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ASIATIC FISHES (*DIPLOPRION* AND *LAEOPS*) HAV-
ING A GREATLY ELONGATED DORSAL RAY
IN VERY LARGE POSTLARVAE

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WE have lately had occasion to identify and study two species of Asiatic fishes, which are remarkable for their unusually protracted postlarval development. In both species, an outstanding feature of the postlarva is the immense prolongation of one or two of the anteriormost dorsal rays (see plates). One of these, *Diploprion bifasciatus*, is a sea bass of the family Serranidae, while the other one, identified as *Laeops parviceps*, is a flounder of the family Bothidae.

Thus these two species, though unrelated, show a very similar postlarval adaptation. This is in fact a common adaptation to pelagic existence, shown by the postlarvae of a number of other unrelated fishes, such as *Trachypterus*, *Carapus* (*Fierasfer*), and *Lophius*. The great prolongation of one or several of the dorsal rays no doubt serves a floatational function. It is analogous to the development of long spines, tentacles, or flagellae in numerous pelagic organisms, including unicellular animals and plants.

1. *Diploprion bifasciatus* (Kuhl and van Hasselt)

Plate I

Our knowledge of the early stages of this species is based chiefly on an advanced postlarval specimen 49 mm. in stand-

ard length, from Fukien, China. This specimen is described below, and is illustrated as Fig. 1 on Plate I. We have supplementary data on younger specimens, with two dorsal rays much more produced. These latter were taken in the inlet bay of Hashidate, at Miyazu, on the coast of the Sea of Japan. Mr. Yozo Nakashima, Director of the Suisan Koshusho (Fisheries Institute) of Miyazu, kindly sent us the photograph reproduced as Fig. 2 of Plate I. This represents one of three specimens 31 to 38 mm. long without caudal, which recently came to his attention.

Following is a description of the 49 mm. specimen from Fukien: Dorsal VIII, 16; anal II, 12; pectoral 17; pelvic I, 5. Scales more than 100 in lateral line. Depth 2.5; head 2.8; eye 3.5. Head and body much compressed. Mouth oblique; maxillary extending almost to below middle of eye; lower jaw slightly projecting. Maxillary with a narrow, elongate, supplemental bone, not slipping into preorbital; premaxillary with lips produced backward into thin folds, covering also the front part of the maxillary; lips of lower jaw thicker, also produced backward. Vomer produced outward and bent downward. Distal part of tongue slender and pointed. Fine villiform teeth on jaws, vomer, and palatines. Opercle ending in 4 spines, the upper two very strong; preopercle serrated. The spinous portion and the soft portion of the dorsal fin about equally developed, deeply notched by a low membrane. The second spine considerably produced; the third very greatly produced, longer than the total length of the body; the fin membranes produced with the spine. Soft anal similar to soft dorsal but shorter. Pelvic spine half as long as the first soft ray; last soft ray connected with the belly by a membrane. Pectorals rounded, symmetrical, dusky at the tip. Caudal rounded. Lateral line concurrent with the dorsal profile, running to the middle of the peduncle. Peritoneum uniformly yellowish; pyloric appendages arranged in 3 groups. Two dark, oblique bands, one extending through eye dorsoventrally, another from the membrane of the spinous dorsal across the body almost to base of anal. This fish agrees

well with the description given by Cuvier and Valenciennes (1828: 137), except that the eyes are much larger, and the second and the third dorsal spines are much produced. These are obviously characters of the young.

2. *Laeops parviceps* (Günther)

Plate II

The remarkable postlarval flounder shown in Plate II is 70.5 mm. long to the caudal fin. It was collected at the surface of the sea off Sipadan Island, near Tawao, Borneo, on December 17, 1931, by Mr. S. Saito, Assistant in the Imperial Fisheries Institute of Tokyo. The specimen was brought to America and kindly presented to the Museum of Zoology, University of Michigan, by Professor Yaichiro Okada.

This flounder is remarkable for the immense size which it has retained as a postlarva, for the greatly produced second dorsal ray, and for the flower-like coloration on the vertical fins. The postlarval features, in addition to the greatly elongated second dorsal ray, include the height of the dorsal and anal fins as a whole, the pedunculated pectoral, the small eyes, still on the opposite sides of the head (that of the right side beginning its migration), the mouth fixed in protracted state, the extension of the convoluted intestine beyond the body in what might be called a normal postlarval hernia, and the translucent body. The extension of three intestinal coils beyond the body is obviously related to the tremendous reduction of the coelom, which is not large enough to contain the required length of intestine. Franz's suggestion (1910: 63) that this condition in postlarval *Laeops* might be an artifact was obviously unfounded.

The identification of this specimen involves a degree of uncertainty. It is clearly a member of the family Bothidae, for it is sinistral and has the left pelvic elongated and located on the abdominal ridge. The number of fin rays (dorsal 111 and anal 86, counting the last ray as double), and of scales in lateral line (101) fits well only one species which has been

reported from the East Indies, namely, *Laeops parviceps* Günther (see Weber and de Beaufort, 1929: 116, fig. 28).

About the only other possible generic identification would be *Arnoglossus*. A point in favor of such an identification is the almost equal development of teeth on both sides of the jaws (in one series, plus suggestions of a few teeth within the main outer row). *Laeops*, at least when adult, has the teeth largely confined to the blind side. Furthermore, Ehrenbaum, Petersen, Williamson, Kyle, and other students of the early stages of European fishes have reported somewhat similar though less extreme postlarval stages for species of *Arnoglossus*, and some species of that genus have one or several of the anterior dorsal rays produced in adults.

We can find no species of *Arnoglossus* from eastern Asia which has a fin and scale formula near that of the postlarval specimen at hand. Norman (1927), in his review of Indian flatfishes, indicated a species of that genus having the counts of our postlarva, but he has since (1934: 244, fig. 186) referred that species, *Arnoglossus malhensis* Regan (1908: 235, pl. 26, fig. 2), to another genus, *Parabothus*. To whatever genus it may be referred, *malhensis* is obviously different from our species, having the origin of the dorsal fin far in advance of the eyes, the mouth much larger (upper jaw nearly half length of head) and the arch in the lateral line much longer and lower (height of arch 3 in its chord; length of chord 4 in straight part of lateral line). Two Hawaiian and one Japanese species placed in *Parabothus* by Norman (1934) also resemble our specimen in ray and scale counts, but otherwise surely differ from it.

A few species from New Zealand, Hawaii, and Natal, retained by Norman (1934: 194-197) in *Arnoglossus*, resemble our species in number of rays and scales, but differ from our postlarval fish in having a much larger mouth and in other respects.

In agreement with our identification of the postlarval specimen as *Laeops*, we find that it has a small mouth, as the upper jaw is only one-fourth as long as the head (the mouth seems

larger, because of its fixedly protracted state), and that it has a short, high arch in the lateral line (height of arch 2 in its chord; length of chord 7.8 in straight part of lateral line).

Confirmation of our identification of this flounder as the postlarva of *Laeops parviceps* is furnished by the circumstance that somewhat similar though less extreme immature forms have been described from India and Japan.

Laeops lophoptera of India, as represented by the type 78 mm. in total length, has the eyes very small (5.2 in head) and the dorsal rays high (equal to head). In these respects it strongly approaches our specimen. Another Indian species, *Laeops macrophthalmus*, otherwise similar, and represented by specimens 95 to 135 mm. long, has the eyes large (3.75 to 4.2 in head) and the dorsal rays shorter than the head. (For descriptions and references, see Norman, 1927: 36-39). In the light of present evidence, we conclude that *L. lophoptera* was based on recently and not quite completely metamorphosed examples of *L. macrophthalmus*, of which it may be regarded as a synonym. Norman (1934: 254) has recently come to the same conclusion, though he has retained as distinct the similarly differentiated Japanese pair of nominal species discussed below.

From Japan, Franz (1910: 62-63, pl. 8) described and figured what we may now with some confidence regard as late postlarva and adult of a single species. His *Laeops variegata* has "die erste Dorsalspina" (presumably second dorsal soft ray) produced, and more than twice as long as the head; the main dorsal rays longer than the head; the pectoral fin short, rounded, and somewhat pedunculated; the eyes small (6.5 in head); the gut protruded (in two specimens) for a distance figured as two-thirds as long as the head; color much variegated. The length of these specimens is not given by Franz, but to judge all the figures, their reproduction was meant to be of natural size. The figure of *L. variegata* measures 65 mm. to caudal and 78 mm. over all. Norman (1931: 602) had two of the type specimens, measuring 77 and 92 mm. in total length. Franz's *L. lanceolata* is obviously based on the adult.

It has the anterior dorsal rays very short, and not at all produced; the main dorsal rays shorter than the head; the pectoral longer, pointed and not pedunculated; the eyes large (3.25 in head); the gut not produced; the color nearly plain. The total length (presumably including caudal fin) is given by Franz as 8–9 cm. and by Norman as 77–87 mm. The distinctive features of *variegata* appear to be those of a protracted postlarva, as suggested by Hubbs (1915: 460) and Norman (1931: 602). The differences between *variegata* and *lanceolata* closely parallel those which distinguish our more extreme postlarva from *Laeops parviceps*. There can be no question that we are dealing with a remarkably protracted postlarval development in *Laeops*.

Much doubt exists as to the proper identification of the several species of *Laeops* described from Japan (Franz, 1910: 62; Hubbs, 1915: 460; Jordan and Hubbs, 1925: 295; Norman, 1931: 602; Norman, 1934: 258). It is even possible that some or even all of these nominal species should be referred to *Laeops parviceps*. *Laeops gracilis* Fowler (1934: 338, fig. 92), from the Philippines, is not obviously distinct from the Japanese species, and may also be the same as *L. parviceps*. Some of the species described from the Indian Ocean (for references, descriptions, and figures see Norman, 1934: 252–261) may also be synonymous with or only racially separable from *L. parviceps*. The group is much in need of a critical study.

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PLATE I

- FIG. 1. Specimen 49 mm. in standard length, from Fukien, China.
FIG. 2. Specimen 31 to 38 mm. in standard length.

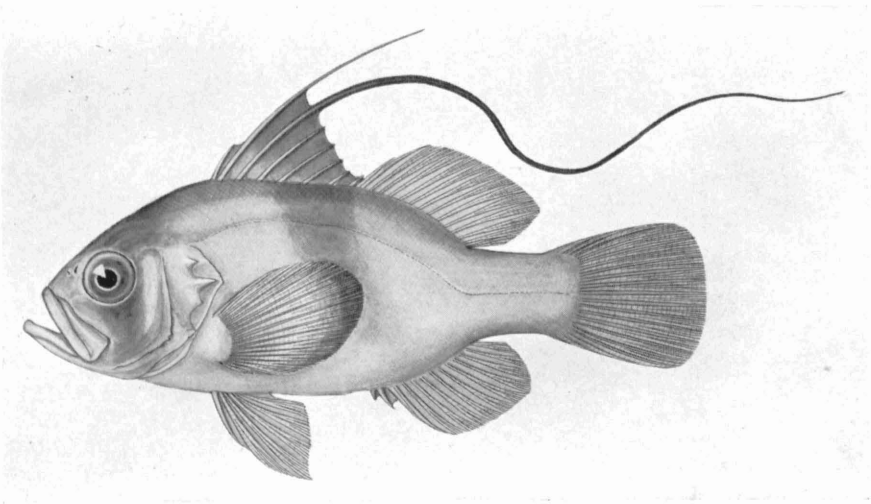
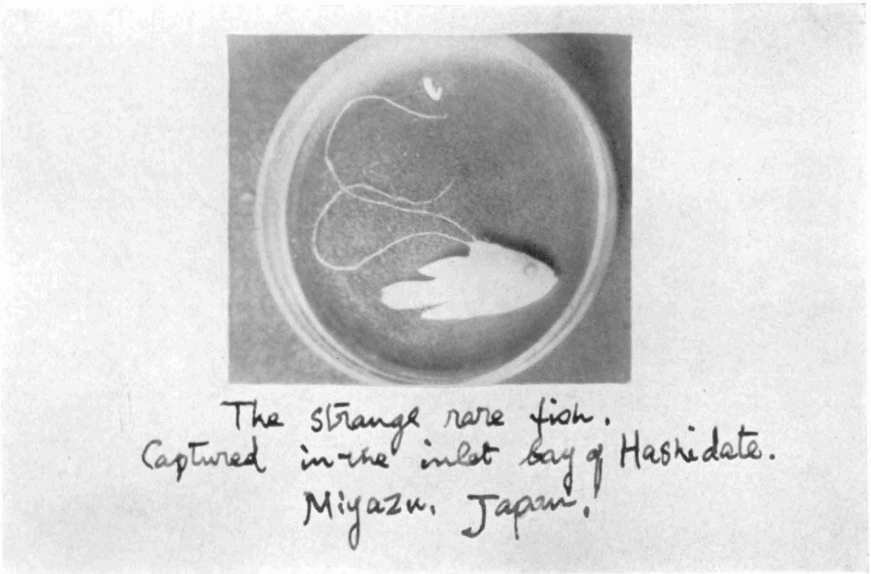


FIG. 1



The strange rare fish.
Captured in the inlet bay of Hashidate.
Miyazu, Japan.

FIG. 2

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PLATE II

Remarkable postlarva, probably of *Laeops parviceps*, 70.5 mm. in
standard length, from Borneo.

