



## *Epigonus indicus*, a new species of deepwater cardinalfish (Perciformes: Epigonidae) from the Indian Ocean

K.K. IDREES BABU

*Department of Science and Technology, U.T. of Lakshadweep, Kavaratti, India*  
*E-mail: idreesbabu@gmail.com*

K.V. AKHILESH

*ICAR–Central Marine Fisheries Research Institute, Mumbai Regional Station, Maharashtra, India*  
*Corresponding Author, E-mail: akhikv@gmail.com*

### Abstract

A new species of deepwater cardinalfish, *Epigonus indicus*, is described from two specimens, 105.2 and 100.2 mm SL, from Kavaratti Island, Lakshadweep (Laccadive) Sea, India. The specimens were collected from storage tanks at a desalination plant where seawater was piped up from 350–400 m depths. Diagnostic features distinguishing the new species from congeners include no pungent opercular spines, no maxillary mustache-like process, no projections on the symphysis of the lower jaw, ribs absent on the last abdominal vertebra, no isolated dorsal-fin spine between the first and second dorsal fins, gill rakers 26–27, pectoral-fin rays 15–17, pectoral-fin length about 22–23% SL, and body depth about 28–29% SL.

**Key words:** taxonomy, ichthyology, India, Lakshadweep, Laccadive, western Indian Ocean, Kavaratti.

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## Introduction

Deepwater cardinalfishes of the genus *Epigonus* Rafinesque, 1810 (Family Epigonidae) are distributed widely in tropical and temperate seas around the world. They are typically found along slopes, seamounts, island drop-offs, and underwater rises, commonly occurring at depths of 50–1400 m (Mayer 1974, Abramov 1992, Okamoto & Gon 2018). Deepwater cardinalfishes are quite diverse in the Indian Ocean: a recent revision of these fishes for the western Indian Ocean listed 14 species, including two newly described species (Okamoto & Gon 2018).

During biodiversity surveys in Lakshadweep waters by the Department of Science and Technology (DST-UT of Lakshadweep, India), samples were regularly collected from storage tanks placed before filter screens that prevented the entry of larger marine life into the desalination plant. Water drawn up from 350–400 m depth carried deepwater organisms to the surface. Among various deepwater fishes collected, including *Physiculus* sp., *Cephaloscyllium* sp., and other interesting taxa currently under investigation, two specimens of a new *Epigonus* were found.

## Materials and Methods

Type specimens are deposited in the collection of the Bombay Natural History Society (BNHS), Mumbai, India. Meristic and morphometric methods follow Mayer (1974) and Okamoto (2011). Lengths of specimens are standard length (SL) unless otherwise indicated, and all measurements were made to the nearest 0.1 mm. Values for the holotype are presented first, followed by those for the paratype in parentheses, if different. Mitochondrial DNA COI sequences were obtained and analyzed following the procedure in Hall (1999) and Ward et al. (2009); and available as GenBank accession numbers MW172267–MW172269.

## *Epigonus indicus*, n. sp.

### Indian Deepwater Cardinalfish

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Figures 1–6.

**Holotype.** BNHS MF 94 (Bombay Natural History Society), 105.2 mm SL, 129.9 mm TL, India, Lakshadweep, Kavaratti Island, offshore of desalination plant, 10.576°, 72.649°, from 350–400 m, 31 January 2018.



**Figure 1.** *Epigonus indicus*, fresh holotype, BNHS MF 94, 105.2 mm SL, Kavaratti Island, Lakshadweep (K.K Idrees Babu).

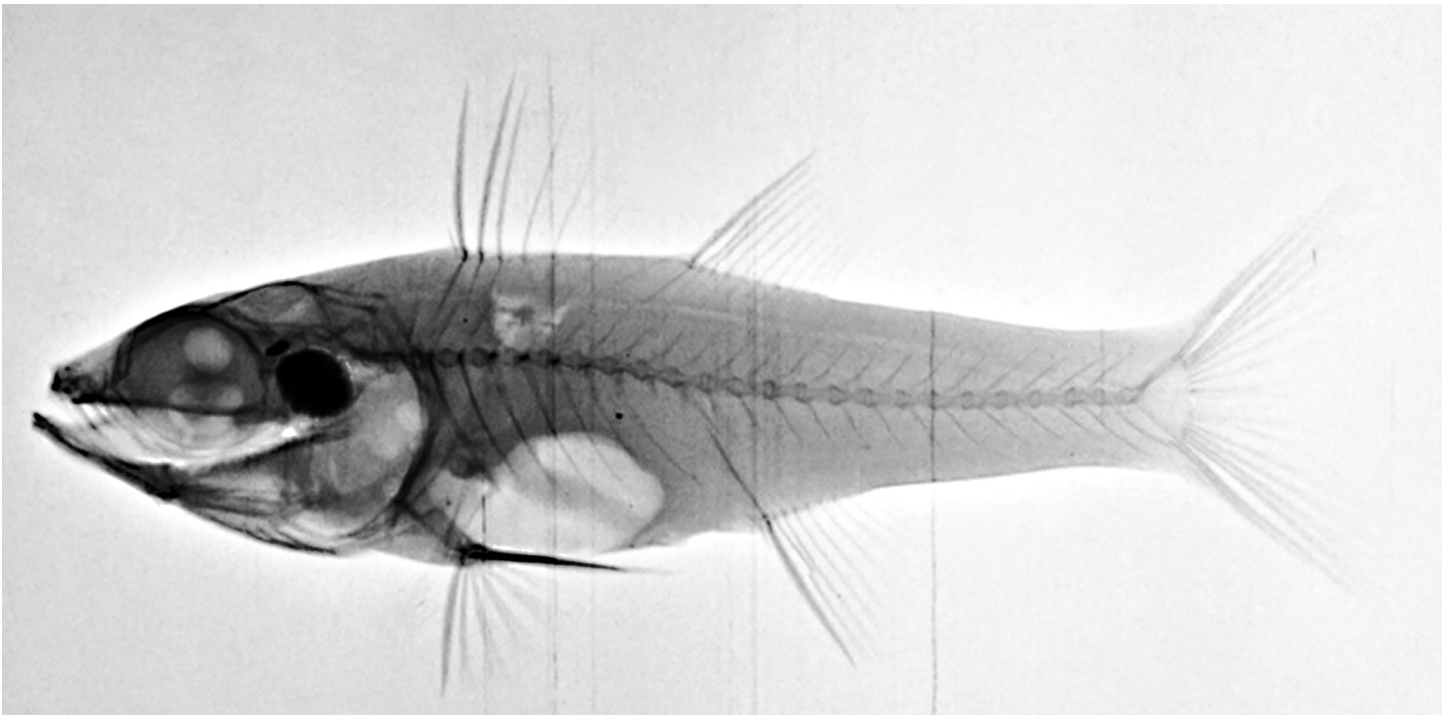


**Figure 2.** *Epigonus indicus*, preserved paratype, BNHS MF 95, 100.2 mm SL, Kavaratti Island, Lakshadweep (K.V. Akhilesh).

**Paratype.** BNHS MF 95, 100.2 mm SL, 116.7 mm TL, collected with holotype.

**Diagnosis.** A species of *Epigonus* with dorsal-fin elements VII+I,10; anal-fin elements II,9; pectoral-fin rays 15–17; total gill rakers  $7+1+18-19 = 26-27$ ; vertebrae 10+14 (Fig 3); pored lateral-line scales 38–39 + 3–5; scales below lateral line 7 or 8, above lateral line 2.5–3; no pungent opercular spines; no maxillary mustache-like process; no projections on symphysis of lower or upper jaw; ribs absent on last abdominal vertebra; no isolated dorsal-fin spine between first and second dorsal fins; body depth at dorsal-fin origin 28–29% SL; pectoral fins long, 22–23% SL, reaching beyond vertical at second dorsal-fin origin; pelvic-fin rays reaching anus when adpressed, 19–21% SL.

**Description.** Dorsal-fin elements VII+I,10; anal-fin elements II,9; pectoral-fin rays 15–17; pelvic-fin rays I,5; vertebrae 10+14 (Fig 3).



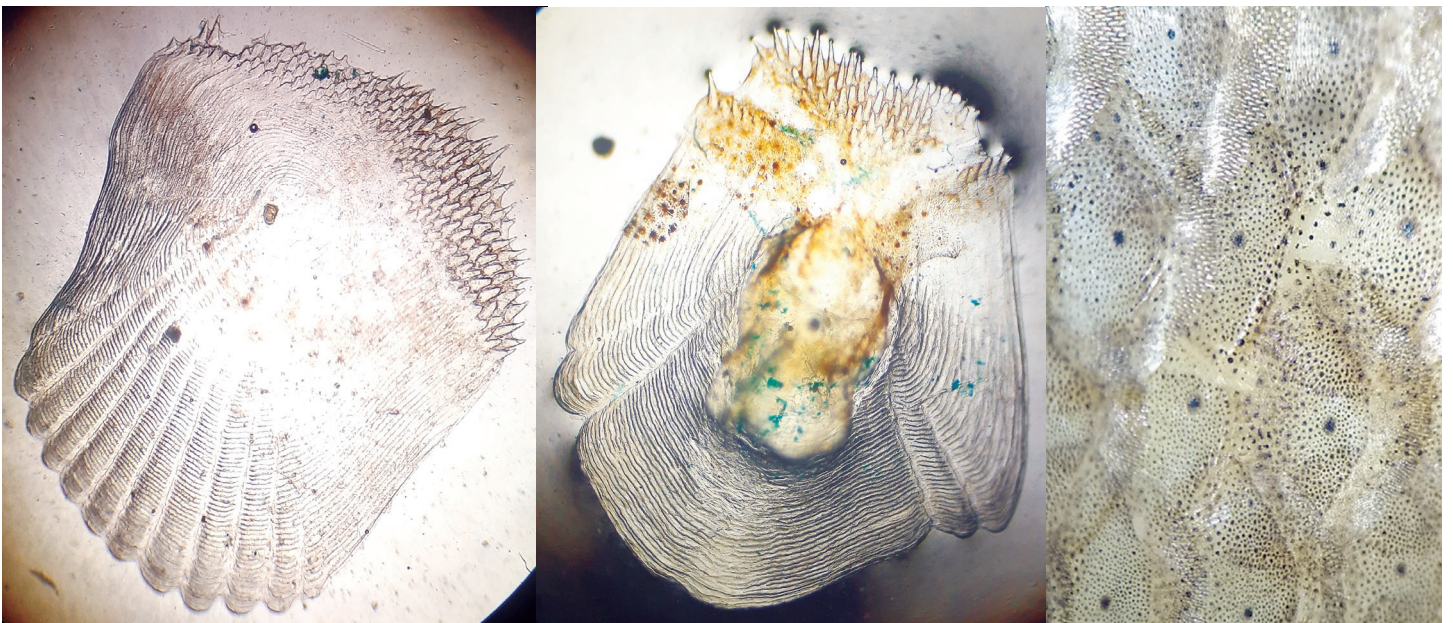
**Figure 3.** *Epigonus indicus*, x-ray of holotype, BNHS MF 94, 105.2 mm SL, Kavaratti Island, Lakshadweep (K.V. Akhilesh).



**Figure 4.** *Epigonus indicus*, ventral head view of paratype, BNHS MF 95, 100.2 mm SL, Kavaratti Island, Lakshadweep (K.V. Akhilesh).

Body elongate, moderately deep, body depth 28.9 (28.1)% SL; slightly compressed laterally, body width 15.4 (14.7)% SL; head large and thick, maximum thickness at dorsal-fin origin; head length 41.5 (39.1)% SL; anterodorsal profile convex; eye large and broadly oval, eye diameter 13.9 (13.4)% SL, 2.9–3.0 in HL, 1.4–1.5 in postorbital length; bony rim of orbit slightly raised above dorsal profile; interorbital region flat, interorbital width 9.0 (9.2)% SL, 2 in HL; interorbital scaly up to anterior rim of the orbit, 3 scales in interorbital; postorbital length 20.1 (19.5)% SL; snout blunt, long 7.4 (7.7)% SL, 5.1–5.6 in HL, shorter than interorbital; opercular spine absent; mouth large, oblique, angle of gape moderate; upper-jaw length 14% SL, 2.8–3 in HL; lower jaw projecting when mouth closed and visible in dorsal and lateral views; posterior margin of maxilla not extending to below center of eye in vertical; maxillary moustache-like process absent; teeth minute, in one row on anterior portion of upper jaw, toothless at symphysis; a row of 5 or 6 small conical teeth at sides of symphysis of the lower jaw (holotype); tongue without teeth; total gill rakers  $7+1+18-19=26-27$ .

First-dorsal-fin origin above origin of pelvic fin in vertical; pre-dorsal length 38.1 (36.6)% SL; first dorsal-fin spine minute 2.3 (2.4)% SL, second spine 15.7 (13.5)% SL, third spine 17.3 (14.5)% SL, fourth spine 16.1



**Figure 5.** *Epigonus indicus*, regular scale (left) and lateral-line scale (middle) and lateral scale pattern (right), on preserved holotype, BNHS MF 94, 105.2 mm SL, Kavaratti Island, Lakshadweep (K.V. Akhilesh).

(14.3)% SL; pre-second-dorsal-fin length 57.4 (56.6)% SL; second-dorsal-fin spine 15.4 (14.7)% SL, slightly thicker than fourth dorsal-fin spine; first-dorsal-fin base 15.2 (12.5)% SL; second dorsal-fin base length nearly equal to first 12.8 (12.4)% SL; interdorsal space slightly longer than snout length, 7.7 (4.9)% SL. Pectoral fin long 22.5 (22.1)% SL, posterior tip of pectoral fin reaching to third or fourth ray of the second dorsal fin in vertical, pre-pectoral-fin length 38.4 (37.2)% SL. Pelvic fin short, reaching to anus or slightly shorter when adpressed, length 20.9 (19.0)% SL, pelvic-fin spine length 14.4 (13.8)% SL, pre-pelvic-fin length 38.8 (38.6)% SL. Anus located below second dorsal-fin origin, pre-anal length 58.8 (56.9)% SL. Origin of anal fin vertically below middle portion of second dorsal-fin base, pre-anal-fin length 64.5 (63)% SL, first anal-fin spine minute, 2.2 (2.3)% SL; second anal-fin spine long, 15.8 (14.5)% SL; anal-fin base length 11.6 (10.3)% SL. Caudal-peduncle depth 12.1 (12.3)% SL; caudal-peduncle length 28.9 (31)% SL. Caudal fin deeply forked, length 24.7 (16.5)% SL.

Scales deciduous, ctenoid (Figs. 4 & 5), covering body except snout tip, anterior to rim of orbit, on jaws and isthmus; scales present on bases of second dorsal, anal, and caudal fins; pored lateral-line scales 38–39 + 3–5 on the caudal fin; scales below lateral line 7 or 8, above lateral line 2.5–3.

**Color** (Figs. 1, 2, 4 & 6) Head and body shiny black when fresh (Fig.1) with fluorescent blue along ventral side between anus and pelvic fin, not extending to upper parts of body (Fig. 6). After preservation, head and



**Figure 6.** *Epigonus indicus*, paratype, ventral color, BNHS MF 95, 100.2 mm SL, Kavaratti Island, Lakshadweep (K.V. Akhilesh).

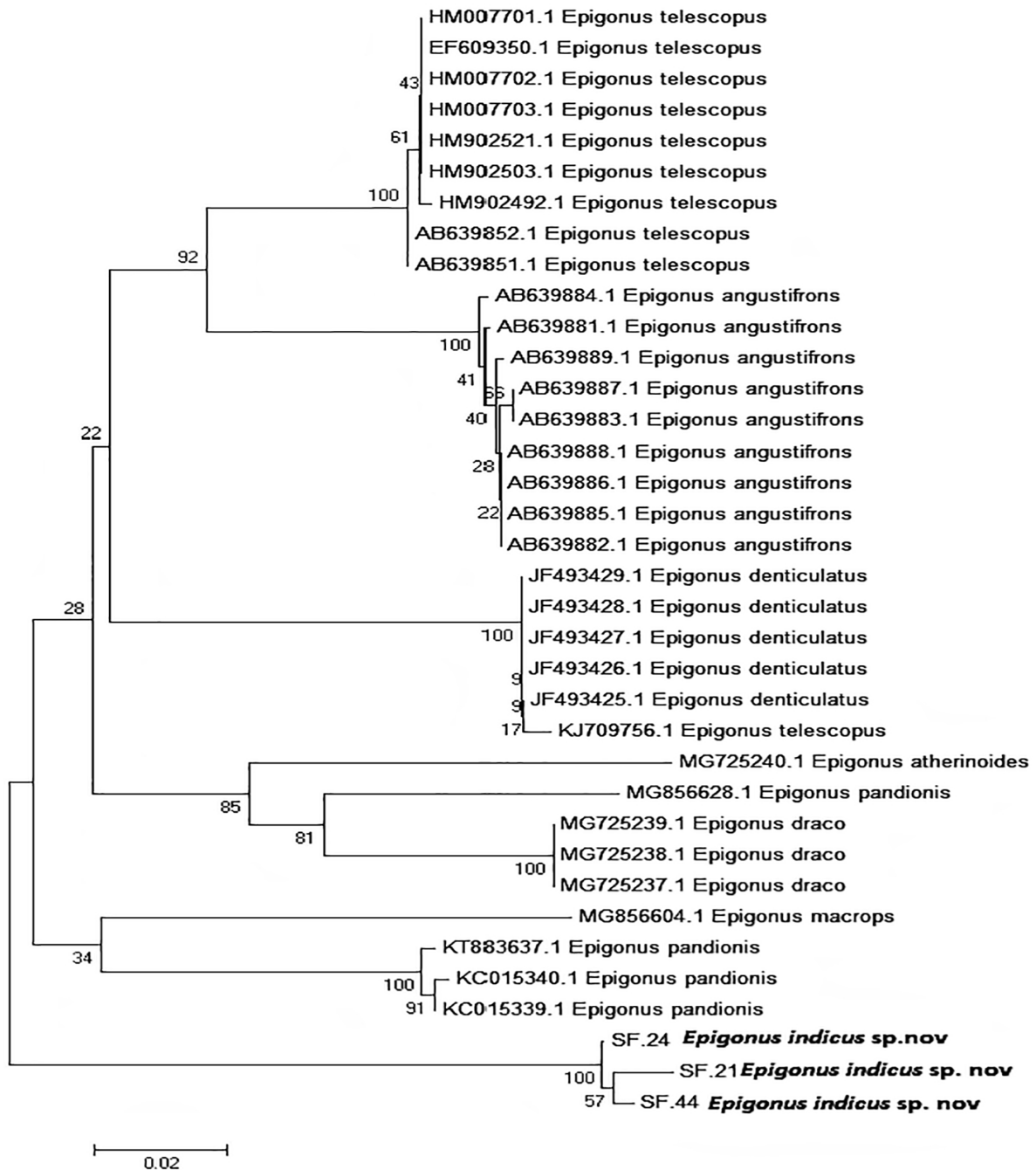
body dark brown with some paler areas; each scale has a prominent, small, central, black spot and scattered fine melanophores (Fig. 5).

**Etymology.** The new species is named for the country of collection, as a masculine singular nominative adjective.

**Distribution.** *Epigonus indicus* is currently known only from the type locality at Kavaratti Island, Lakshadweep, India at 350–400 m.

**Remarks and Comparisons.** The rarity of *Epigonus* specimens is typical and several new species have been described recently based on low numbers of specimens (see Krupp et al. 2009, Okamoto & Motomura 2012, Okamoto & Gon 2018).

The congener, *Epigonus marimonticolus* Parin & Abramov, 1986, is also known from the eastern Arabian Sea (Parin & Abramov 1986, Abramov 1992, Okamoto & Gon 2018). The new species *E. indicus* can be distinguished from *E. marimonticolus* by having fewer pectoral-fin rays, 15–17 (vs. 20–22); fewer gill rakers, 26 or 27 (vs.



**Figure 7.** The neighbor-joining tree of mtDNA COI sequences of *Epigonus* species available on GenBank. The scale bar at left represents a 2% sequence difference. GenBank accession numbers are listed.

29–32); fewer vertebrae, 10+14 (vs. 10+15); fewer pored lateral-line scales, 38–39 + 3–5 (vs. 45–48 + 3–4); no pungent opercular spine (vs. present); a longer pectoral fin about 22% SL (vs. short, 13.4–16.4% SL); a wider body, about 28% SL (vs. 19.1–23.5% SL); and a smaller eye, about 14% SL (vs. 15.5–17.1 % SL).

The new species *E. indicus* can be distinguished from the nearby *Epigonus marisrubri* Krupp, Zajonz & Khalaf, 2009 (from the Arabian Sea and Somalia) by having no ribs on the last abdominal vertebra (vs. present); no spines on the symphysis of the lower jaw (vs. present); and fewer pored lateral-line scales, 38–39 + 3–5 (vs. 48–49) (Krupp et al. 2009).

The lack of a pungent opercular spine indicates that *E. indicus* does not belong to the “*E. constanciae*” group as defined by Okamoto (2012), thus excluding the western Indian Ocean *Epigonus bispinosus* Okamoto & Gon, 2016 and *Epigonus ideii* Okamoto & Gon, 2016. The absence of an isolated dorsal-fin spine between the first and second dorsal fins distinguishes the new species from the “*E. telescopus*” group.

A possible ventral bioluminescent organ is present in *E. indicus*, based on the ventral fluorescent blue color (Fig. 6), although the specimens were not dissected due to their status as the only types. If it is present, it is only shared by the luminous deepwater cardinalfish *Epigonus macrops* (Brauer, 1906) (Okamoto & Nakayama 2016). However, *E. macrops* has a lower gill-raker count, 18–20 (vs. 26–27), more pored lateral-line scales, 45–51 + 3–5 (vs. 38–39 + 3–5); more pectoral-fin rays, 18–19 (vs. 15–17), and has ribs on the last abdominal vertebra and an isolated dorsal-fin spine between the first and second dorsal fins, both of which *E. indicus* lacks.

The mtDNA COI “barcode” sequence obtained for the new species shows it is very different from *E. macrops*, more than 15% divergent (Fig. 7). There are no close lineages in GenBank, including a number of regional species. When compared to unpublished sequences in the barcode database BOLD ([www.boldsystems.org](http://www.boldsystems.org)), the nearest lineages are three from the western Atlantic Ocean, 6.3%, 11.9% & 12.2% different (minimum interspecific p-distance), likely representing *E. occidentalis*, *E. oligolepis*, *E. pectinifer*, or another described Indo-Pacific species, or even undescribed species.

From the Indian Exclusive Economic Zone (EEZ), only three deepwater cardinalfishes have been reported prior to this description, i.e. *Brephostoma carpenteri* Alcock, 1889, *Epigonus marimonticolus*, and “*Epigonus pandionis*” by Sreedhar et al. (2013). However, *E. pandionis* is an Atlantic species and not reported from the Indian Ocean (Okamoto & Gon 2018). The diversity of the deepwater fish fauna in Indian waters is still poorly documented (Alcock 1894, Jones & Kumaran 1980). However, there have been significant recent advances in the understanding of the deepwater fauna of India with a number of new species and new distributional records being documented (e.g. *Pteropsaron indicum* Victor & Kumar, 2019).

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## References

- Abramov, A.A. (1992) Species composition and distribution of *Epigonus* (Epigonidae) in the world ocean. *Journal of Ichthyology*, 32 (5), 94–108.
- Alcock, A.W. (1894) Natural History Notes from H. M. Indian Marine Survey Steamer ‘Investigator’ Commander C.F. Oldham Commanding. Series II., No. 11. An Account of a Recent Collection of Bathybial Fishes from the Bay of Bengal and from the Laccadive Sea. *Journal of the Asiatic Society of Bengal*, 63 (2), 115–137.
- Hall, T. (1999) BioEdit: A user-friendly biological sequence alignment editor and analysis program for Windows 95/98/NT. *Nucleic Acids Symposium Series*, 41, 95–98.
- Jones, S. & Kumaran, M. (1980) *Fishes of the Laccadive Archipelago*. The Nature Conservation and Aquatic Sciences Service, Santinivas, Nanthancode, Trivandrum, Kerala, India, 760 pp.

- Krupp, F., Zajonz, U. & Khalaf, M.A. (2009) A new species of the deepwater cardinalfish genus *Epigonus* (Perciformes: Epigonidae) from the Gulf of Aqaba, Red Sea. *Aqua, International Journal of Ichthyology*, 15 (4), 223–227.
- Mayer, G.F. (1974) A revision of the cardinalfish genus *Epigonus* (Perciformes, Apogonidae), with descriptions of two new species. *Bulletin of the Museum of Comparative Zoology*, 146 (3), 147–203.
- Okamoto, M. (2011) A new species of deepwater cardinalfish, *Epigonus mayeri*, from the eastern central Atlantic, and redescription of *Epigonus heracleus* Parin and Abramov 1986 (Perciformes: Epigonidae). *Ichthyological Research*, 58 (2), 101–108.
- Okamoto, M. (2012) Two new species of the genus *Epigonus* (Perciformes: Epigonidae) from the South Pacific, with a definition of the *Epigonus constanciae* group. *Ichthyological Research*, 59, 242–254
- Okamoto, M. & Gon O. (2018). A review of the deepwater cardinalfish genus *Epigonus* (Perciformes: Epigonidae) of the Western Indian Ocean, with description of two new species. *Zootaxa*, 4382 (2), 261–291.
- Okamoto, M. & Motomura, H. (2012) *Epigonus exodon*, a new species of deepwater cardinalfish (Teleostei: Perciformes: Epigonidae) from Réunion, western Indian Ocean. *Zootaxa*, 3453, 84–88.
- Okamoto, M. & Nakayama, N. (2016) First Records of the Luminous Deepwater Cardinalfish (Perciformes: Epigonidae), *Epigonus macrops* (Brauer, 1906), from the Southeastern Atlantic and Timor Sea. *Species Diversity*, 21, 79–83. <https://doi.org/10.12782/sd.21.1.079>
- Parin, N.V. & Abramov A.A. (1986) Two new species of benthopelagic fishes of the genus *Epigonus* (Apogonidae) from the western tropical part of the Indian Ocean. *Byulleten' Moskovskogo Obshchestva Ispytatelei Prirody, Otdel Biologicheskii*, 91 (3), 53–57.
- Sreedhar, U., Sudhakar, G.V.S. & Meena Kumari, B. (2013) Length-weight relationship of deepsea demersal fishes from the Indian EEZ. *Indian Journal of Fisheries*, 60 (3), 123–125.
- Victor, B.C. & Kumar, A.B. (2019) *Pteropsaron indicum*, a new species of signalfish (Teleostei: Trichonotidae: Hemerocoetinae) with a micro-CT analysis of osteology. *Journal of the Ocean Science Foundation*, 33, 70–78. <https://doi.org/10.5281/zenodo.3497519>
- Ward, R.D., Hanner, R. & Hebert, P.D.N. (2009) The campaign to DNA barcode all fishes, FISH-BOL. *Journal of Fish Biology*, 74 (2), 329–356.