

**Bathypelagic Capture of a Metamorphosing
Juvenile of *Ipnops agassizi*
(Ipnopidae, Myctophiformes)**

Muneo Okiyama

(Received June 5, 1985)

Epipelagic occurrence of the early developmental stages of the deep-sea benthic fishes of the family Ipnopidae, Myctophiformes, strongly suggests the possible ontogenetical vertical migration common to all genera of the family (Okiyama, 1984). Judging from the known depth distributions of these fishes, bathymetrical ranges of their migration are estimated to be quite extensive as sometimes exceeding 5,000 m. Remarkable metamorphosis is expected to take place during this migration, while little substantial evidence has been available from midwater collections.

Among the enormous fish collections taken during the course of micronekton sampling programs of R.V. *Kaiyo-maru*, Fisheries Agency, in the western North Pacific, an excellent specimen of a metamorphosing juvenile probably referable to *Ipnops agassizi* (Garman) was found. An epipelagic larva of this species was reported previously (Okiyama, 1981). In the present paper, therefore, this juvenile apparently representing the first record of bathypelagic capture of young

ipnopids is reported along with discussions on the morphological and ecological aspects in relation to its ontogenetic descent.

Selection of characters and their counts and measurements were made according to Nielsen (1966). In the following data, values in parentheses indicate the ranges of characters on adults (Nielsen, 1966; Okiyama, 1981), and characters with asterisks mean that their figures did not fall within those ranges. Vertebral counts excluding the urostyle were obtained from radiography.

Description

Material. Metamorphosing juvenile of *Ipnops agassizi*, 55 mm in standard length (TH 830515); captured in the soundings of 1,810–1,990 m by the horizontal tow with *Kaiyo-maru*'s Opening-Closing net (KOC-net) from R.V. *Kaiyo-maru*; at Station 27 covering the distance between 23°19.5'N, 150°30.9'E, and 23°36.1'N, 150°27.7'E in the subtropical western North Pacific; May 19, 22:00–May 20, 04:00, 1983. TH is the institutional abbreviation of Tokaiku Hoshano-bu.

Meristic characters. Dorsal fin 9(9–11); anal fin 15(14–19); pelvic fin (d-s), 8–8(8–8); pectoral fin* (d-s), ca. 17–17(13–16); caudal fin 20(19–20); branchiostegal rays (d-s), 10–10(9–10); gill rakers on anterior arch 20(20–24); lateral line scale ca. 55(55–58); vertebrae 56(55–56).

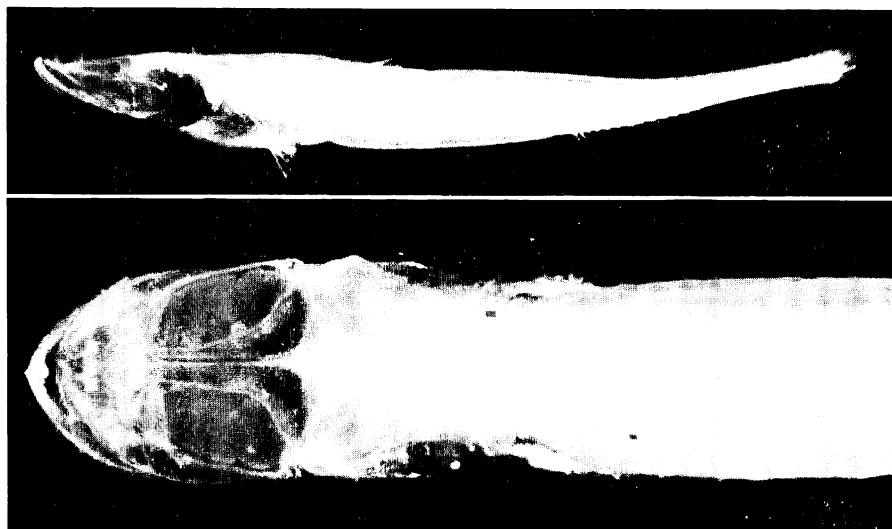


Fig. 1. Bathypelagic juvenile of *Ipnops agassizi*, 55 mm SL. Lateral view of the specimen (above), and dorsal view of the anterior body part of the same (below).

Morphometric characters in % of standard length, 55 mm. Head* 24.2(18.8–21.0); depth at anterior D* 9.8(5.9–7.8); upper jaw 12.9(11.0–13.0); maximum width of eye plates 9.3(8.2–9.9); preanal* 67.3(61–66); predorsal* 40.5(34.0–36.0); base of D* 7.5(8.3–10.0); base of A 17.5(17.5–26.5); anterior anal fin to caudal base 35.5(33.0–41.0); anterior D-ray over vertebra no. 19–20 (18–20); anterior A-ray under vertebra no. 37 (35–40).

Morphology. The present juvenile (Fig. 1) has already the general appearance of the adult except for the body pigmentation, dermal integument, and several proportional dimensions of the body. The head excepting the occipital part and the abdomen are uniformly black, being in sharp contrast with the almost colorless remaining body portions. A closer observation, however, reveals minute melanophore specks outlining each scale pocket throughout the body surface. No scales are yet observed.

The leptocephalus-like appearance of the body with a broad dermal space of gelatinous texture is peculiar to this juvenile, although the fish is rather heavily depressed dorso-ventrally, particularly in the head as in the adult. This gelatinous space is most prominent in the trunk, thus resulting in the slightly deeper bodied profile of the juvenile. The greatest body depth is measured at the level of the origin of the anterior dorsal where the muscular part occupies only half of the total depth. Posterior extension of this space is distinct until around the level of the anal fin base. The dorsal pterygiophores broadly rooted the muscular body are piled up in this space to form the elevated dorsal fin base along the body surface. In contrast, no similar structures are developed in the anal fin, although anal pterygiophores are slightly produced.

All fin rays are more or less damaged or missing, but remaining parts show their poor development. The elongated pectoral rays distinct in the epipelagic larva (Okiyama, 1981) seem reduced in this specimen.

In the head morphology, the unique structure of the eye plaques (or eye plates) is fully formed, while a small but distinct lens lay on the pars optica retinae at the innermost corner of the right eye (Fig. 1). The small brain visible through the transparent occiput shows the similar morphology described on the adult of *I. murrayi* (Marshall and

Staiger, 1975). The dentitions of both jaws are fully formed but the sensory canal system is still indistinct.

The gut is completely enclosed by the uniformly dark peritoneum. It is composed of the short oesophagus, moderately large stomach with well-formed blind sac, and straight intestine. Two lobes of the liver are anteriorly placed. Black dots are present only on the posterior portion of the stomach. No food organisms were identified.

Discussion

Genus *Ipnotops* contains two species in the Pacific Ocean, i.e., *I. agassizi* and *I. meadi* (Nielsen, 1966). The present juvenile taken from the western North Pacific is readily identified as *I. agassizi* by the close agreements of meristic counts, particularly of the anal rays which form the only substantial difference between these two species. A slightly greater count of the pectoral rays in this juvenile intermediate between larva (19) and adult (13–16) may be associated with the possible ontogenetic changes peculiar to the genus (Marshall and Staiger, 1975; Okiyama, 1981). The reduced

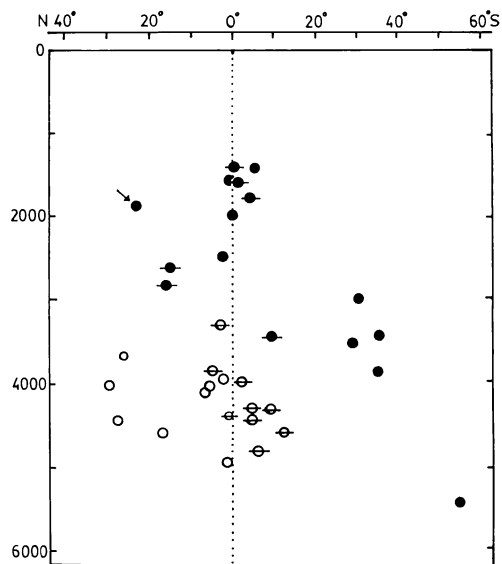


Fig. 2. Vertical distribution of two species of *Ipnotops* from the Indian and Pacific Oceans along a north-south section. Solid circle, *I. agassizi*. Open circle, *I. meadi*. Circles with horizontal bar indicate the records from the Indian sector, and that with arrow the pelagic juvenile described in this paper.

features of the ventralmost rays in the juvenile pectorals favor such an assumption. Most of the differences in proportional dimensions are also explainable in terms of ontogenetic variation.

Figure 2 shows the depth distribution of the benthic specimens of these two species along a meridional section by putting together the scattered records from the Indian and Pacific Oceans (Nielsen, 1966; Okiyama, 1981, 1984; Shcherbachev, 1981). The present juvenile is shown in this profile as a dot indicated by the arrow. Two species are clearly segregated vertically in such a way as *I. agassizi* inhabits relatively shallower bottoms than *I. meadi* in the same latitudes. Varying patterns of depth preference of *I. agassizi* are of interest, because there is a striking difference in the bathymetrical ranges between the northern (1,525–2,820 m) and southern (1,380–5,400 m) hemispheres. The locality of the juvenile lies in the western North Pacific central waters, and slightly north of the known geographical ranges of demersal specimens of *I. agassizi*. Although the juvenile occupies a reasonable site with respect to the captive depth in the bathypelagic zone, the bottom depth of the relevant location of about 5,700 m seems too deep to be successfully settled. This fact shows that the bathymetrical data are of prime importance in the zoogeography of this benthic fish.

According to Sulak (1977), the smallest benthic specimen of *Ipnots murrayi*, 43 mm SL, has not yet fully formed eye plaques, implying that the pelagic life of this group can terminate before the adult morphology is fully differentiated. Therefore, although the dermal texture of the present juvenile retains features peculiar to pelagic life, it is close to the end of metamorphosis and can be ascribed to the "subadult" *sensu* Sulak (1977: 105). The reversed relationship in body sizes between the pelagic juvenile (55 mm) and the smallest benthic specimen of *I. agassizi* (49 mm: Okiyama, 1981) may be a simple individual variation.

Despite a single record, this juvenile revealed the elaborate features characteristic to the specimens of ontogenetic descent. For example, its contrasted color pattern may work as a cryptic mechanism against predators, and eye plaques, if functional enough to "see" the nearby luminescent prey (Marshall and Staiger, 1975), are of vital use for their successful feeding in the food limited

deep sea environments.

Additional materials are needed before we can picture a more dynamic pattern of life history of this fascinating fishes.

Acknowledgments

Thanks are due to Dr. Kenji Tabata and Mr. Eiichi Fujii, The Tokai Regional Fisheries Research Laboratory, who kindly donated this interesting specimen for my study. Dr. Ikuo Hayashi, Ocean Research Institute, University of Tokyo, took the photograph. This work was partly supported by a Grant-in-Aid (59560181) from the Ministry of Education, Science and Culture, Japan.

Literature cited

- Marshall, N. B. and J. C. Staiger. 1975. Aspects of the structure, relationships, and biology of the deep-sea fish *Ipnots murrayi* (Family Bathypetrolidae). *Bull. Mar. Sci.*, 25(1): 101–111.
- Nielsen, J. G. 1966. Synopsis of the Ipnotidae (Pisces, Iniomi). *Galathea Rep.*, 3: 79–87.
- Okiyama, M. 1981. A larval *Ipnots* and its possible metamorphosing process. *Japan. J. Ichthyol.*, 28(3): 247–253.
- Okiyama, M. 1984. Travel between surface and abyssal bottom during early life of the ipnotid fish: a risky migration? Program and abstracts of international symposium on the early life history of fishes and 8th annual larval fish conference: 20.
- Sulak, K. J. 1977. The systematics and biology of *Bathypetrolis* (Pisces, Chlorophthalmidae) with a revised classification of benthic myctophiform fishes. *Galathea Rep.*, 14: 49–108.
- Shcherbachev, Y. N. 1981. Preliminary review of the Indian Ocean species of the Chlorophthalmidae (Myctophiformes, Osteichthys). *In: Fishes of the open ocean. Inst. Oceanol. Acad. Sci. USSR*, 47–67. (In Russian with English abstract.)

(Ocean Research Institute, University of Tokyo, Minamidai 1–15–1, Nakano, Tokyo 164, Japan)

下部漸深層から採集された チョウチンハダカ (ハダカイワシ目) の変態期稚魚

沖山宗雄

亜熱帯北西太平洋の下部漸深層 (1,810~1,990 m) から採集された チョウチンハダカ *Ipnots agassizi* と同定される変態期稚魚, 55 mm SL, の外形形態の観察とその出現に関する生態的考察をおこなった。本個体は チョウチン

ハダカ科魚類幼期が中層において出現した最初の記録にあたり、この類の個体発育にともなう顕著な鉛直移動を考える上で貴重な情報を提供するものである。本個体は正常な発育段階にあり、間もなく底生移行をおこなうことが予測されるが、採集域の水深が約 5,700 m であることから着底に成功する可能性は少なく、本種にとっては

水深の条件が、とくに北太平洋では、地理的分布を支配する重要な要因であることが示唆された。本個体の外部形態上の特徴が底生移行の諸側面で適応的な内容を持っていることについても明らかとなった。

(164 東京都中野区南台 1-15-1 東京大学海洋研究所)