, 1758, p. 247 (*tobianus*.)

Argyrotenia GILL, Cat. Fish. North. Amer., 1861, p. 40 (*vittatus*.)

Body elongate, lanceolate, the skin with many transverse folds running obliquely downward and backward, the small cycloid scales mostly in oblique cross-series between them; lateral line concurrent with the back; a fold of skin on each side of the belly; jaws without teeth; vomer prominent, but unarmed. Vertebrae about 62; dorsal rays about 60; anal rays about 30. Color silvery. Northern seas, swarming on sandy shores. Species very closely related, perhaps all relatively recent offshoots from a single one, for which the oldest name is *Ammodytes tobianus* Linnæus.

(ἄμμος, sand; δύτης, diver.)

2. AMMODYTES PERSONATUS Girard.

Ammodytes personatus GIRARD, Proc. Ac. Nat. Sci. Phila., 1856, p. 137; Cape Flattery.—JORDAN and GILBERT, Synopsis, 1883, p. 415; Alaska to Monterey.—JORDAN and EVERMANN, Fish N. M. Am., I, 1898, p. 833; Alaska to Monterey.

Ammodytes tobianus SCHMIDT, Pisc. Mar. Oriente, 1904, p. 209; Terpienia, Mauka, Eustafia, St. Katerina, Sakhalin; perhaps the same as *Ammodytes tobianus* Linnæus (Syst. Nat., 10th ed., 1758, p. 247), of the coasts of northern Europe, originally described from Sweden.

?*Ammodytes americanus* DE KAY, New York Fauna, Fishes, 1842, p. 317; Stratford, Connecticut.

?*Ammodytes vittatus* DE KAY, New York Fauna, Fishes, 1842, p. 318, pl. LX, fig. 197; New York.

?*Ammodytes alascanus* COPE, Proc. Am. Phil. Soc., 1873, p. 7; Sitka.

Habitat.—Coasts of the northern Pacific, on both shores. South from Alaska and Siberia to the Inland Sea of Japan, and to Monterey Bay.

Head, 4.5 in length; depth, 11; eye, 5 in head; snout, 3.5 in head; D. 54; A. 30; lateral folds, 1.53.

Body, lanceolate; maxillary extending to front of orbit; gill rakers, 17 below angle of arch; origin of dorsal over posterior third of pectorals; pectorals, 2.1 in head; longest dorsal ray about half depth of body; caudal, 2.1 in head. Color in spirits, brownish above, white below; a brownish spot on opercle above; fins pale.

This description is taken from a specimen 4 inches long, from Onomichi, on the Inland Sea. We have also specimens from Hakodate. The species is enormously abundant on sandy shores open to the sea in northern Japan. We can not separate the Japanese species from *Ammodytes personatus* of the coasts of California and northward, the only apparent difference being a number of anal rays rather higher in the Japanese species (30) than usual in the American (24). The European species *Ammodytes tobianus* Linnaeus has but 120 to 130 lateral

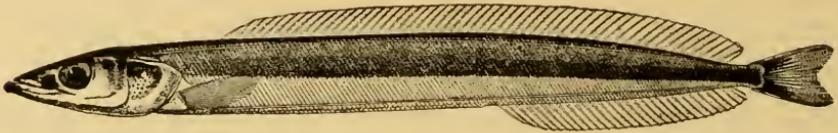


FIG. 2.—*AMMODYTES PERSONATUS* (from Onomichi).

folds, but is otherwise scarcely different. *Ammodytes americanus* of our Atlantic Coast is scarcely different from *A. tobianus*, and *Ammodytes alascanus* of the Aleutian Islands (D. 62; A. 31; folds, 160 to 182) is doubtfully distinct from *A. personatus*. At present it seems safe to identify the Japanese species as *Ammodytes personatus*.

(*Personatus*, masked.)

HYPOPTYCHUS Steindachner.

Hypoptychus STEINDACHNER, Ichth. Beitr., IX, 1880, p. 20. (*dybowskii*.)

Body lanceolate, formed as in *Ammodytes*, but scaleless and without oblique folds. Head pointed, the premaxillaries protractile, the chin prominent; upper jaw with small teeth; lower jaw toothless; vomer with a conical prominence. Gill openings very wide, the membranes fully united, but free from the isthmus; opercles thin, unarmed. Lateral line along middle of sides; no fold of skin on side of belly. Dorsal and anal similar, confined to the posterior part of the body, each of about 20 soft rays, the anterior rays highest; vent just before anal; pectorals rather long, symmetrical; ventrals wanting. Caudal forked. A low translucent fold of skin along middle line of belly from the base of pectorals to the vent. Branchiostegals, 4. Japan Sea. (*ὑπό*, below; *πτύχην* fold).

3. *HYPOPTYCHUS DYBOWSKII* Steindachner.

Hypoptychus dybowskii STEINDACHNER, Ichth. Beitr., X, 1880, p. 20, pl. 11, fig. 3; Bay of Strielok, Japan Sea (near Vladivostok).—SCHMIDT, Pisc. Mar. Orient., 1904, p. 210; Bays of Patroke, Mauka, Aneva, and Corsakou; all near Vladivostok.

Habitat.—Japan Sea.

Head, 4.4 to 4.5; depth, 8.2 to 8.7. D. 20, A. 20, P. 9. Eye, 3.5 in head; snout, 3. Form of *Ammodytes*; first and last rays of dorsal and anal not divided. Silvery, sprinkled with dark specks.

This species is known from specimens taken by Professor Dybowski in the bays of Majen, Sydyjen, Rasbojnik, and Abrek, near Vladivostok, as also from 22 specimens procured by Dr. Peter Schmidt in the same region. We have not seen it.

(Named for Professor Dybowski.)

SUMMARY.

Family AMMODYTIDÆ.

Subfamily BLEEKERINÆ.

Embolichthys Jordan and Evermann.

1. *mitsukurii* (Jordan and Evermann); Giran, Kagoshima.

Subfamily AMMODYTINÆ.

Ammodytes (Artemis) Linnæus.

2. *personatus* Girard; Tokyo, Onomichi, Hakodate.

Subfamily HYPOPTYCHINÆ.

Hypoptychus Steindachner.

3. *dybowski* Steindachner.