

## Research Article

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# Seven new distributional records of cryptobenthic reef fishes in Lakshadweep, India

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## Abstract

Investigations on the diversity of cryptobenthic reef fishes resulted in observation of seven new geographic records for Lakshadweep waters, India: halfbarred goby *Amblygobius semicinctus*, target shrimp goby *Cryptocentrus strigilliceus*, thread shrimp goby *Ctenogobiops mitodes*, eye-bar goby *Gnatholepis anjerensis*, Miki's dwarf goby *Eviota mikiiae*, Erythropterygops goby *Bryaninops erythropterygops*, and *Enneapterygius* sp. *Ctenogobiops mitodes* is a new record to Indian waters. The genera *Cryptocentrus* and *Bryaninops* are reported from Lakshadweep for the first time. The observations were conducted in the lagoon and reef slope of Kavaratti Island, one of the 12 atolls of the Lakshadweep archipelago, from January–March 2021. The cryptobenthic reef fishes were observed and recorded through underwater photography and videography.

## Introduction

Cryptobenthic reef fishes (hereafter CRF) are small fishes that are visually or behaviourally cryptic, i.e. they hide in cracks, holes, sand, rubble or coral heads or are camouflaged. They tend to restrict their swimming to the immediate environs of their hiding places and are among the least understood reef organisms in terms of diversity, ecology and distribution owing to their cryptic nature. Their size range is limited to less than 50 mm (Depczynski & Bellwood, 2003) or 100 mm.

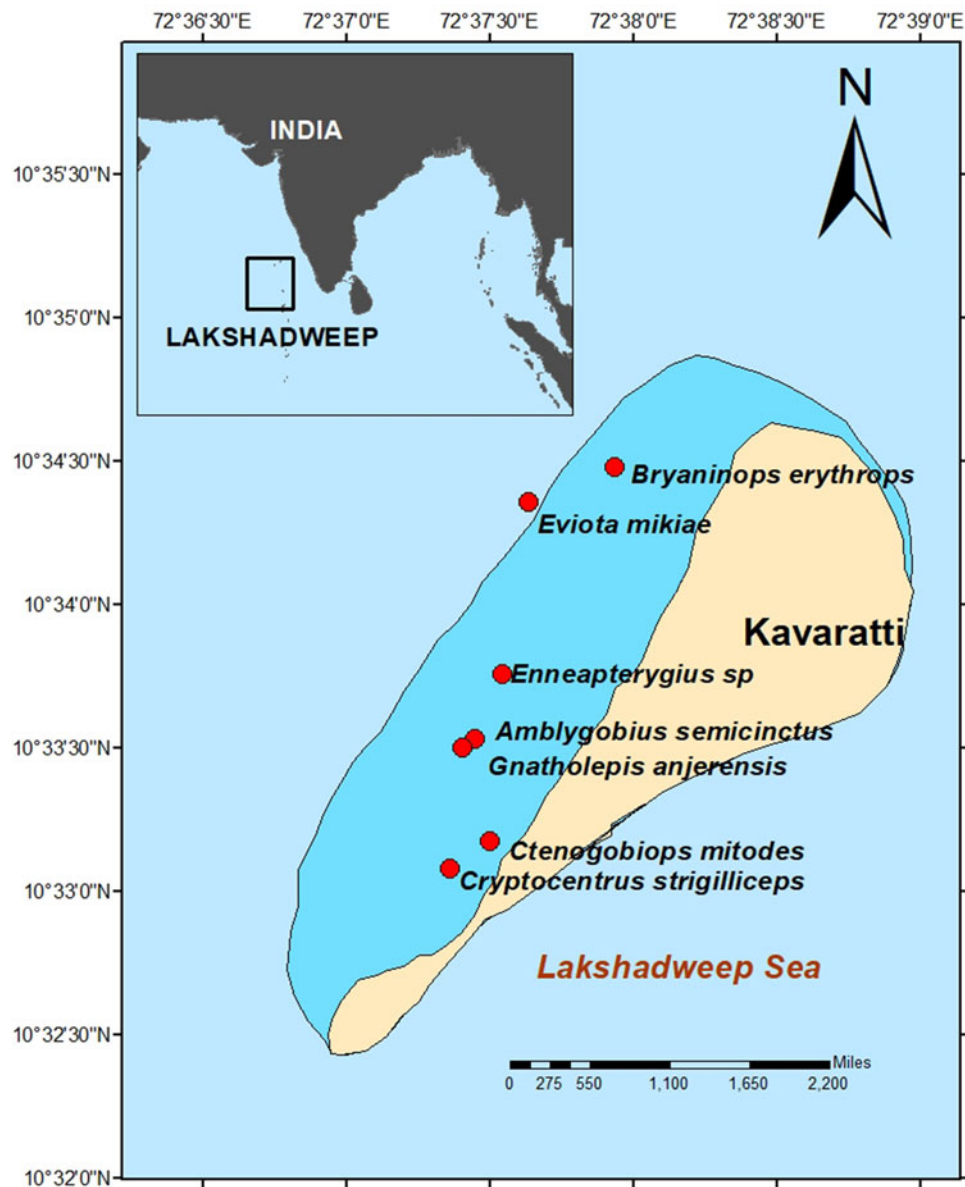
Brandl *et al.* (2018) noted that 100 mm is sometimes used, but they retained the size as typically less than 50 mm as per various definitions. The latter work is the most recent thorough analysis on CRFs, defining them by size range and reef relationships and identifying 17 major cryptobenthic families: Aploactinidae, Apogonidae, Blenniidae, Bythitidae, Callionymidae, Chaenopsidae, Creediidae, Dactyloscopidae, Gobiidae, Gobiesocidae, Grammatidae, Labrisomidae, Opisthogathidae, Plesiopidae, Pseudochromidae, Syngnathidae and Tripterygiidae.

The Lakshadweep atolls are an oceanic coral archipelago in the tropical western Indian Ocean. It consists of 36 islands, with 10 of them being inhabited. Every inhabited island has a lagoon within it that is bordered by reef, except for Androth (Sinha, 1994). Reef fish diversity research has been conducted in this region over the last 130 years. Major comprehensive work on reef fishes of Lakshadweep includes Jones & Kumaran (1980) and Murty (2002). A checklist of Lakshadweep fishes was provided by Rajan *et al.* (2021) which included 86 CRF species. We provide reports of seven new fish records from Lakshadweep that were observed during a fish faunal diversity study in Kavaratti atoll. The study adds to the information about the CRF community in this region. Since CRF are coral symbionts this information is helpful in understanding reef fish diversity and function in the region.

## Materials and methods

Fish faunal diversity surveys using the Underwater Visual Census method in the lagoon (depth 0.3–4 m) and reef slopes (depth 5 m) covering a total of 11 stations off Kavaratti Island, which were carried out from January–March 2021. Fishes were photographed and videographed underwater using TG6 Olympus, GoPro Hero 9 and Nikon W300 cameras. The geographic coordinates where the fishes were photographed (Figure 1) were recorded using the Nikon W300 camera. Snorkelling was done at 0.3–1 m depth. Scuba was employed for depths from 3–15 m. Most of the surveys included exploring crevices, rubble, sand and live corals for CRFs. Identification of documented fishes was carried out using relevant literature (Smith & Heemstra, 1986; Lieske & Myers, 2002; Allen, 2009; Allen *et al.*, 2015), and other published literature on specific groups. Geographic distributions of the identified species were referred from the relevant literature (Froese & Pauly, 2022; Heemstra *et al.*, 2022) and additional literature references collected for identified species. Taxonomic experts were consulted for confirming doubtful species.





**Figure 1.** Map indicating the locations where the newly recorded CRF species were sighted.

All seven new recorded species are confirmed as CRF through Brandl *et al.*'s (2018) classification.

## Results and discussion

The underwater surveys yielded a total of 26 CRFs, with seven species belonging to two families (Gobiidae and Trypterigidae) and are new records for the Lakshadweep fish fauna. The newly recorded CRFs are *Cryptocentrus strigilliceus*, *Ctenogobiops mitodes*, *Gnatholepis anjerensis*, *Amblygobius semicinctus*, *Eviota mikiaie*, *Bryaninops erythropros* and *Enneapterygius* sp. Of these, fishes of the genus *Cryptocentrus* and *Bryaninops* were not reported earlier from Lakshadweep. *Ctenogobiops mitodes* is a new record for Indian waters.

### New distributional records of CRF from Lakshadweep

#### (1) *Cryptocentrus strigilliceus* (Jordan & Seale, 1906)

Target shrimpgoby  
Family: Gobiidae  
Figure 2A & B

### Observation details

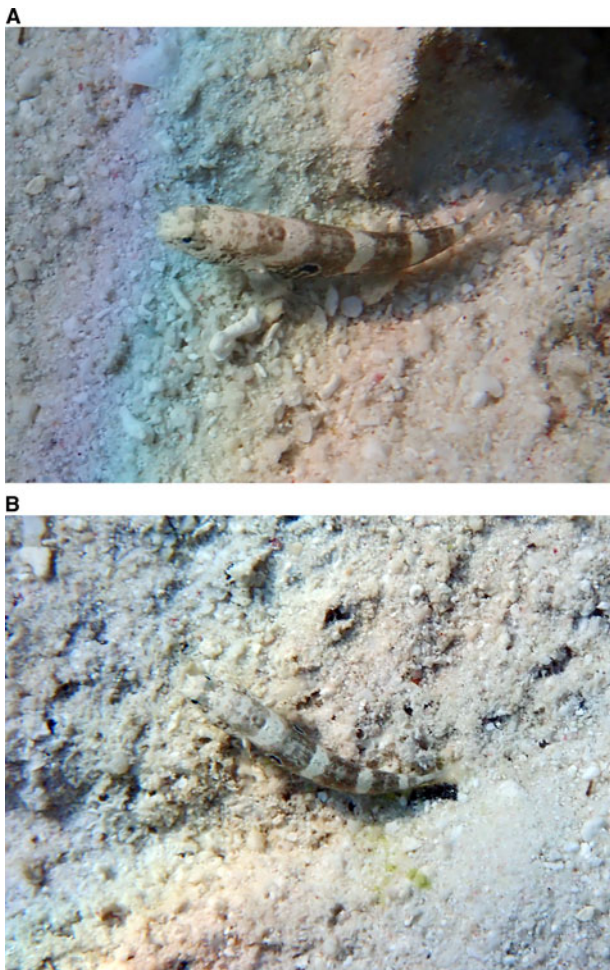
Target shrimpgoby, *Cryptocentrus strigilliceus*, ~6 cm TL, spotted near the coral at 3 m depth in the Kavaratti lagoon (10.551304°N 72.622689°E), Lakshadweep, India.

### Diagnosis

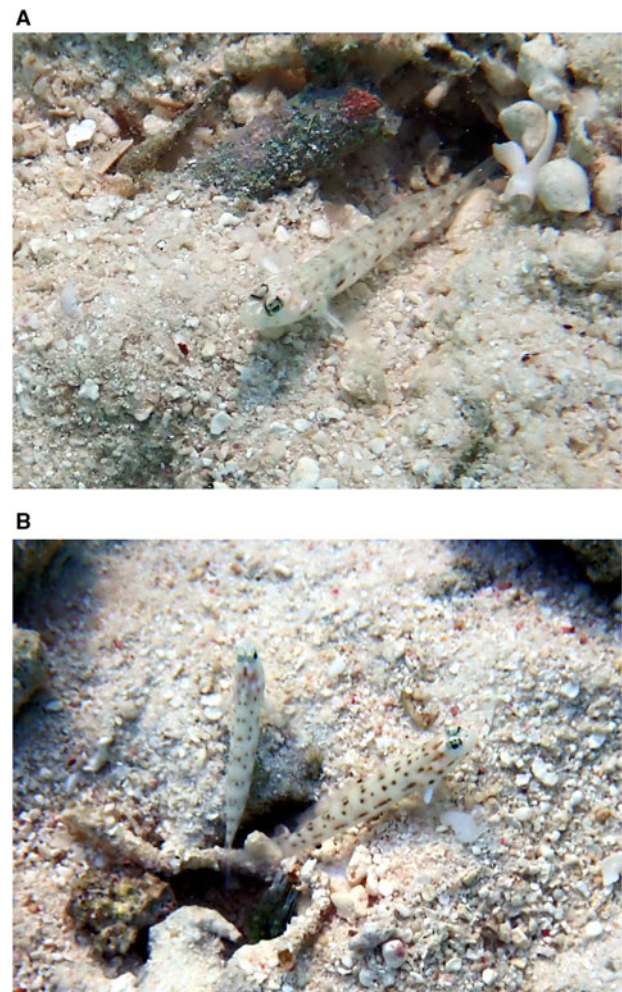
Goby belonging to the *Cryptocentrus strigilliceus* complex consisting of *C. altipinna*, *C. caeruleomaculatus* and *C. strigilliceus*, the group being characterized within the genus in having ctenoid scales on the posterior part of the body, in comparison with other congeners which have cycloid scales (Hoese, 2019). *Cryptocentrus strigilliceus* is distinguished from *C. altipinna* and *C. caeruleomaculatus* by the presence of predorsal midline scales and a noticeable eye-sized dark spot with white margin placed above the midline and below the first dorsal fin.

### Distribution

*Cryptocentrus strigilliceus* is an Indo-Pacific species reported from Gilbert Island and Tonga in the West Pacific to Somalia and Comoros Island of Eastern Africa and found through Micronesia, Northern Great Barrier Reef, Indonesia and north



**Figure 2.** (A and B) *Cryptocentrus strigilliceptus* spotted near a shrimp burrow, Kavaratti lagoon.



**Figure 3.** (A and B) *Ctenogobiops mitodes* spotted near a shrimp burrow in the Kavaratti lagoon.

up to Philippines, Vietnam and Taiwan (Froese & Pauly, 2022), and also in Andaman and Nicobar Islands (Rajan *et al.*, 2013).

(2) *Ctenogobiops mitodes* Randall *et al.*, 2007

Thread shrimpgoby  
Family: Gobiidae  
Figure 3A & B

*Observation details*

A pair of thread shrimpgoby, *Ctenogobiops mitodes*, ~5 cm TL, spotted in shrimp burrow near the coral beds at a depth of 2.5 m in the Kavaratti lagoon (10.552917°N 72.625008°E), Lakshadweep, India.

*Diagnosis*

Four longitudinal rows of dark markings, the third row having the largest, on the body. Prominent white spot on pectoral fin. Elongated second spine in dorsal fin main distinguishing feature of this species. Subsequently the same fishes spotted on several occasion on the sandy bottom of the Kavaratti lagoon, typically in pairs. Similar to *Ctenogobiops pomastictus*, but distinguished from the same by the robust second dorsal spine and a single row of three dots on the cheek. All thread shrimpgobies observed had a row of three dark spots on cheek which may be less than two to three in the case of *C. pomastictus*. Also the large midlateral row spots lack yellow centres which are characteristically present in *C. pomastictus* (Randall *et al.*, 2007).

*Distribution*

Reported from the Western Pacific regions of Indonesia to Papua New Guinea and Australia and east towards the Islands of Oceania such as Fiji, Marshall Islands, New Caledonia and Solomon Islands (Froese & Pauly, 2022).

(3) *Gnatholepis anjerensis* (Bleeker, 1851)

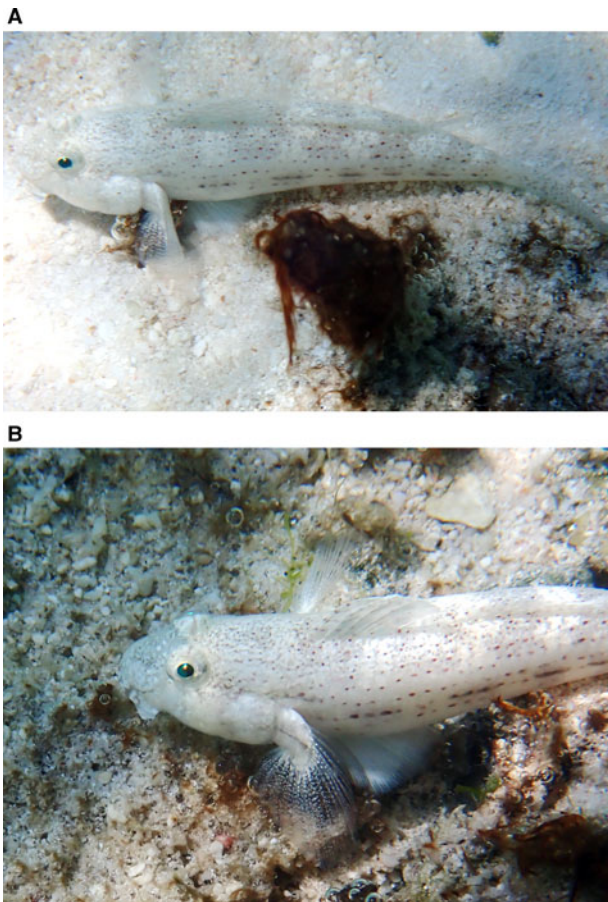
Eye-bar goby  
Family: Gobiidae  
Figure 4A & B

*Observation details*

A female eye-bar goby *Gnatholepis anjerensis*, ~8 cm TL, spotted on sandy bottom at a depth of 2 m in the Kavaratti lagoon (10.558326°N 72.623437°E), Lakshadweep, India.

*Diagnosis*

Pectoral fin features fine white speckles. Several black or reddish spots present on body, including the nape. Five to six faded dark elongate blotches present on the mid part of the body. Head and body appear stocky. First dorsal fin with squarish appearance due to the presence of a long 5th spine which is almost equal to the 3rd and 4th spine. The shape of this fin distinguishes it from its closest congener *Gnatholepis caurensis*, which has a rounded first dorsal fin lacking a long 5th dorsal spine.



**Figure 4.** (A and B) *Gnatholepis anjerensis* was observed on the sandy area of the Kavaratti lagoon.

#### Distribution

*Gnatholepis anjerensis* is found in the Indo-Pacific region from South Africa to Society Islands including Mozambique, Kenya, Egypt and Comoros islands along Africa, the Persian Gulf and Red Sea, Maldive Islands, Chagos Islands, the Arabian Sea, the Andaman Sea, Australia, the Banda Sea, the Coral Sea, Fiji, and French Polynesia, Hawaii and northward up to Taiwan and Ryukyu Islands (Larson & Buckle, 2012; Froese & Pauly, 2022).

#### (4) *Amblygobius semicinctus* (Bennett, 1833)

Halfbarred goby  
Family: Gobiidae  
Figure 5A & B

#### Observation details

Male and female halfbarred goby, *Amblygobius semicinctus*, ~7 cm TL, spotted in a sandy region near coral rock at a depth of 3 m in the Kavaratti lagoon (10.558902°N 72.624148°E), Lakshadweep, India.

#### Diagnosis

Body greyish, with a pale ventral half. Ventral side of the head with blue-green dots and short lines. Female with a set of four narrow dark bands on the sides and six white bars on the abdomen. A dark brown band running from frontal snout to eye and continuing as a double band behind the eye. A dark reddish eye-sized spot in the middle of first dorsal fin and another at the base of caudal fin. Male with four or five indistinct narrow dark bars on the side of the body, overlaid by dark and pale patches and

blotches. Only one congener, *Amblygobius albimaculatus*, has been reported in Lakshadweep thus far. The main distinction between *A. semicinctus* and *A. albimaculatus* is that in the female *A. semicinctus* characteristic bands as mentioned above are present whereas *A. albimaculatus* lacks the same (Randall & Goren, 1993).

#### Distribution

*Amblygobius semicinctus* is native to the Western Indian Ocean, which includes Mozambique, Chagos, Seychelles and Indonesia (Froese & Pauly, 2022). This species is reported from Maldives (Randall & Goren, 1993) and also in Andaman and Nicobar Islands (Rajan et al., 2013).

#### (5) *Eviota mikiiae* Allen, 2001

Miki's dwarfgoby  
Family: Gobiidae  
Figure 6

#### Observation details

Miki's dwarfgoby, *Eviota mikiiae*, ~3 cm TL, spotted on live *Porites* in the reef slope area at a depth of 15.3 m off Kavaratti Island (10.572594°N 72.627245°E), Lakshadweep, India.

#### Diagnosis

Body translucent with a conspicuous dark anterior nasal tube. Two patches of darkly pigmented chromatophores found behind the eye on the dorsal portion of head, separated by a short pale area along the midline. Only one congener of this species, *Eviota distigma*, has been reported from Lakshadweep so far, which is morphologically very distinct from *E. mikiiae* (Greenfield & Winterbottom, 2016).

#### Distribution

*Eviota mikiiae* has a distribution that is restricted to the Indian Ocean including Seychelles, Maldives, Chagos, Thailand and Indonesia.

#### (6) *Bryaninops erythropros* (Jordan & Seale, 1906)

Erythropros goby  
Family: Gobiidae  
Figure 7A & B

#### Observation details

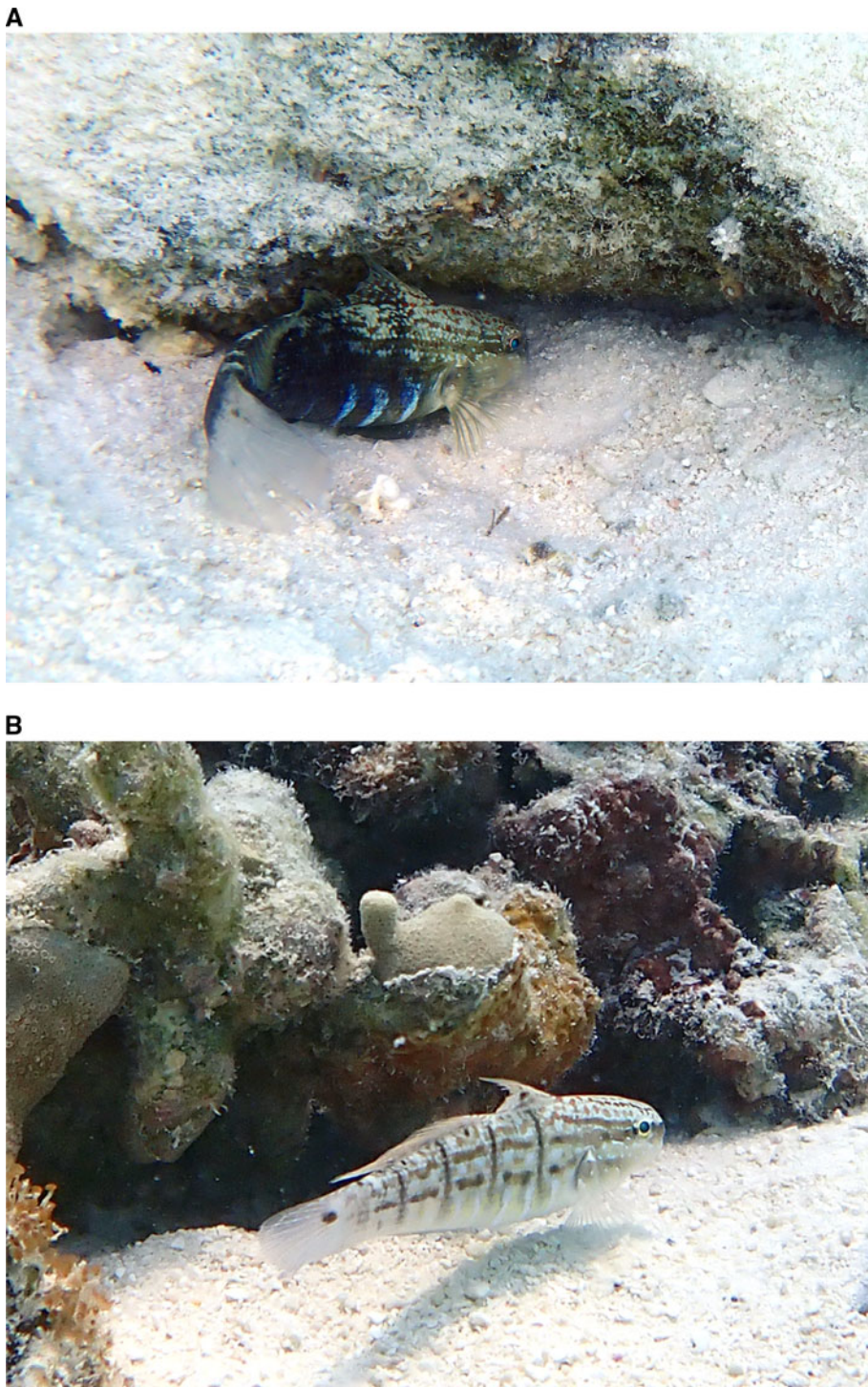
Two individuals of Erythropros goby, *Bryaninops erythropros*, ~2 cm TL, observed resting on live *Porites* sp. at a depth of 2.2 m in the Kavaratti lagoon (10.574641°N 72.632214°E), Lakshadweep, India.

#### Diagnosis

Species distinguished by a transparent body with a dark to dusky internal half body. Internal bars rarely visible. White internal pigment present in the brain region and a white line along the top of the vertebral column. To date, no congener of this species has been reported from Lakshadweep. *Bryaninops erythropros* closely resemble *B. loki*, which possesses seven visible bars on the body that may get broader on the ventral side which are absent in *B. erythropros*.

#### Distribution

The native range of *Bryaninops erythropros* in the Indo-Pacific region extends from Micronesian islands of Marshall, eastern Caroline and Mariana to American Samoa, Fiji and New Caledonia and the Great Barrier Reef in the western Pacific. It is also reported from Chagos and Comoros Island in the Indian



**Figure 5.** (A and B) *Amblygobius semicinctus* observed near coral rock in the Kavaratti lagoon.

Ocean. Distribution is seen in Papua New Guinea, Philippines, Thailand and Taiwan in the northern limits (Winterbottom and Anderson, 1997; Froese & Pauly, 2022).

(7) *Enneapterygius* sp.

Family: Tripterygiidae

Figure 8

*Observation details*

A solitary triplefin, ~2 cm TL, spotted on *Porites* coral at a depth of 2 m in the Kavaratti lagoon (10.562610°N 72.625738°E), Lakshadweep, India.

*Diagnosis*

It was not possible to identify this specimen to species level due to complicated morphological traits within this family which are not

evident in photographs. The presence of three dorsal fins is the most distinguishing feature of this family. The genus *Enneapterygius* is distinguished by a distinct lateral line. The colourful pattern in fluorescent blue on the head and around the eye and a dark spot on the base of the pectoral fin of the *Enneapterygius* specimen seen in this study are interesting.

*Remarks*

*Enneapterygius* sp. recorded in the current study appears to be an undescribed one, owing to the distinct fluorescent blue markings in the head and eye regions.

Research in fish faunal diversity has been ongoing in Lakshadweep for over a century. Cryptobenthic fishes have been recorded along with other species, with 89 species being reported so far, though until recently they were not subjected to detailed



**Figure 6.** *Eviota mikiae* spotted on the live coral on the Kavaratti reef slope.

studies perhaps owing to the characteristic cryptic behaviour and occurrence which makes them difficult subjects. All the seven records in the present study are new to Lakshadweep waters. Six of the seven new records are from the Gobiidae family. Gobies are the most diverse family in the Indo-Pacific region (Randall & Goren, 1993). Twenty-six gobies have been documented amongst the reef fishes in Lakshadweep with 24 species being listed by Rajan *et al.* (2021) and another two recently added by Sreeraj *et al.* (2022). The majority of these species are a shared diversity with the reefs of Maldives (Randall & Goren, 1993). The current records increase the tally of gobiid species to 32 for the Lakshadweep islands. Amongst the 16 extant *Amblygobius* species only two others, *A. albimaculatus* and *A. sphynx*, have been reported from India (Mohapatra *et al.*, 2020). *Amblygobius semicinctus* with distribution within the Indian Ocean has been found in nearby islands including Maldives, Chagos and also in the Andaman and Nicobar (Winterbottom & Emery, 1986;

**A**



**B**



**Figure 7.** (A and B) *Bryaninops erythroptus* spotted on live *Porites* on the Kavaratti lagoon.



**Figure 8.** *Enneapterygius* sp. spotted on live *Porites* in the Kavaratti lagoon.

Rajan & Mishra, 2018). *Ctenogobiops* genus consisting of 13 species is well distributed in the Indo-Pacific (Randall & Goren, 1993) though only one species, *C. crocines*, has been earlier reported from India, with its record being from Lakshadweep. *Ctenogobiops mitodes* has been reported from Malaysia, Japan, South China and Marshall Islands (Randall *et al.*, 2007; Wu *et al.*, 2009; Du *et al.*, 2019). Earlier only *Gnatholepis caurensis* represented the genus in Indian waters and was recorded from Lakshadweep. *Eviota distigma* reported from Lakshadweep was earlier the only representative of the genus in Indian waters. Seven species of *Cryptocentrus* genus have been reported from Indian waters so far including *Cryptocentrus fasciatus*, *C. octofasciatus*, *C. pavaninoides*, *C. strigilliceus*, from the Andaman and Nicobars (Rao, 2009; Rajan *et al.*, 2013), and *C. gymnocephalus* (Ramesh *et al.*, 2008), *C. cinctus* (Kumar *et al.*, 2013) and *C. cyanotaenia* (Kumar *et al.*, 2015) from the Gulf of Mannar preceding the current report of *Cryptocentrus strigilliceus* from Lakshadweep.

Trypterygiidae is represented by two genera in Indian waters, namely *Helcogramma* and *Enneapterygius*, with a total of six species. *Enneapterygius* which has 63 extant species was earlier represented by four species in Indian waters namely *E. elegans* recorded from the Gulf of Mannar (Lal Mohan, 1971) and *E. puscillus*, *E. fasciatus* (Fricke, 1997; Kapoor *et al.*, 2002) and *E. clarkae* (Sreeraj *et al.*, 2022) from Lakshadweep.

Cryptobenthic families have limited representation in Indian fish faunal records perhaps owing to very few investigations into cryptic species. Most CRF are shy organisms, with many being burrowing symbionts and do not come to notice during underwater studies unless specially surveyed for. Concentrated efforts on recording cryptobenthic species are bound to yield several more records in the Lakshadweep and being sensitive species, they will prove to be indicators of reef health and resilience.

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**Author contributions.** SB and AA conducted the Lakshadweep field survey. SB and AA collected photographs of fishes, and developed the concept for this manuscript. MPS and SB confirmed the identification of the new species records. SB, MPS, SKR edited and finalized the manuscript. The final manuscript was read and approved by all authors.

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**Conflict of interest.** The authors declare none.

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