

Postlarval development of the gempylid fish *Paradiplospinus gracilis* (BRAUER)

Yasuo NISHIKAWA*

Abstract

Based on specimens collected from the South Atlantic Ocean, postlarval development of the gempylid, *Paradiplospinus gracilis* (BRAUER) is described.

Postlarvae of this species are characterized by the pelvic fin comprising only single spine, small mouth, many dorsal spines, and two pigment lines on the body. The postlarva has similar morphological features at the postlarval stages of *Diplospinus multistriatus* MAUL in this family, but differs from it by lack of pigment on the branchiostegal membrane, and the prominent uppermost preopercular spine.

All postlarval specimens were obtained from the subsurface collections (about 20-50 meters deep).

Introduction

A rare gempylid fish, *P. gracilis* is known to occur in the deep sea of the Antarctic and subantarctic waters (ANDRIASHEV, 1960 ; BUSSING, 1965 ; PARIN, 1968). Our knowledge about the early life history of the wide ranging gempylid fishes, particularly *P. gracilis*, remains incomplete. The only descriptive work on the early stages of this species is BUSSING (1965) who examined juvenile specimens (32.2 mm - 410 mm SL) collected from the Antarctic waters and off the coast of Chile. So far as I know, no postlarval *P. gracilis* has been reported as yet.

This paper describes the developmental change of the postlarvae referable to *P. gracilis* taken in the South Atlantic Ocean.

I am very grateful to Dr. Muneo OKIYAMA of the Ocean Research Institute, University of Tokyo, Dr. Shoji KIKAWA of the Far Seas Fisheries Research Laboratory, Dr. Shoji UEYANAGI of the Faculty of Marine Science and Technology, Tokai University, and Dr. Izumi NAKAMURA of the Fisheries Research Station of Kyoto University for their valuable suggestions and critical reading of the manuscript. I am also grateful to Mr. Mamoru KATO of the Far Seas Fisheries Research Laboratory, who helped me in translating some Russian papers.

Received Sep. 27, 1983. Contribution No. 225 from the Far Seas Fisheries Research Laboratory.

* Far Seas Fisheries Research Laboratory, Shimizu, 424, Japan

Materials and methods

Eight specimens ranging from 6.4 mm to 23.4 mm in standard length, were obtained by the larva-net at Lat. $38^{\circ} 42.5' S$, Long. $5^{\circ} 43.2' E$ on November 16, 1965 by the R/V Shoyo Maru of the Japanese Fisheries Agency (Fig. 1).

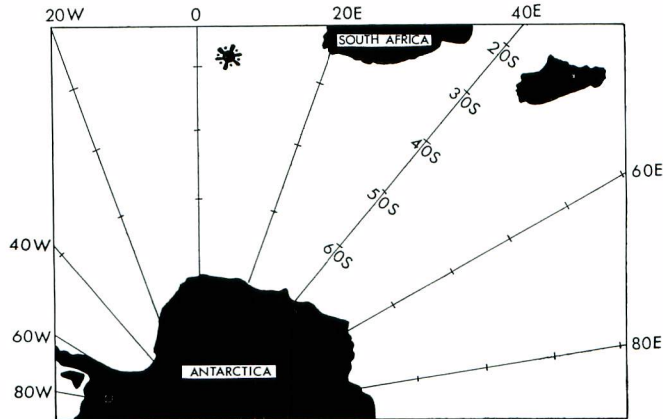


Fig. 1. Locality of capture of larval *P. gracilis*.

All materials were preserved in 10 % formalin as soon as fished and were transferred to 70 % alcohol after sorting at the laboratory. Methods of counts and measurements are the same as those in the previous paper (NISHIKAWA and NAKAMURA, 1978).

Description of postlarval stages

Postlarval development illustrated in Fig. 2 - Fig. 5 is based on 4 selected specimens, ranging from 6.4 mm to 15.5 mm SL. Counts and Measurements on these specimens are given in Table 1.

In the smallest specimen of 6.4 mm SL (Fig. 2), the body is deep anteriorly, sharply tapering posteriorly. The head is large and deep, and is provided with developed armatures. Three spines are present on the hind margin of the preopercle, with the upper two conspicuous. The uppermost one is serrated, bent slightly upward and as long as one half of the orbit diameter. As shown in Fig. 6, it remains still conspicuous in the specimen 15.5 mm SL. The supraorbital crest is distinct, with 4 spines on upper margin. There are two spines at the temporal region. Six small conical teeth are present on the upper jaw only. The snout is pointed, being about one third of the head length. The mouth is rather small. The posterior end of the maxillary reaches below the front margin of the orbit. The eye is large, the orbit diameter being slightly larger than the snout length. The nostril is a large oval and single opening. The spinous dorsal and pelvic fins are considerably

Table 1. Measurements and counts for *P. gracilis* described.

	Length in mm	Length in mm	Length in mm	Length in mm
Measurements				
Standard length	6.4	8.3	10.6	15.5
Head length	2.6 (40.6)	3.5 (42.2)	4.4 (41.5)	5.7 (36.8)
Maximum body depth	1.8 (28.1)	2.2 (26.5)	2.5 (23.6)	2.9 (18.7)
Snout length	0.8 (12.5)	1.2 (14.5)	1.4 (13.2)	1.8 (11.6)
Upper jaw length	0.8 (12.5)	1.1 (13.3)	1.3 (12.3)	1.9 (12.3)
Eye diameter	0.7 (10.9)	0.9 (10.8)	0.9 (8.5)	1.2 (7.7)
Orbit diameter	0.9 (14.1)	1.2 (14.5)	1.4 (13.2)	1.6 (10.3)
Pelvic spine length	1.5 (23.4)	3.2 (38.6)	3.1 (29.2)	3.9 (25.2)
Snout to dorsal fin origin	2.6 (40.6)	3.4 (41.0)	4.2 (39.6)	5.7 (36.8)
Snout to pectoral fin origin	2.7 (42.2)	3.5 (42.2)	4.3 (40.6)	5.8 (37.4)
Snout to pelvic fin origin	2.9 (45.3)	3.7 (44.6)	4.6 (43.4)	6.4 (41.3)
Snout to anterior margin of anus	4.1 (64.1)	5.3 (63.9)	7.4 (69.8)	10.8 (69.7)
Counts				
Dorsal fin	XI, 10	XXII, 21	XXVI, 24	XXXVI, 22
Anal fin	10	15	14	II, 22
Pectoral fin	9	10	12	13
Pelvic fin	I	I	I	I

* Numerals in parentheses show percentage to the standard length

developed. A total of 11 spines are discernible in the dorsal fin. The pelvic fin is represented by a single spine, its length being about twofold as long as the eye diameter. Both dorsal and pelvic spines are Y-shaped in cross section, with minute spines on all three edges. The rudimentary fin rays are formed in the soft dorsal, pectoral, anal, and caudal fins. Tip of the notochord is nearly straight. The anus is located at posterior one third of the body. The myomeres are not clear.

A few large chromatophores are present on the top of the head. There is a large pigment patch on the postorbital region. There are two longitudinal pigment lines on the body ; one along the dorsal fin base, and the other on the lateral median line on the trunk. Many black pigments are concentrated in a row on the dorsal wall of the digestive tract except for the free terminal section. The antero-lateral portion of the abdominal cavity is dark.

In the specimen of 8.3 mm SL (Fig. 3), the dorsal fin is more developed and has 22 serrated spines and 21 rudimentary soft rays. The pelvic spine is elongate, longer than 3 times of the eye diameter.

Pigmentation of the body and head is similar to the 6.4 mm specimen except for the chromatophore in the hind margin of the nasal opening, which newly appeared in this specimen.

In the specimens of 10.6 and 15.5 mm SL (Fig. 4, Fig.5), the body becomes elongate. The anus is shifted backward to posterior one fourth of the body, and the abdominal

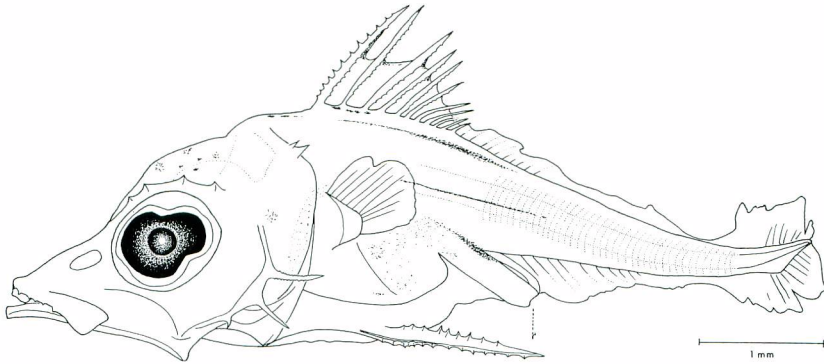


Fig. 2. *P. gracilis* larva, 6.4 mm SL.

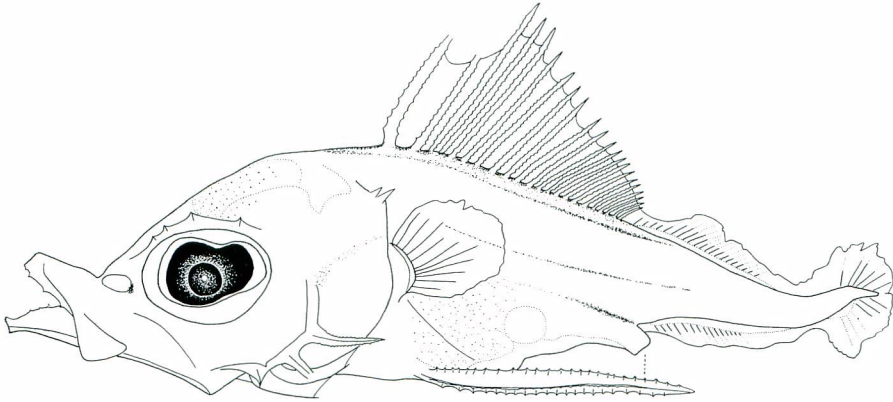


Fig. 3. *P. gracilis* larva, 8.3 mm SL.

cavity is extended. The dorsal spines increase in number with growth ; 26 spines in the 10.6 mm specimen and 36 in the 15.5 mm specimen. In the specimen of 10.6 mm (Fig. 4), the pectoral fin is round and fully developed with 12 rays. The lower jaw is slightly projected beyond the snout tip. A new chromatophore is present at the front margin of the eye. In the specimen of 15.5 mm (Fig. 5), the preopercular spines are slightly reduced in length. The supraorbital crest is still prominent. The front edge of the snout is blunt as though it was curtailed as in illustration. The two sharp teeth are projected out of the tip of lower jaw. The nostril has a constriction in mid part. Two small spines are in the anal fin, their posterior edges being serrated. The caudal fin is developed and has about 17 rays. The pigment line along the dorsal base extends posteriorly, but the pigment on the mid-lateral line of the trunk are merged in the skin in this stage. The tip of the snout is pigmented. A new pigment row is along the anal fin base and an additional pigment patch is present on the body above the pectoral fin.

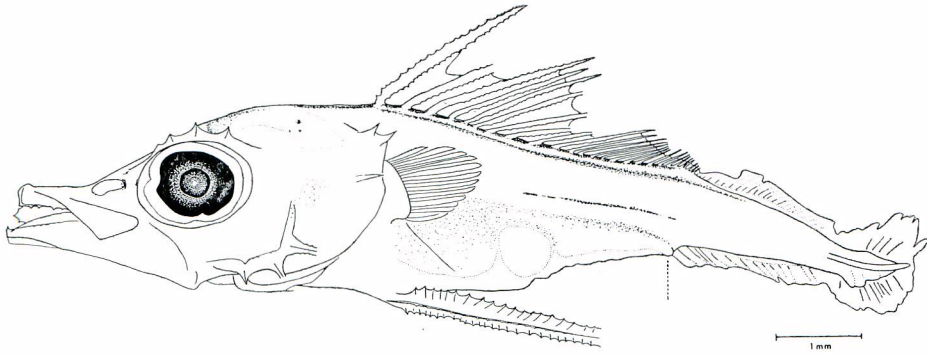


Fig. 4. *P. racilis* larva, 10.6 mm SL.

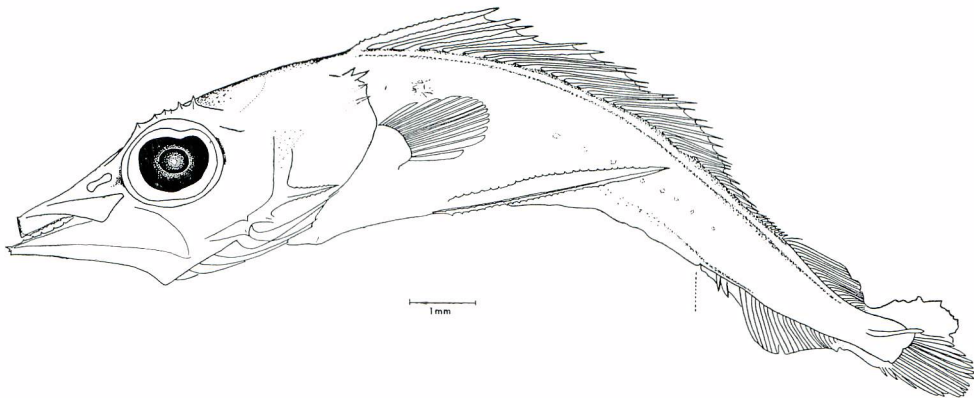


Fig. 5. *P. gracilis* larva, 15.5 mm SL.

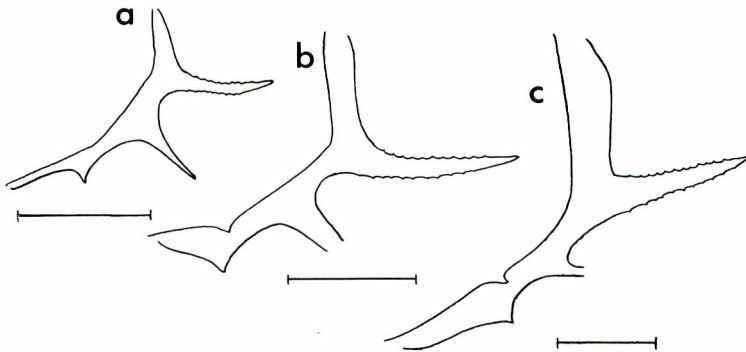


Fig. 6. Development of preopercular spines. Scales equal to 0.5mm, a : 6.4mm SL, b : 8.3mm SL, c : 15.5mm SL.

Identification and comparison

The above postlarval specimens have large dorsal spines and a large pelvic spine both characteristically serrated in the larval gempylids. They have the pelvic fin that comprises a single spine only, two longitudinal pigment lines on the body, and many dorsal spines.

In the larval stage, the following four species of this family have the pelvic fin comprising a spine only, i. e., *Rexea prometheoides* (BLEEKER), *Promethichthys prometheus* (CUVIER), *D. multistriatus*, and *P. gracilis* (STRASBURG, 1964 ; BUSSING, 1965 ; PARIN and BEKKER 1972 ; YEVSEYENKO and SEREBRYAKOV, 1974 ; GORBUNOVA, 1977). However, *D. multistriatus* differs from the present specimens in the shape of the preopercular spines and the presence of the pigments on the branchiostegal membrane (STRASBURG, 1964 ; YEVSEYENKO and SEREBRYAKOV, 1974). Both *Rexea* and *Promethichthys* differ from the present specimens in the presence of the distinct pigment row on the snout and of the cartilaginous process on the lower jaw tip, body shape, and the meristic counts (NISHIKAWA unpublished MS).

The larvae of *Gempylus serpens* Cuvier, which also have the longitudinal pigment lines on the body and many dorsal spines (Voss, 1954), differ from the present specimens in having the pelvic soft rays and well developed the body pigment. The presence of the two body pigment lines, the characteristic pelvic fin, and many dorsal spines separate the present specimens from other known gempylid larvae (Voss, 1954 ; GORBUNOVA, 1977 ; NISHIKAWA and NAKAMURA, 1978 ; ROBERTSON and MITO, 1979 ; NISHIKAWA, 1982, 1984). The number of fin spines of the 23.4 mm specimen, the largest examined, agrees with that of *P. gracilis* described by ANDRIASHEV (1960). The above evidences, together with the locality of capture, indicate that the present specimens are referable to *P. gracilis*.

According to BUSSING (1965), the young fish of this species has been taken in deep waters, suggesting that they inhabit in waters deeper than the the adult. It seems, however, that the larvae of this species are the dwellers near the sea surface, since the specimens in this study were collected from the subsurface larva-net tow (about 20—50 meters deep).

References

- ANDRIASHEV, A.P. 1960 : Families of fishes new to Antarctic. I. *Paradiplospinus antarcticus* Gen. et Sp. N. (Pisces, Trichiuridae). *Zoologicheskii Zhurnal*, **39** (2), 244—249 (in Russian).
- BUSSING, W. A. 1965 : Studies of the midwater fishes of the Peru-Chile Trench. Biology of Antarctic Seas. II. Antarctic Res. Ser., **5**, 185—227.
- GORBUNOVA, N. N. 1977 : Larvae and juveniles of some species of trichiuroid fishes (Trichiuroidea : Gempylidae and Trichiuridae). *Trudy Inst. Okeanol.*, **109**, 133—148 (in Russian).
- NISHIKAWA, Y. and I. NAKAMURA 1978 : Postlarvae and juveniles of the gempylid fish, *Neopinnula orientalis* (GILCHRIST and VON BONDE) from the North Arabian Sea. *Bull. Far Seas Fish. Res. Lab.*, (16), 75—91.

- NISHIKAWA, Y. 1982 : Early development of the fishes of the family Gempylidae. I. Larvae and juveniles of the escolar, *Lepidocybium flavobrunneum* (SMITH). *Ibid.*, (19), 1—14.
- 1984 : Postlarvae and juveniles of *Thyrsitops lepidopoides* CUVIER (Pisces : Gempylidae). *Ibid.*, (21), 9—18.
- PARIN, N. V. 1968 : Ichthyofauna of epipelagic zone. 206 pp. Israel Program for Scientific Translations, Jerusalem (Translated into English from Russian by M. RAVEH, edited by H. MILLS).
- ROBERTSON, D. A and S. MITO 1979 : Sea surface ichthyoplankton off southeastern New Zealand, summer 1977—78. *New Zealand J. Mar. Freshw. Res.*, 13 (3), 415—424.
- STRASBURG, D. W. 1964 : Postlarval scombroid fishes of the genera *Acanthocybium*, *Nealotus*, and *Diplospinus* from the central Pacific Ocean. *Pac. Sci.*, 18 (2), 174—185.
- VOSS, N. A. 1954 : The postlarval development of the fishes of the family Gempylidae from the Florida Current. I. *Nesiarchus* JOHNSON and *Gempylus* CUV. and VAL., *Bull. Mar. Sci. Gulf and Caribb.*, 4 (2), 120—159.
- YEVSEYENKO, S. A and V. P. SEREBRYAKOV 1974 : Larvae of *Diplospinus multistriatus* MAUL (Pisces, Gempylidae) from the northwestern Atlantic. *J. Ichthyol.*, 14 (1), 92—98.

クロタチカマス科魚類 *Paradiplospinus gracilis*
(BRAUER) の後期仔魚の形態

西川 康夫

摘 要

南アフリカ西岸沖の南大西洋において採集されたクロタチカマス科と推定される8個体の後期仔魚標本について、成長に伴う形態の変化を検討し、記載した。検討の結果、これらの後期仔魚はクロタチカマス科の *P. gracilis* と同定された。

P. gracilis の後期仔魚は相対的に口が小さく、背鰭の棘条数が多いこと（体長 15.5 mm の仔魚では36本）、体の背面および躯幹部の体側正中線に沿って黒色素胞の点列が存在すること、更に腹鰭は軟条を欠き、縁辺部に鋸歯を伴った単一棘で構成される点で特徴的である。

形態的に、これらの仔魚は科内の *D. multistriatus* に酷似するが、鰓膜に黒色素胞が出現しないことおよび前鰓蓋骨後縁の棘の形状等によって容易に識別できる。

既往の報告では、本種の幼魚はかなり深い水域から採集されているが、本報で記載した仔魚は 50 m 以浅の表層近くにおいて稚魚網によって採集された。