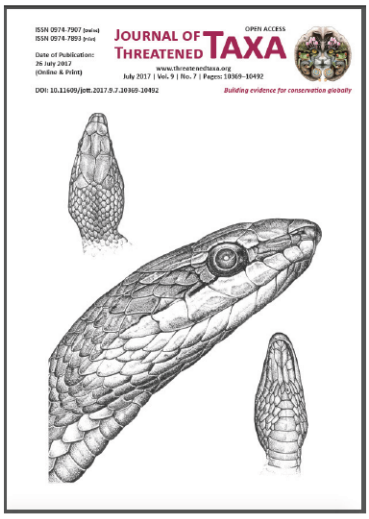

Journal of Threatened Taxa

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ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

COMMUNICATION

ON THE OCCURRENCE OF THE BLACK SPINE-CHEEK GUDGEON *ELEOTRIS MELANOSOMA* BLEEKER IN SRI LANKAN WATERS, WITH COMMENTS ON THE GREEN-BACKED GUAVINA *BUNAKA GYRINOIDES* (BLEEKER) (TELEOSTEI: ELEOTRIDAE)

Sudesh Batuwita, Sampath Udugampala & Udeni Edirisinghe

26 July 2017 | Vol. 9| No. 7 | Pp. 10374–10379
10.11609/jott.2915.9.7.10374–10379

ISSN 0974-7907 (Online)
ISSN 0974-7893 (Print)

Journal of Threatened Taxa | www.threatenedtaxa.org | 26 July 2017 | 9(7): 10374–10379

On the occurrence of the Black Spine-cheek Gudgeon *Eleotris melanosoma* Bleeker in Sri Lankan waters, with comments on the Green-backed Guavina *Bunaka gyrinoides* (Bleeker) (Teleostei: Eleotridae)

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Abstract: A new record of Black Spine-cheek Gudgeon *Eleotris melanosoma* Bleeker is provided from the southern and western coasts of Sri Lanka. This species was previously confused with two closely resembling eleotrid species—*E. fusca* (Bloch & Schneider in Bloch) and *Bunaka gyrinoides* (Bleeker) of Sri Lanka. It is speculated that records of *E. melanosoma* juveniles from coastal areas and *B. gyrinoides* from inland freshwater habitats appear to be the elevated locality records of *E. fusca* in Sri Lanka. Data are provided to distinguish *Eleotris melanosoma* from *E. fusca* and from *B. gyrinoides,* to clarify their taxonomy, and also discuss their distribution and natural history. This study adds two new records of fishes to the Sri Lankan freshwater fish list. Previous records of *Eleotris fusca* from Sri Lanka have to be clarified in future studies.

Keywords: Brackish water fish, *Eleotris fusca,* Broadhead Sleeper.

DOI: http://doi.org/10.11609/jott.2915.9.7.10374-10379 | **ZooBank:** urn:lsid:zoobank.org:pub:98B00F65-6534-4D6A-8B94-FECA1A575C2D

Editor: Neelesh Dahanukar, IISER, Pune, India. **Date of publication:** 26 July 2017 (online & print)

Manuscript details: Ms # 2915 | Received 18 July 2017 | Final received 02 July 2017 | Finally accepted 07 July 2017

Citation: Batuwita, S., S. Udugampala & U. Edirisinghe (2017). On the occurrence of the Black Spine-cheek Gudgeon *Eleotris melanosoma* Bleeker in Sri Lankan waters, with comments on the Green-backed Guavina *Bunaka gyrinoides* (Bleeker) (Teleostei: Eleotridae). *Journal of Threatened Taxa* 9(7): 10374–10379; http://doi.org/10.11609/jott.2915.9.7.10374-10379

Funding: The Nagao Natural Environmental Foundation (NEF) Japan, the Biodiversity Secretariat of the Ministry of Environment & Renewable Energy of Sri Lanka (BDS), and the National Science Foundation of Sri Lanka (NSF).

Competing interests: The authors declare no competing interests.

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Author Contribution: SB, SU & UE - designed the research, did the field work and wrote the manuscript.

Acknowledgements: We thank the Department of Wildlife Conservation for providing research permits (ref. WL/3/2/38/14) to conduct field work in Sri Lanka (2014–2016); and for financial support the Nagao Natural Environmental Foundation (NEF) Japan and the Biodiversity Secretariat of the Ministry of Environment & Renewable Energy of Sri Lanka, and for partial funding the National Science Foundation of Sri Lanka (NSF). We are grateful to Ronald de Ruiter and Karien Lahaise (RMNH) for providing syntype photographs of *Eleotris melanosoma*. Thank to N. Wickramasinghe, M. Goonatilake and C. Munasinghe (all of NMSL) for permission to access material in their care. We are also grateful to R. Pethiyagoda (Australian Museum, Sydney) for access to the WHT collection at Agarapatana and for Fig. 2; M. de Silva (Wildlife Conservation Society- Galle) for hospitality at Hiyare Conservation Center; and to M. M. Bahir and S. Nanayakkara (WHT) for hospitality at WHT Field Station, Agarapatana (2000–2001). Thanks are extended to R. Fernandupulle and Padma Ranasinghe (University of Peradeniya), A. Patrick (Jaffna University) and S. Ranasinghe (2014–2015) for fieldwork; and to M. Demel (FAO, Sri Lanka) for literature. Finally, we thank anonymous reviewers for criticism and helpful suggestions that helped substantially to improve the quality of this manuscript.

INTRODUCTION

The diversity of freshwater fishes of Sri Lanka is considered as one of the well-understood areas (Deraniyagala 1952; Pethiyagoda 1991; Goonatilake 2007; De Silva et al. 2015); however, brackish water fishes of Sri Lanka have long been neglected probably because of lack of interest (Deraniyagala 1952; Pethiyagoda 1991; De Silva et al. 2015). In 1952, Dr. P.E.P. Deraniyagala published the classic colored atlas of the fishes of Sri Lanka. He included some marine and a few brackish water species. Munro's (1955) publication 'Marine and Freshwater Fishes of Sri Lanka' appears to be the first near complete work with updated information, including on brackish water species. Subsequently published works on the fish fauna of Sri Lanka mostly concentrate on freshwater fishes (Pethiyagoda 1991; Goonatilake 2007; De Silva et al. 2015).

Among the brackish water fishes, eleotrid fishes of Sri Lanka belong to a small fish family of 10 species (Munro 1955). The Eleotridae (some spell it as 'Eleotrididae') are a group of fish known as gudgeons or sleepers which have a close affinity to one of the largest bony fish family, the Gobiidae (Kottelat et al. 1993). Eleotridae differs from the Gobiidae by the absence of united pelvic fins and in having six branchiostegal rays instead of five (Kottelat et al. 1993). These fishes are found in freshwater, brackish water as well as in sea water (Kottelat et al. 1993; Kottelat 2001). Munro (1955) provided illustrations and descriptions of almost all eleotrids recorded from Sri Lanka. Out of 10 species reported by him, five species were marine inhabitants and two were considered to enter freshwater: *Eleotris fusca* and *Butis butis* (Hamilton-Buchanan) (Pethiyagoda 1991; De Silva et al. 2015). *Butis koilomatodon* (Bleeker), *Bunaka gyrinoides* (Bleeker) and *Ophiocara porocephala* (Valenciennes) were reported as saltwater inhabitants (Munro 1955). Two species that have been reported by Munro (1955), *Eleotriodes muralis* (Valenciennes) and *E. sexguttatus* (Valenciennes), are now placed in the genus *Valenciennea* Bleeker of the family Gobiidae (see Dor 1984; Allen & Swainston 1988).

Based on the on-going brackish water fish survey and museum reference materials, we record a fish, which is new to Sri Lankan waters. In addition, the long time confused taxonomy of the eleotrid fish, *Bunaka gyrinoides* is discussed, along with its distribution and natural history.

MATERIALS AND METHODS

The specimens used for this study were deposited in the collection of the Rijksmuseum van Natuurlijke Historie, Netherlands (RMNH), and in the Wildlife Heritage Trust of Sri Lanka (WHT), which are now in the National Museum, Colombo (NMSL). Specimens were also collected during the recent survey conducted in Sri Lanka (2014–2015). All recent material will be eventually accessioned with NMSL. Measurements were taken to the nearest 0.1mm using a dial caliper. Standard length (SL) was measured from the snout-tip to the hypural notch, and head length from the snout-tip to the bony edge of the opercle. Body depth was measured from origin of first dorsal fin to belly. A few body scales were removed for taking measurements. The longitudinal lateral scale count was taken from the upper pectoral insertion to the end of the caudal peduncle, except the scales on the caudal fin base. Pectoral fin rays were counted with the inclusion of two unbranched rays. Gill raker counts are given as a whole count. Values in brackets following a count indicate the frequency of that count.

Photographs were taken with a Canon IXUS 50 digital camera (for WHT materials). Altitudes are given in metres above mean sea level; geographic coordinates were taken using topographic maps (1 inch: 1 mile, Survey Department, Colombo) and as well as from Google Earth.

RESULTS

Eleotris melanosoma Bleeker, 1853 (Image 1A–B, Figs. 1,2)

Material examined

RMNH 4815, ~86.0 mm SL, Wahai, western Sumatra, Indonesia; WHT 5328, 20 examples (ex.), 38.4–67.0 mm SL, Wakwella, swamp in the Gin River, Sri Lanka, 6.10000000 N & 80.18333333 E; WHT 5331, 3 ex., 51.6–64.5 mm SL, Moragoda Ela Stream: stream), near Nawinna (Galle), Sri Lanka, 6.05833333 N & 80.21666667 E; WHT 5329, 7 ex., Virankattuwa, Negambo estuary, Sri Lanka, 7.68333333 N & 79.81666667 E; WHT 5330, 1 ex., 81.4mm SL, Baddegama (Galle), a tributary of Gin River, Sri Lanka, 6.14166667 N & 80.20000000 E.

Description of specimens

(Image 1A–B; Figs. 1). Body subcylindrical, posterior half laterally compressed; head with numerous rows of papillae; two sensory papillae rows on opercle meet at

Image 1. A - *Eleotris melanosoma,* RMNH 4815 (syntype), 86.0 mm, from Wahai, Indonesia; B - *Eleotris melanosoma,* WHT 5330, 81.4mm SL, from Wakwella, Sri Lanka

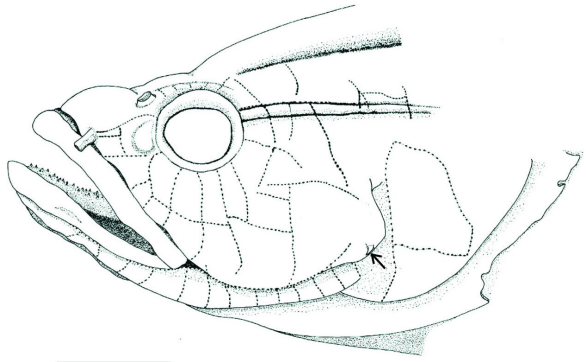

Figure 1. *Eleotris melanosoma,* WHT 5330, lateral view of head showing sensory papillae and spine on preopercle angle (arrow indicates the spine). Scale = 5mm.

posterior border; preopercle angle with a downward spine. First dorsal fin with six spines (n=13); second dorsal fin with one simple ray and eight branched rays (n=13); anal fin with one simple ray and eight branched rays (n=13); 16–17 (16[6], 17[7]) in pectoral fin. Body scales ctenoid, except the cycloid scales on predorsal, preventral, pectoral fin base and pelvic fin base. Preventral scales are subimbricate. Pelvic fin base and pectoral fin base scales were equal in size and about half the size of body scales; scales on the first and second dorsal fin bases were about half the size of body scales; 48–58 lateral row scales; 10–12 (10[1], 11[7], 12[2]) gill rakers on anterior side of the first gill arch. Standard length (SL), 38.4–81.4 mm (n=13); total length, 47.6–99.0 mm; body depth in standard length (SL), 4.2–5.3 (mean=4.8; s.d.= 0.5; n=13) and in TL 5.1–6.4 (mean=5.8; s.d.=0.5; n=13).

Colouration

Adult body colour (in preservative, Image 1A–B) dusky brown. Preventral and preanal areas white; each lateral body scale having an indistinct dark spot forming hardly visible longitudinal lines. These longitudinal lines in smaller individuals (SL<70.0mm) are more pronounced.

In life, large individuals are dark brown with pale ventral side; and a series of dark longitudinal lines on body; first dorsal fin hyaline with a distinct black stripe. Juveniles' body coloration markedly different from adults: from middorsal line to about ⅓ of body depth towards lateral sides of body light brown and below it (about ⅓ of body depth) dark brown; ventrolateral and

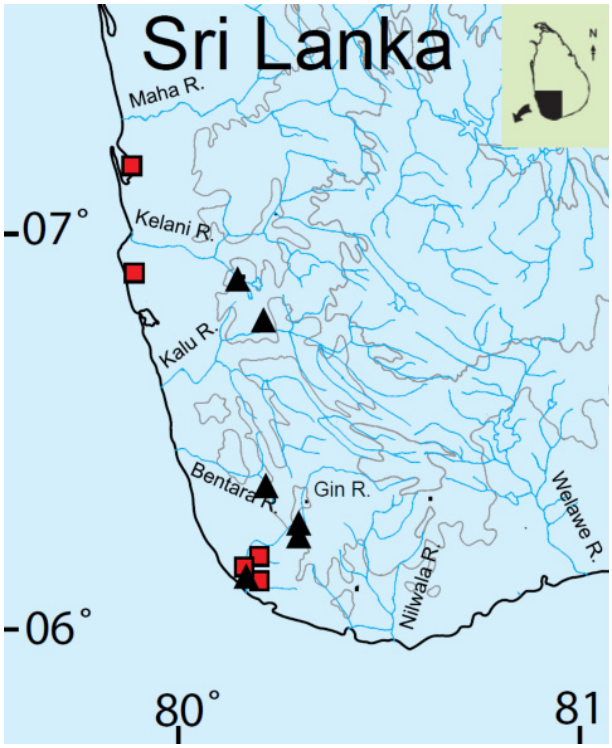

Figure 2. Records of *Eleotris melanosoma* (red squares) and *Bunaka gyrinoides* (black triangles) in Sri Lanka.

ventral sides dusky white.

Natural history and distribution

Juveniles observed in brackish water with low salinity (close to river mouths and sometimes in coastal swamps), whereas adult specimens were mostly observed in freshwater. This species may be spawning in brackish water. Juveniles and adults were found together in some locations; a predatory fish, standard length of ~35.0mm *Rasbora dandia* was found in the stomach of WHT 5328 (67.0mm in SL). Specimens were observed in Wakwella, Keembiya Ela stream and Moragoda Ela stream near Nawinna. Specimens were also received from Virankattuwa, Bellanwila–Attidiya in the Western Province of Sri Lanka (Fig. 2).

***Bunaka gyrinoides* (Bleeker, 1853)**
(Image 2 & Fig. 3)

Material examined

All from Sri Lanka. WHT 10, 1 examples (ex.), 130.0mm SL, Waga, near Labugama, in the Kelani River, 6.90000000 N & 80.11666667 E; WHT 14, 2 ex., 89.2mm, 99.0mm SL, same location data as above; WHT 5333, 1 ex., 121.3mm SL, Wakwella, swamp in the Gin River basin, 6.10000000 N & 80.18333333 E; WHT 5335, 4 ex., 56.8–93.5 mm SL, Madakada, near Ingiriya, a tributary of Kalu River; WHT 5332, 2 ex., 94.5mm, 96.6mm SL, Bambarawana near Mattaka bridge, a tributary of Bentara River, 6.31250000 N & 80.24583333 E; WHT 5349, 1 ex., 52.8mm SL, Homadola, near Udugama, a tributary of Gin River, 6.21666667 N & 80.34166667 E; WHT 5336, 1 ex., 111.0mm SL, same location data as above; WHT 5334, 1 ex., 52.5mm SL, Nanikitha Ela stream, in Kanneliya forest, a tributary of Gin River, 6.25000000 N & 80.33333333 E.

Description of specimens

(Image 2 & Fig. 3). Body subcylindrical, posterior half laterally compressed; head with numerous granular-shaped papillae. First dorsal fin with six spines and second dorsal fin with one simple ray and eight branched rays; anal fin with one simple ray and eight branched rays; 19 rays in pectoral fin; and pelvic fin with six rays. Body scales ctenoid, except the cycloid scales on predorsal and preventral areas; pectoral base scales half the size of body scales. Scales on opercle and preopercle areas equal to pectoral base scales in size; minute scales on the preopercle and opercle angle areas. Caudal fin base scales ctenoid and subimbricate; 57–61 lateral row scales. Standard length, 42.0–130.0 mm; total length, 50.0–141.0 mm; body depth in standard length, 4.7–5.4 (mean= 4.2; s.d.= 0.3; n=13) and in total length, 5.6–6.3 (mean= 6.1; s.d.=0.3; n=13).

Colouration

In preserved samples (Image 2), body colour dark brown; preanal and preventral areas white; ventral side of head with small white spots and a prominent small white blotch laterally on the upper lip; black large crescent-shaped blotch on the base of caudal fin.

In life, general body colour dark brown; from middorsal line to about ⅓ of body depth towards the lateral sides of body light brown and below (in two third of the body depth) dark brown. Body with series of interrupted black longitudinal lines; fins hyaline with orange and dark brown markings; first dorsal fin hyaline with distinct two dark bands; second dorsal fin hyaline with less prominent dark bands; caudal fin base with a distinct dark brown, crescentic-shaped blotch; head with orange colour blotches, prominent on suborbital, opercle and preopercle areas.

Natural history and distribution

Bunaka gyrinoides was observed in both brackish water and freshwater habitats. All juvenile specimens were observed in freshwater habitats, in stagnant

Image 2. *Bunaka gyrinoides,* WHT 5349, 52.8mm SL; from Udugama, Sri Lanka

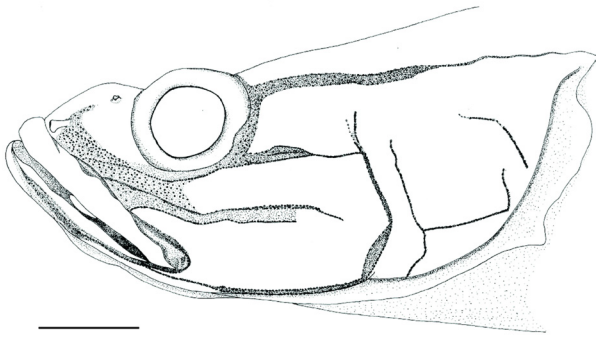

Figure 3. *Bunaka gyrinoides,* WHT 5349, lateral view of head showing sensory papillae. Scale bar: 5 mm.

pools close to rainforest streams (e.g., Kanneliya Forest Reserve, Bambarawana [near Elpitiya]). Two juvenile specimens were collected in shallow (~0.3m) water at Homadola (6.21666667 N & 80.34166667 E), a tributary of Udugama Ela, of which the largest one (SL 53.0mm) was collected in fast flowing water (found in a hollowed, submerged tree trunk of *Caryota urenus*) and the small one (SL 42.0mm) was observed in a stagnant pool in leaf debris. Large individuals found on rocky and sandy substrate, about one and a half metre depth, slow flowing water. It was also observed in brackish water (WHT 5333, an adult male was collected from Wakwella swamp [6.10000000 N & 80.18333333 E]). Thus, this species may be spawning in freshwater. WHT 5336 was observed sympatry with *Sicyopterus* sp. (Gobiidae), whereas the other specimens were found in association with *Rasbora dandia* (Valenciennes in Cuvier & Valenciennes) and *Pethia* spp. (Cyprinidae). Two specimens were observed in the Bentara River near Mattaka bridge (6.31250000 N & 80.24583333 E) about one metre depth in fast flowing water but also in submerged vegetation. Specimens were also reported from Western Province of Sri Lanka, e.g., Waga near Labugama and Madakada near Ingiriya in the Kelani and Kalu rivers, respectively (Fig. 2).

DISCUSSION

Eleotris melanosoma

Eleotris melanosoma was described by Bleeker from Wahai, western Sumatra, Indonesia (Bleeker 1853a). It has been reported from the Indo-West Pacific (Kottelat et al. 1993). Based on the key provided by Allen (1991), *E. melanosoma* is distinguished from *E. fusca* by having anterior three vertical lines of papillae below the eye, which extended below the horizontal line of papillae in the middle of cheek, Fig. 1 (vs. second vertical line of papillae below eye does not extend below the horizontal line in *E. fusca*). As described by Kottelat et al. (1993), *Eleotris melanosoma* further differs from *E. fusca* by having 46–56 scales in the lateral row (vs. 56–65 in *E. fusca*) and pectoral fin having 16–17 rays (vs. 18–19 in *E. fusca*). Freshly collected specimens (13ex.) had 48–56 scales in the lateral row (48 in the syntype RMNH 4815, Image 1A), and along with the other characters, these materials were in accordance with the description given by Kottelat et al. (1993) and also with the description and keys provided by Talwar & Jhingran (1991), except for the following variations: pectoral fin with 16–17 rays (vs. 15–16 in Talwar & Jhingran, 1991) and the anterior gill rakers of the first gill arch, 10–12 (vs. 12–13 in Kottelat et al. 1993).

Eleotris fusca had been recorded by Deraniyagala (1932) from Kanniyai (hot springs) in the Eastern Province (8.49083333 N & 81.18333333 E). Attempts to search for this fish in Kanniyai hot springs were fruitless. Though Munro (1955) reported it from brackish water and freshwater, however, had not provided exact localities. Munro (1955) also described that *E. fusca* has cycloid scales before the first dorsal fin (vs. ctenoid in *E. melanosoma*) and has 60–65 lateral scales (vs. 46–56 in *E. melanosoma*). Specimens for the present study were mostly from the southern, southwestern and western regions of the country. Thus, future collections may confirm the occurrence of *E. fusca* in Sri Lanka and as well

as new records for *E. melanosoma* and *Bunaka gyrinoides* in Sri Lanka. Deraniyagala's (1932) voucher specimen/s of *Eleotris fusca* were not found in the collection of National Museum of Sri Lanka. Subsequent records of *Eleotris fusca* from various localities either from inland or/and from coastal areas however appeared to be the examples of *Eleotris melanosoma* juveniles and *Bunaka gyrinoides* (e.g., *E. melanosoma* juv, in Goonatilake 2007, p. 61; and *B. gyrinoides* in De Silva et al. 2015, p. 252) because juveniles of *E. melanosoma* and *B. gyrinoides* superficially resemble *E. fusca* in overall colouration.

Bunaka gyrinoides

This species has been first described from Benculen [Bengkulu], Priaman, Indonesia by Bleeker (1853b). Herre (1934) also he listed this species as *Eleotris canarensis* Day (a synonym of the latter) from Colombo (Sri Lanka). Munro (1955) confirmed the records of *B. gyrinoides* from Sri Lanka. *B. gyrinoides* is quite remarkable because of its superficial resemblance to juveniles of *Eleotris melanosoma* (Image 2 vs. fig. 17 of Plate XVII; Allen, 1991). Nevertheless, *B. gyrinoides* differs from *E. fusca* and *E. melanosoma* by the absence of a downward spine on preopercle angle (vs. presence of a downward spine on preopercle angle in *Eleotris* spp.; Image 1B) and presence (vs. absence) of distinct black crescent-shaped blotch on caudal fin base (Image 2). Talwar & Jhingran (1991) stated that *Bunaka* Herre have been reported from estuarine areas from several parts of the Indo-West Pacific but not in the Indian region.

Based on our observations, it is speculated that *E. melanosoma* may be an amphidromus fish, whereas *B. gyrinoides* is an anadromous fish. De Bruin et al. (1994) had stated that adults (Eleotrids) are generally in freshwater but entering brackish and coastal waters; however, Kottelat et al. (1993) mentioned that those species are marine or freshwater, but most occur in brackish water and estuaries. Pethiyagoda (1991) mentioned *E. fusca* is vulnerable to pollution. Coastal areas of Sri Lanka are also rapidly developing (urbanization, even for agriculture, aquaculture). Thus, unique habitats like mangrove forests (e.g., Koggala, Maduganga), coastal swamps (e.g., Wakwella, Bellanwila-Attidiya, Madampa [near Ambalangoda], Muthurajawela) are in threat. Unfortunately, most of these ecosystems are present outside the protected areas (PA) of Sri Lanka. Southern and western coasts of Sri Lanka, which lie within the wet zone contain about 67% of the island's 19 million human population (Anonymous 2003) and that accounts for a population density of 700km^{-2}, which is exceptional by the standards of all other Global biodiversity hotspots (Cincotta et al. 2000). Therefore, these unique species inhabiting outside the PAs should be inventoried first in order to initiate conservation measures in the future. On the other hand most of the brackish water fishes are in danger because they have a great interest to fishery of Sri Lanka (De Bruin et al. 1994). Fortunately, eleotrid fishes, except *Ophiocara porocephala*, have a little interest to the fisheries of Sri Lanka; however, some smaller species have an economic value in the aquarium trade in Sri Lanka.

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Journal of Threatened Taxa

ISSN 0974-7907 (Online); ISSN 0974-7893 (Print)

July 2017 | Vol. 9 | No. 7 | Pages: 10369–10492
Date of Publication: 26 July 2017 (Online & Print)
DOI: 10.11609/jott.2017.9.7.10369-10492
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