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Larval Record of a Red Firefish, *Pterois volitans*, from Northwestern Australia (Pisces : Scorpaeniformes)

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Abstract

The larval stage of the scorpaenid *Pterois volitans* is described based on five specimens (3.8 mm NL-11.0 mm SL) collected from northwestern Australia, the eastern Indian Ocean. The larval stage of *P. volitans* is characterized by having the following combination of characters : dorsal fin rays XIII, 11-12, anal fin rays III, 7, pectoral fin rays 13-15, pelvic fin rays I, 5, vertebrae 24, dorsal and anal fins not continuous with caudal fin, suborbital stay with broad posterior margin, long pectoral fin, melanophores on pectoral fin except for basal portion, lower margin of caudal peduncle, bases of posterior half of dorsal fin and posterior anal fin rays, and anterior middle portion of caudal.

Key words : Pisces, Scorpaenidae, larvae, *Pterois volitans*, Australia, eastern Indian Ocean

The scorpaenid Pteroinae (*sensu* Eschmeyer, 1986) is composed of the following five genera : *Brachypterois*, *Dendrochirus*, *Ebosia*, *Parapterois* and *Pterois*. Among the subfamily, only three species of larvae and juveniles, viz. *Pterois lunulata*, *Dendrochirus bellus* and *D. zebra*, presently can be identified at the species-level (Washington et al, 1984 ; Kojima, 1988). Recently we found five larvae of *Pterois volitans*, collected from the surface and midwater, off northwestern Australia, in the eastern Indian Ocean by the "Sho-yo Maru" under the auspices of the Far Seas Fisheries Research Laboratory. We describe and present illustrations of the larval stage of the species based on these specimens. The specimens were fixed and preserved in 5% formalin and deposited in HUMZ-L (larval collection of the Laboratory of Marine Zoology, Faculty of Fisheries, Hokkaido University). Developmental terminology follows Richardson and Laroche (1979). Counts and measurements were made according to Hubbs and Lagler (1958) except for the notochord length (NL) measured from the anterior tip of the snout to the posterior end of the notochord. The anteriormost soft rays of the dorsal and anal fins, that would change to spines in later stage, were counted as spines. Names of the spines on the head follow Moser and Ahlstrom (1978). Vertebral counts were taken after the specimens were cleared and stained with alizarin red S and alcian blue, based on the method of Potthoff (1984).

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Pterois volitans (Linnaeus, 1758)
(Figs. 1 and 2)

Material examined. HUMZ-L 6886, 1 flexion and 1 postflexion larvae, 3.8 mm NL-4.5 mm SL, northwestern Australia, eastern Indian Ocean (15°59.5′S, 120°59.9′E),

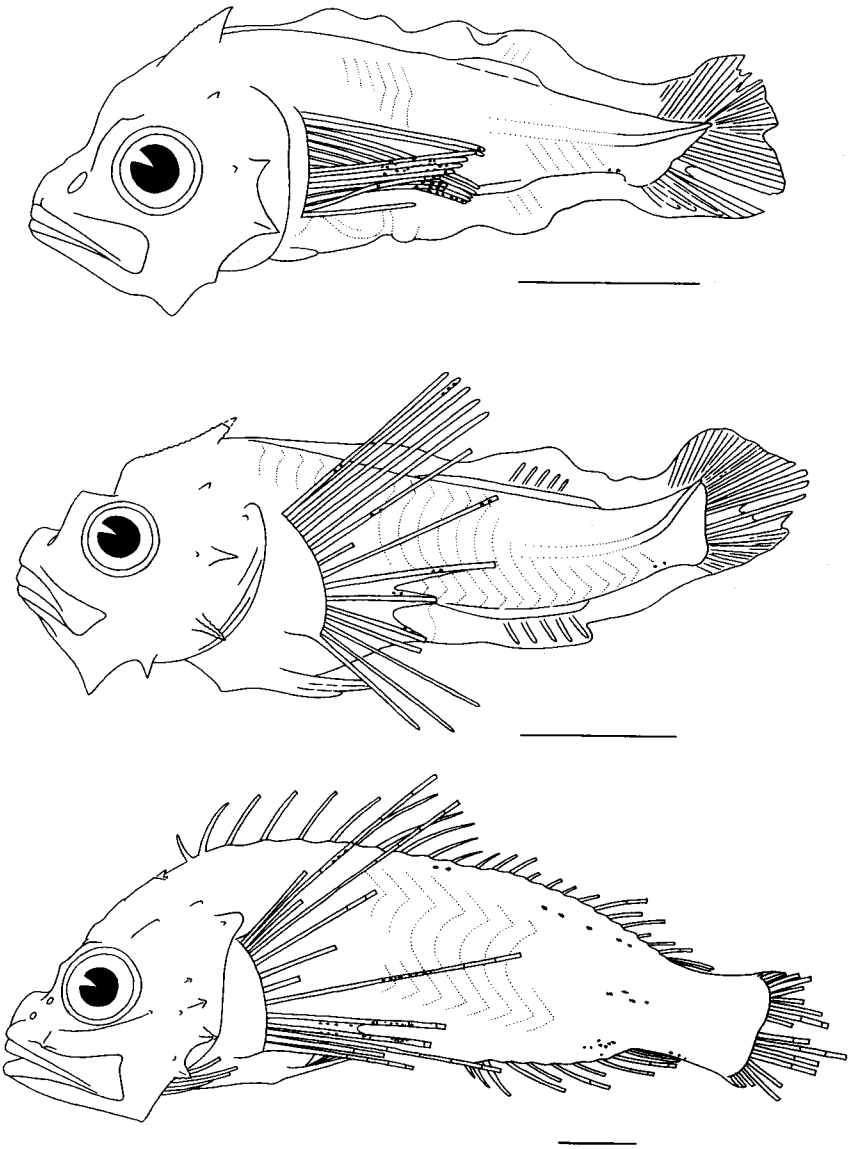

Fig. 1. Lateral view of larvae of *Pterois volitans*. HUMZ-L 6886, 3.8 mm NL (*upper*), HUMZ-L 6886, 4.5 mm SL (*middle*) and HUMZ-L 6887, 10.7 mm SL (*lower*). Scales indicate 1.0 mm.

midwater (depth not given), 1 Dec. 1989 ; HUMZ-L 6887, 3 postflexion larvae, 9.5-11.0 mm SL, northwestern Australia, eastern Indian Ocean (18°29.3′S, 118°59.0′E), surface, 10 Jan. 1989.

Diagnosis of larval stages. In flexion and early postflexion larval stages (3.8 mm NL-4.5 mm SL), *Pterois volitans* characterized by having pectoral fin except for basal portion and lower margin of caudal peduncle with melanophores.

In late postflexion larval stage (9.5-11.0 mm SL), dorsal fin rays XIII, 11-12 (last ray double) ; anal fin rays III, 7 (last ray double) ; pectoral fin rays 13-15 ; vertebrae 24 ; long pectoral fin ; dorsal and anal fins not continuous with caudal fin ; suborbital stay with broad posterior margin ; and with melanophores on bases of posterior half of dorsal fin and posterior anal fin rays, and anterior middle portion of caudal peduncle.

Description. Counts and measurements are shown in Table 1.

Flexion larval stage (3.8 mm NL). — Head and body compressed. Body elongated. Snout longer than eye diameter. Exposed bony surface on head with following spines : one weak postocular spine without serration, one very long parietal spine with serration, one sharp pterotic spine, second anterior preopercular spine and second to fourth posterior preopercular spines without serration. Suborbital stay not visible. Large nostril present in front of eye. Pectoral fin rays completed. Pelvic fin weakly developed, but rays not visible. Several weak dorsal, anal and caudal fin rays visible.

Table 1. Counts, measurements and proportions of larvae of *Peerois volitans* from northwestern Australia.

HUMZ-L	6886	6886	6887	6887	6887
Measurements					
NL or SL (mm)	3.8	4.5	9.5	10.7	11.0
% of NL or SL					
Head length	39.3	36.7	34.6	32.5	29.2
Eye diameter	10.4	9.4	8.2	7.9	8.2
Snout length	13.7	10.5	10.4	9.6	9.9
Upper jaw length	18.2	16.9	15.4	16.5	16.2
Lewer jaw length	28.9	22.3	19.3	19.3	19.2
Caudal peduncle depth	9.6	9.8	12.0	12.7	12.0
Pectoral fin length	31.5	30.7	—	—	—
Pelvic fin length	9.6	16.9	—	—	—
Counts					
Dorsal fin rays	—	—	XIII, 11	XIII, 12	XIII, 11
Anal fin rays	—	—	III, 7	III, 7	III, 7
Pectoral fin rays (left)	15	15	14	13	13
(right)	15	14	14	14	13
Pelvic fin rays	—	—	I, 5	I, 5	I, 5
Vertebrae	—	—	24	24	24

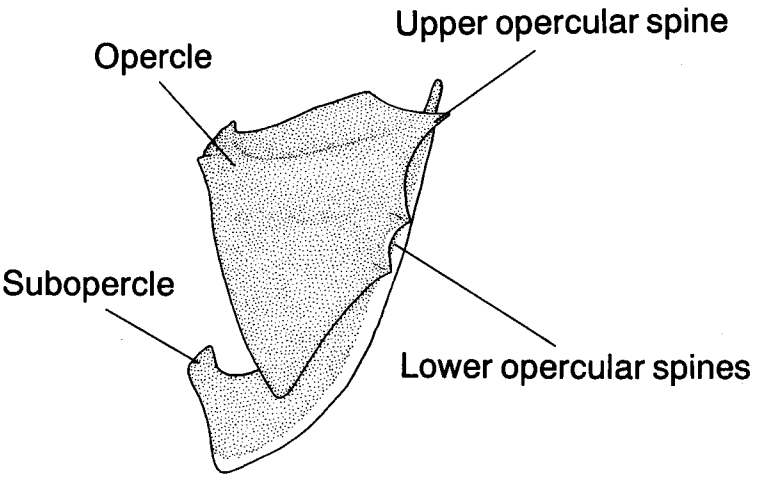

Fig. 2. Lateral view of opercular region of *Pterois volitans*, HUMZ-L 6886, 11.0 mm SL. Scale indicates 0.5 mm. Doted areas indicate ossified bones.

Early postflexion larval stage (4.5 mm SL). — Ascending process of upper jaw long and stout. Posterior end of lower jaw strongly pointed. Postocular spine strongly developed. Third posterior opercular spine with serration. Blunt upper opercular spine present. Pelvic fin rays weakly developed.

Late postflexion larval stage (9.5-11.0 mm SL). — Following spines on head at 9.5 mm SL: first lower infraorbital spine, fourth upper infraorbital spine, one nuchal spine, tympanic spine, third and fourth anterior preopercular spines and first posterior preopercular spine (lower posttemporal present on right side, absent on left side). A sensory canal between bases of parietal and nuchal spines present at 9.5 mm SL. Second lower infraorbital spine and two lower opercular spines present at 11.0 mm SL (Fig. 2). Postocular spines becoming shorter with growth. Suborbital stay developed, posterior end broad and not reaching preopercle at 9.5 mm SL. Two nostrils present in front of eye; anterior nostril without a flap on posterior margin at 9.5 mm SL. Body scales not yet developed. Dorsal, anal and pelvic fin rays complete at 9.5 mm SL. Dorsal, anal, pectoral and caudal fin rays with segments at 10.5 mm SL. Pectoral fin long, at least reaching middle of anal fin at 9.5 mm SL (most fin rays broken). No fin rays branched yet. Dorsal fin originating behind posterior margin of opercle.

Remarks. The larval specimens described here are considered conspecific, owing to their stable fin ray counts, and the serial transformation of morphology and color with growth. Moreover, the species is a member of the subfamily Pteroinae because the following diagnostic characters only fit those of the subfamily: presence of suborbital stay with broad posterior margin; more than 22 dorsal fin elements in total, III, 7 anal fin elements; 13-15 pectoral fin elements; I, 5 pelvic fin elements; 24 vertebrae; long pectoral fin; and dorsal and anal fins not continuous with caudal fin. The following nine species of the subfamily are known from Australia at

Table 2. Fin ray counts in present species and nine species of Pteroinae known from Australia.

	D	A	P
Present species	XIII, 11-12	III, 7	13-15
Brachypterois serrulatus	XIII, 10-11	III, 5-6	15-16
Dendrochirus brachypterus	XIII, 9-10	III, 5-6	17-18
D. zebra	XIII, 10-11	III, 6-7	16-17
Ebosia bleekeri	XIII, 9	III, 7	15-16
Pterois antennata	XIII, 11-12	III, 6	16-17
P. radiata	XII, 10-11	III, 5-6	16
P. mombasae	XIII, 10	III, 6	18-20
P. russelli	XIII, 10-11	III, 6-7	12-13
P. volitans	XIII, 10-11	III, 6-7	13-15

Data from Gloerfelt-Tarp and Kailola (1984), Sainsbury et al. (1985), Eschmeyer (1986), Paxton et al. (1989), Randall et al. (1990) and Kuiter (1993). D, dorsal fin rays ; A, anal fin rays ; P, pectoral fin rays.

present time (Gloerfelt-Tarp and Kailola, 1984 ; Sainsbury et al., 1985 ; Paxton et al., 1989 ; Randall et al., 1990 ; Kuiter, 1993) : *Brachypterois serrulatus, Dendrochirus brachypterus, D. zebra, Ebosia bleekeri, Pterois antennata, P. radiata, P. mombasae, P. russelli*, and *P. volitans*. Among these species, only *P. volitans* satisfies the characters of the present species except for the soft dorsal fin ray count 12 in one specimen of HUMZ-L 6887, 10.7 mm SL (vs. usually 10-11 in *P. volitans*, according to Gloerfelt-Tarp and Kailola, 1984 ; Sainsbury et al., 1985 ; Eschmeyer, 1986 ; Randall et al., 1990 ; Kuiter, 1993) (Table 2). Only de Beaufort and Briggs (1962) described the number of soft dorsal fin rays as "10-11(12)," which could be interpreted that the range is 10-12. In this study, we identify the present specimens as *Pterois volitans*, and regard the 12 soft dorsal fin rays of HUMZ-L 6887 as a rare variation in the species.

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References

de Beaufort, L.F. and Briggs, J.C. (1962). *The fishes of the Indo-Australian Archipelago. 11. Scleroparei, Hypostomides, Pediculati, Plectognathi, Opisthomi, Discocephali, Xenopterygii*. E.J. Brill, Leiden, xi+481 p.

Eschmeyer, W.N. (1986). Family No. 149 : Scorpaenidae. p. 463-478, Smith, M.M. and Heemstra, P.C. (eds.). *Smiths' sea fishes*. Springer-Verlag, Berlin.

Gloerfelt-Tarp, T. and Kailola, P.J. (1984). *Trawled fishes of southern Indonesia and northern Australia*. The Australian Development Assistance Bureau, the Directorate-General of

fisheries, Indonesia and the German Agency for Technical Cooperation, Jakarta, xviii+406 p.

Hubbs, C.L. and Lagler, K.F. (1958). Fishes of the Great Lakes region. *Bull. Cranbrook Inst. Sci.*, **26**, 1-213.

Kojima, J. (1988). Scorpaenidae. p. 777-810, Okiyama, M. (ed.). *An atlas of the early stages fishes in Japan*. Tokai Univ. Press., Tokyo (in Japanese).

Kuiter, R.H. (1993). *Coastal fishes of south-eastern Australia*. Crawford House Press, Bathurst, Australia, xxxi+437 p.

Moser, H.G. and Ahlstrom, E.H. (1978). Larvae and pelagic juveniles of blackgill rockfish, *Sebastes melanostomus*, taken in midwater trawls off southern California. *J. Fish. Res. Board Can.*, **35**, 981-996.

Paxton, J.R., Hoese, D.F., Allen, G.R. and Hanley, J.E. (1989). *Zoological catalogue of Australia. Vol. 7. Pisces. Petromyzonidae to Carangidae*. Australian Government Publishing Service, Canberra, xii+664 p.

Potthoff, T. (1984). Clearing and staining techniques. p. 35-37, Moser, H.G., Richards, W.J., Cohen, D.M., Fahay, M.P., Kendall, A.W., Jr. and Richardson, S.L. (eds.). *Ontogeny and systematics of fishes*. Allen Press Inc., Lawrence.

Randall, J.E., Allen, G.R. and Steene, R.C.. (1990). *Fishes of the Great Barrier Reef and Coral Sea*. Crawford House Press, Bathurst, xx+507 p.

Richardson, A.L. and Laroche, W.A. (1979). Development and occurrence of larvae and juveniles of the rockfishes *Sebastes crameri*, *Sebastes pinniger*, and *Sebastes helvomaculatus* (Family Scorpaenidae) off Oregon. *Fish. Bull.*, **77**, 1-41.

Sainsbury, K.J., Kailola, P.J. and Leyland, G.G. (1985). *Continental shelf fishes of northern and north-western Australia*. Clouston and Hall and Peter Pownall Fisheries Information Service, Canberra, viii+375 p.

Washington, B.B., Moser, H.G., Laroche, W.A. and Richards, W.J. (1984). Scorpaeniformes: development. p. 405-428, Moser, H.G., Richards, W.J., Cohen, D.M., Fahay, M.P., Kendall, A.W., Jr. and Richardson, S.L. (eds.). *Ontogeny and systematics of fishes*. Allen Press Inc., Lawrence.