J. Mar. Biol. Ass. India, **51** (2) : 217 - 222, July - December 2009

New record of arrowfin bigeye *Priacanthus sagittarius* Starnes, 1988 (Pisces: Priacanthidae) from Indian waters with taxonomic account

*S. Ramachandran and Benjamin C. Varghese

Fishery Survey of India, P. B. No. 853, Kochangadi, Kochi - 682 005, Kerala, India.
**E-mail: marine_ramc@yahoo.co.in*

Abstract

Occurrence of *Priacanthus sagittarius* is reported for the first time from the Indian waters. A total of 16 individuals of *P. sagittarius* was caught during the demersal fishery survey conducted along the southwest coast in the area between 08°13.4'-10°19.6'N lat.,76°44.6'-75°45.2' E long.) during September 2008 - April 2009. The species was recorded from a depth zone of 60-84 m along with the catches of *P. hamrur*. The cranial and postcranial osteology of *P. sagittarius* is also described based on five specimens.

Keywords: *Priacanthus sagittarius*, first record, osteology

Introduction

The circumtemporal epibenthic marine percoid fish under the family Priacanthidae (commonly called big eyes) are characterized by extremely large eyes, rough scales, bright red coloration and deep, laterally compressed oval to moderately elongate body. Remarkably, the eye shine noted in the members of the family Pricanthidae due to the presence of tapida lucidum is unique among the teleosts. The genus *Priacanthus* Oken, 1817 varied from other genera (*Pristigenys* spp., *Cookeolus* spp. and *Heteropriacanthus* spp.) of the family Priacanthidae by the presence of scales behind the sensory canal of preopercle and asymentrical anterior profile (extremity of the jaw above the mid line of the body).

Starnes (1988) reported 18 species under the family Priacanthidae which include *P. hamrur, P. blochi, P. macrocanthus, P. tayenus, Cookeolus japonicus* (Day, 1875; Munro, 1955; Fischer and Bianchi, 1984) *P. prolixus* (Starnes, 1988; Motomura *et al*., 2001) and *Pristigenys niphonia* (Rekha and Geetha, 2006; Ramachandran and Philip, in press) reported from Indian waters. *Priacanthus sagittarius*, Starnes, 1988 is a new species described later by Starnes (1988) which was earlier incorrectly described as *P. blochii* Bleeker, 1853 by several authors (Masuda *et al*., 1984; Kimura and Suzuki, 1980; Gloerfelt-Trap and Kailola 1984; Sainsbury *et al*., 1985). In the demersal fishery survey along the southwest coast, we recorded *Priacanthus sagittarius* for the first time from Indian waters. Description of the species based on morphometry and salient features of the skeletal structure is presented in this paper.

Material and Methods

Priacanthus sagittarius were collected from bottom trawl catches of *Matsya Varshini* (overall length 36.5 m; Gross tonnage: 268.8) of Fishery Survey of India during September 2008 – April 2009 in the area between 08° - 10° N lat. between 50 – 100 m depth contour. Expo model fish trawl with 30 mm cod end mesh size was used. *P. sagittarius* were sorted out from *P. hamrur* and preserved at -40° C for further analysis. Meristic counts and measurements were taken following Starnes (1988). Potassium hydroxide solution (5%) was used for cleaning the bones for osteological studies. Conventional and perhaps most widely understood nomenclature for the bones are used following Cannon (1987) and Ramachandran and Phillip (2009).

Abbreviations for anatomical terms used in the text figures are as follows:

A = angular; AR = articular; AS = anal spine; ASP = alisphenoid; B = basipterigium; BH = basihyal; BOC = basioccipital; BR = branchiostegal ray; C = cleithrum; CC = Coracoid; CH = ceratohyal; D = dentary; DHH = dorsal hypohyal; ECT = ectopterygoid; EH = epihyal; EXO = exoccipital; H = hyomandibular; HH = hypohyal; I = interhyal; IO = interopercle; L = lacrymal; LE = lateralethmoid; M = maxilla; MES = mesopterygoid; MET = metapterygoid; O = opercle; P =parasphenoid; PA = parietal; PC = postcleithrum; PG = pectoralgirdle; PL = palatine; PM = premaxilla; PO = preopercle; PR = prootic; PS = pectoralspine; PTT = post-temporal; PTG = pterigophore; Q = quadrate; S = scapula; SC = supracleithrum; SOB = suborbital; SOC = supraoccipital; SOP = subopecle; SY = symplectic; UH = urohyal; VHH = ventral hypohyal; VO = vomer.

Results and Discussion

Sixteen specimens of *P. sagittarius* were collected onboard the research vessel *Matsya Varshini* of Fishery Survey of India from the following areas (Fig. 1). Three specimens from the area between 10° 09.6' N lat. - 75° 45.2' E long., 10° 25.4' N lat.-75° 42.5' E long. (60-64 m depth); four specimens from the area between 09° 33.6' N lat.-75° 58.2' E long., 09° 28.4' N lat.-75° 42.5' E long. (62- 68 m depth) and nine specimens from the area between 08° 13.2' N lat.-76° 44.3' E long. and 08° 16.2' N lat. - 76° 41.7' E long. (82-88 m depth).

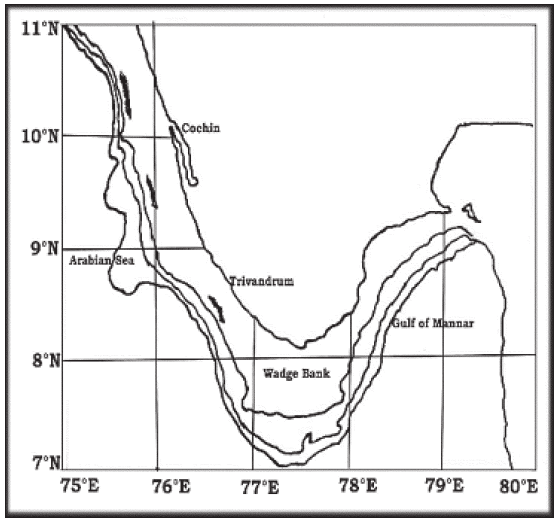

Fig.1. Trawl grounds from where *P. sagittarius* were recorded

Etymology of Priacanthus sagittarius, Starnes 1988: *sagittarius* (Latin) denotes "an arrow", the overall posterior configuration (pointed dorsal and anal fin and the blunt caudal fin towards posterior) of this species bears resemblance to the butt of an arrow.

History: Holotype: USNM 285042, 225mm (SL) recorded from Indonesia, 1983 (April, 30)

Para type : NTMS, 10996005, 96m (SL) Indonesia, 1983 (May, 2)

: USNM 283767, 256mm (SL) Sri Lanka 1969.

Color: Reddish silvery on head and body, iris of eye pink to bright red. Dorsal and anal fin pink, with reddish brown spot on base of the membrane, yellowish with dusky spots less distinct in caudal. First two interspinous membrane of dorsal fin with oblique black blotches only in *P. sagittarius* (Fig. 2). Pelvic fin with a black spot basally on the dorsal surface. The posterior margin of the dorsal, anal and caudal fin are black in color.

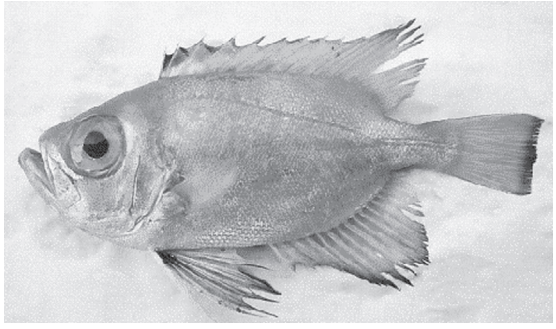

Fig. 2. *Priacanthus sagittarius* (130 mm SL)

The II dorsal spine, which is about twice of tenth dorsal spine differentiates this species from *Priacanthus hamrur / blochi* group (1.5-1.7 times). Pelvic fin moderately larger and the broadly pointed mouth is straightly oblique.

***Morphometric and meristic characteristics*:** The total length of the specimen ranged from 15.2 to

18.5 cm (Table 1). Dorsal fin spine 10 ; 14 rays, pectoral fin rays 18, pelvic fin spine 1; 5 rays, anal fin spine 3 ; 15 rays. Lateral line scale 61-64, scales in lateral line series 74-77; VS 9-10 / 36-40 (Table 2). There are 3 to 4 gill rakers in upper limb / 16-17 in lower limb in total 19 to 21. Scales are ctenoid, the midlateral scales are broadly pointed apical field with spines along the posterior margin and the anterior margin has 3 to 4 interradial projections. The number of apical spine of the midlateral scales (Fig. 3) varied from 20 (15 cm SL) to 46 (12 cm SL).

Table 1. Morphometric characteristics of *P. sagittarius* (n = 16)

Measurements	Minimum (cm)	Maximum (cm)
Total length	15.2	18.5
Standard length	12.8	15.4
Weight (g)	87	114
Head length	4.2	4.7
Pre-orbital length	1.1	1.4
Post-orbital length	1.1	1.4
Eye diameter	1.85	2.15
Inter-orbital length	1	1.2
Anal length	7	8
Pectoral fin length	2.5	2.9
Predorsal length	4	4.7
I dorsal fin length	0.8	1.1
II dorsal fin length	1.2	1.4
10th dorsal fin length	2.6	2.9
Height of caudal peduncle	1	1.3
Ventral fin length	4.3	4.8
Upper jaw length	1.7	2.6
Maximum body depth	5.1	6

Table 2. Meristic characteristics of *P. sagittarius* (n = 16)

Characteristics	Minimum	Maximum
Lateral line scale	61	64
Lat.l tr.	9/40	10/36
Anal fin length	2.6	3.7
Caudal fin rays	19	19
Dorsal fin spine	10	10
Dorsal fin soft ray	14	14
Anal fin spine	3	3
Anal fin soft ray	15	15
Pectoral fin ray	18	18
Pelvic fin spine	1	1
Pelvic fin soft ray	0	0
Vertebrae	23	23
Apical spine of midlateral scale	20	46
Branchiostegal ray	6	6

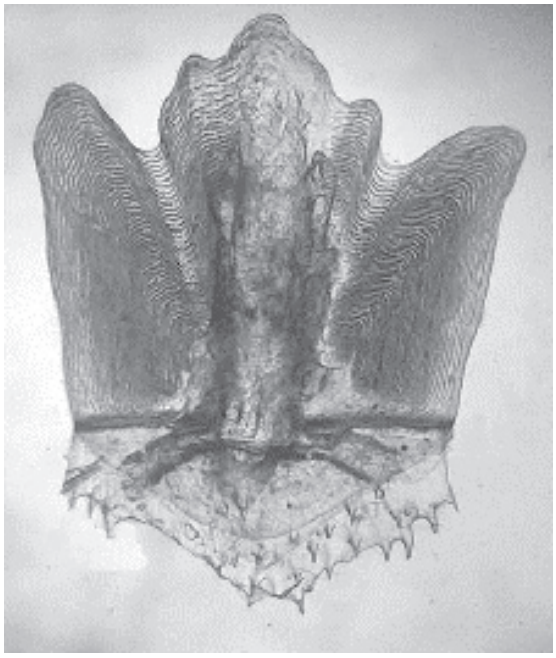

Fig. 3. Microscopic view of mid-lateral scale (4x) of *P. sagittarius*

Comparison of morphometric characters of *P. sagittarius* with *P. hamrur / blochi* group revealed that the latter species has greater head length, snout length and anal length (Table 3) than the former. However *P. sagittatius* has greater body depth (39% of SL), pectoral fin length (18.7% of SL) and pelvic fin length than the other species. Clear differences in meristic counts among the *Pricanthus* spp. were also noticed. *P. sagittarius* has lower lateral line scale count (61-64) compared to *P. hamrur / blochi* group (> 70). The present observation is based on only 16 specimens which would have resulted in a narrow range of lateral line scale count as compared with the observations of larger number of samples given in Table 3. Philip (1994) extracted the data of more than one thousand of specimens of *P. hamrur*.

***Osteology*:** Neurocranial profile is convex around the large orbital region, anteriorly it has a pointed ethmoid and posteriorly supraoccipital, parietal and epiotic crest are prominent. Premaxilla slightly protrudable, palatine spade shaped, ventrally with numerous small conical teeth bearing shelf, preopercle with serrate margin with short curved spine posteriorly. Ethmoidal pointed anteriorly and

Table 3. Comparison of morphometric (% in SL) and meristic characters of closely related species of *P. sagittarius* (range in parenthesis)

Characters	*P. sagittarius* (128-54 mm SL) (Present specimen)	*P. hamrur*** (102-295 mm SL)	*P. blochi** (126-235 mm SL)
Head length	30.7 (29.1-32.2)	31 (27.9-33.7)	31.8 (30-34.3)
Pre-orbital length	8.6 (8.3-9)	9.2 (7.6-13.3)	9.3 (8.5-10.2)
Eye diameter	13.8 (12.9-15.1)	13.7 (11.3-16)	14.6 (12.9-16.7)
Inter-orbital length	7.4 (7-7.9)	7.7 (6.3-8.9)	7.6 (6.9-8.4)
Anal length	43.3 (41.2-45.4)	54 (47-59)	-
Pectoral fin length	18.7 (17.9-19.5)	15.3 (13-16.5)	16.9 (15.2-19)
Pelvic fin length	30.9 (30.2-31.7)	28.8 (26-32.2)	30.2 (27.7-32)
Height of caudal peduncle	8.3 (8-8.5)	8.6 (6.8-9.9)	8.7 (8-9.2)
Maximum body depth	39.2 (37.3-41)	37 (33.2-40.2)	37 (34-38)
Dorsal fin spine	10.0	10	10
Dorsal fin ray	14.0	14 (13.-15)	13 (12 -14)
Anal fin spine	3.0	3	3
Anal fin rays	15.0	14-15	14 (13-15)
Pectoral fin	18.0	19 (18-19)	17 (17-19)
Lateral line scale	61-64	79.6 (70-90)	71.4 (69-77)
Scales in lateral line series	74-77	87.4 (79-96)	78.5 (74-85)
Vertical scale row	46-49	53.6 (48-57)	50.4 (47-56)
Gil rackers	19-21	24-26	20.2 (17-22)

* Starnes (1988); **Philip (1994)

relatively narrow, its lateral flanges folded ventrally, lateral ethmoid with a large foramen. Anterior and posterior lamella of the lateral ethmoid divergent ventrally, straddling on palatine, articulating with frontal, parasphenoid and vomer (Fig. 4). Vomerine articulation with lateral ethmoid narrow bearing a foramen medially. Interopercle elongate serrate ventrally, broadly pointed posteriorly. Opercle narrow pointed ventrally, subopercle asymmetrically V shaped and dorsally pointed. Premaxilla has well developed ascending process articulated with maxilla and ethmoidal posteriorly. Hyomandibular is a narrow strut articulating with sphenotic and prootic dorsoventrally by its dorsal condyle and a truncate dorsal facet articulating with pterotic. Metapterigoid articulating anterior dorsally with entopterigoid (mesopterigoid) and anterioventrally with quadrate and rod like symplectic. The symplectic bone posteriodorsally articulated with hyomandibular and laying in the border of preopercle, metapterigoid and quadrate. Entopterigoid a broad oval bone articulating ventrally with quadrate and posteriorly with metapterigoid and anteriorly with ectopterigoid and palatine. Parasphenoid thick laterally flattened with ventral groove had centro-lateral ridge, a thick sheet of bone extends dorsally throughout its length articulates anteriorly with ventral surface of the

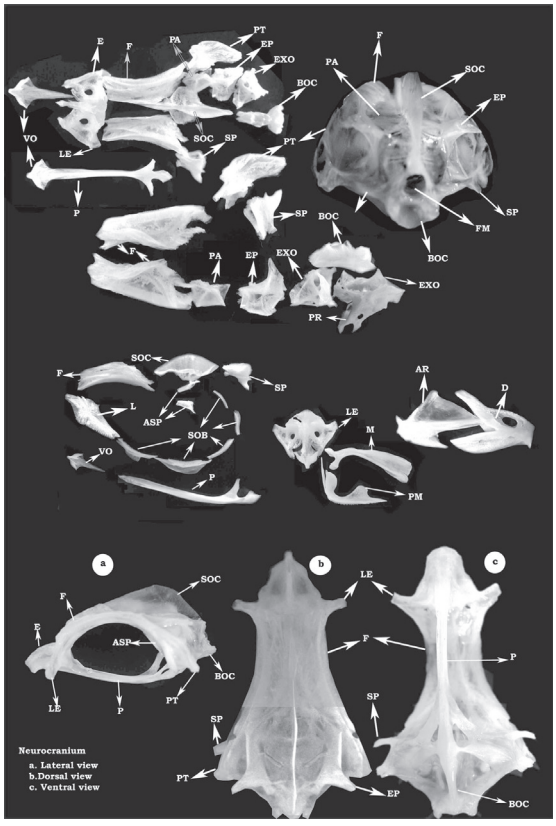

Fig. 4. Cranial bones of *P. sagittarius*

flattened posterior end of the vomer and ventral surface of the ethmoid cartilage.

There are six orbital bones, lacrimal broad consists of spines and fine serrations, second infraorbital moderate in size and serrated, third one had broad suboccular shelf and dorsally serrated. Parietal relatively small, dorsolateral ridge bearing well developed crest, articulating anteriorly with frontal posteriorly with epiotic and laterally with pterotic. There are six branchiostgeal rays, first four attached with anterior ceratohyal two with posterior epihyal. Hypohyals (dorsal and ventral) articulating with anterior part of ceratohyal by cartilage. The cartilage filled glasohyal (basohyal) articulated (cartilaginous articulation) with hypohyal posteriorly. The interhyal short columnar, cartilage filled at its dorsal and ventral concave tip, ventrally it articulated with facet of postdorsal edge of epihyal.

Sphenotic moderately produced posteriorly, a large facet to facilitate the articulation of hyomandibular. Prootic located rear of the orbit bridge of the prootic is well developed. Epiotic more or less circular in shape, paired and being roof of the auditory capsule articulating with parietals pterotic and occipitals. The middle region of the bony ridge of the epiotic crest drawn in to posteriorly directed spine The supraoccipital broad crest bearing and projecting anteriorly between posterior extension of frontal and posteiorly very nearer to foramen magnum. Exoccipital had a foramen magnum. Pelvis approximately triangular comprising two vertically oriented laterally compressed plate along anterioventrall margin of cleithra, and lies 45° to the axis of the body (Fig. 5).

Post-temporal bone (scythe shaped) dorsally articulated with sphenotic, anteriorly with pteroticand ventrally with suproaclethrum. The postemporal and supracleithrum has serrations on posterior margin (Fig. 4). Post-temporal is a laminar plate rounded ventrally, V shaped anterior part located on the pterotic and shphenotic bones, ventral portion articulated with supracleithrum. Pectoral girdle consists of suprocleithrum, a blade like bone dorsally articulated with posttemporal. Scapula laterally compressed plate thickened along its posterior edge where it bears short process (concave facet to

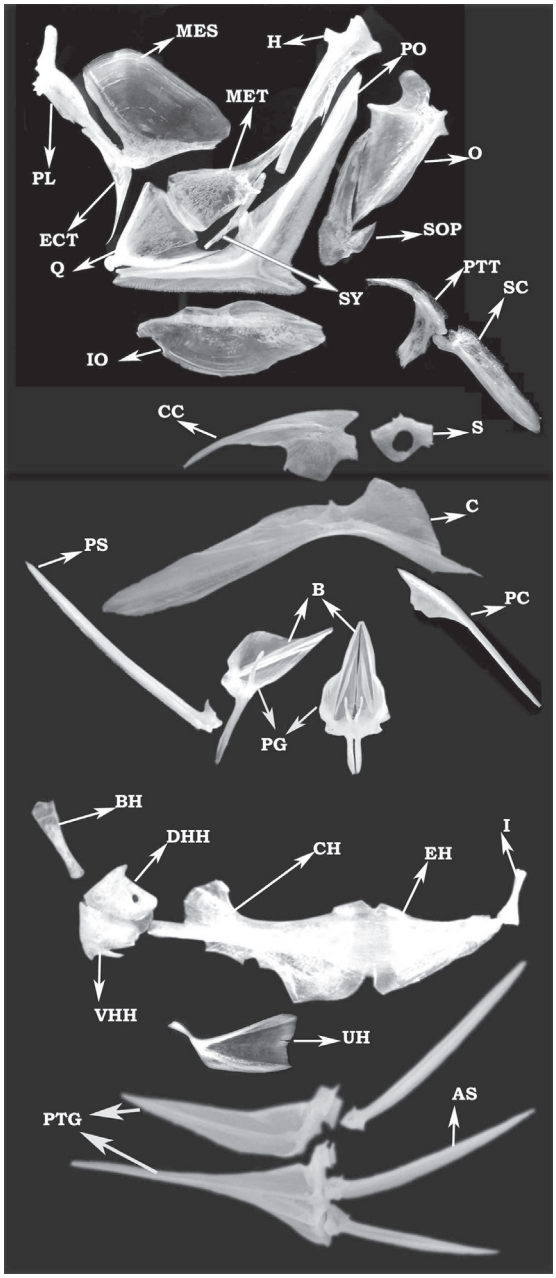

Fig. 5. Postcranial osteology of *P. sagittarius* (The expansions of the abbreviations used are given under Material and Methods)

facilitate the articulation of actinost) scapula has a central oval scapular foramen. Coaracoid is a long laminar posteriorly tapering process, which extends from ventral most pectoral fin origin. The rod like

anteroventral ramus is expanded dorsally and articulated along its anterior margin with cleithrum. Postcleithrum is bound by tissue along the posterodorsal edge of the cleithrum. The dorsal postcleithrum is expanded into a thin rounded plate bound with dorsal edge of the cleithrum.

Most of *Priacanthus* spp. inhabit rock/coral reefs or near crevices or beneath ledges and possibly avoid being caught in trawls. However, a few species (*Priacanthus hamrur, P. sagittarius*) often occur in trawl catches from open bottom areas. *Pricanthus* spp. are reported to occurr between 20 and 200 m depth of open as well as rocky grounds (Philip, 1994). In the survey reported here, *P. sagittarius* were collected along with bulk catches of *P. hamrur* between 61-84 m depth. This species has been earlier reported from Sri Lankan waters by Starnes (1988). Perhaps this species has extended the distribution to the northern latitudes in the Indian Ocean (Arabian Sea).

Acknowledgements

We gratefully acknowledge the Director General, Fishery Survey of India, Mumbai for his encouragement. We thank Dr. E.Vivekanandan, Principal Scientist, CMFRI, Cochin, for critically reviewing the paper and offering valuable suggestions and Shri D. M. Ali, Senior Fisheries Scientist, Fishery Survey of India for suggestions during the preparation of manuscript. We also owe sincere thanks to Dr. Wayne C. Starnes, Director, NC Museum of Natural Sciences, Research Laboratory, Raleigh, USA for confirming species identity and providing literature.

Reference

Cannon, D. L. 1987. Marine fish osteology: *A manual for archaeologists.* Department of Anthropology Publication No. 18. Simon Fraser University, Burnaby, British Columbia. 133 pp.

Day, F. 1875. *The Fishes of India*: *Being A Natural History of the Fishes Known to Inhabit the Sea and Freshwaters of India, Burma and Ceylon*, Pt, I. Quaritch, London, 168 pp.

Fischer, W. and G. Bianchi. 1984. FAO *Species Identification Sheets for Fishery Purposes. Western Indian Ocean* (Fishing Area 51). Vol. 1. FAO, UN, Rome.

Gloerfelt-Tarp, T. and P. J. Kailola. 1984. *Trawled fishes of southern Indonesia and northwestern* Australia. Australian Development Assistance Bureau, Australia, Directorate General of Fishes, Indonesia, and German Agency for Technical Cooperation, Fe Histoire naturelle des poissons, par M. le B.on Cuvier et par M. Valenciennes. Paris, Chez F. G. Levrault; [etc., etc.]1828-49. FRE url p. 108. *J. Shell. Res.,* [S.l.: National Shellfisheries Association, 1981- url p. 3.

Kimura, S. and K. Suzuki. 1980. Fish fauna of Ago Bay and its adjacent waters, Mie Prefecture, *Japan. Rep. Fish. Res. Lab. Mie Univ*., 2: 1 – 58.

Masuda, H., K. Amaoka, C. Araga, T. Uyeno and T. Yoshino. 1984. *The Fishes of the Japanese Archipelago*. Vol. 1. Tokai University Press, Tokyo, Japan, 437 pp.

Motomura, H., A. I. Burhanuddin, S. Kimura and Y. Iwatsuki. 2001. Fresh color notes for *Priacanthus prolixus* Starnes, 1988 from the West Coast of India (Perciformes: Priacanthidae). *Biogeography*, 3: 77 - 81.

Munro, I. S. R. 1955. *The Marine and Freshwater Fishes of Ceylon*. Dept. of External affairs, Canberra, 351 pp.

Philip, K. P. 1994. Studies on the biology and fishery of the fishes of the family Priacanthidae (Pisces: Perciformes) of Indian Waters. *Ph. D., Thesis*, Cochin University of Science and Technology, 169 pp.

Ramachandaran, S. and K. P. Philip. 2009. Redescription of Japanese Catalufa *Pristigenys niphonia* (Cuvier and Valenciennes, 1829) a new distributional record from south Indian waters. *J. Bom. Nat. Hist. Soc*., 106(1) (in press).

Rekha, J. Nair and P. M. Geetha. 2006. First record of the Japanese bigeye *Pristigenys niphonia* (Cuvier & Valenciennes) (Perciformes: Priacanthidae) from the Indian seas. *J. Mar. Biol. Ass. India,* 48(2): 263-266.

Sainsbury, K. J., P. J. Kailola and G. G. Leyland. 1985. *Continental Shelf Fishes of the Northern and North-Western Australia.* CSIRO Division of Fisheries Research, Clouston, Hall and Peter Pownall Fisheries Information Service, Canberra, Australia, 375 pp.

Starnes, W. C. 1988. Revision phylogeny and biogeographic comments on the circumtropical marine percoid fish family Pricanthidae. *Bull. Mar. Sci.,* 43(2): 117 - 203.

Received : 13/10/09
Accepted : 12/11/09