

Novel records of three remoras from Andaman and Nicobar waters, India

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Abstract

Present study reports three remoras viz. marlin sucker *Remora osteochir* (Cuvier, 1829), spearfish remora, *R. brachyptera* (Lowe, 1839) and white suckerfish, *R. albescens* (Temminck and Schlegel, 1850) from Andaman and Nicobar waters. *Remora brachyptera* was found attached on the body surface of Indo pacific sailfish, *Istiophorus platypterus* (Shaw, 1792) hooked in tuna longline operated in and around Andaman and Nicobar waters and *R. osteochir* was collected from the body surface of Indo-Pacific blue marlin *Makaira mazara* (Jordan & Snyder, 1901). While *R. albescens* was recovered from the gill chamber of devil fish *Mobula mobular* (Bonnaterre, 1788) and it is a new host and geographic record for *R. albescens*. Detailed morphological description and comparison with earlier records were provided.

Keywords: White suckerfish, Marlin sucker, Spearfish remora, Andaman and Nicobar Islands.

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Introduction

Remoras or suckerfish (Echeneidae) are stout bodied teleost fishes with characteristic segmented adhesion disc (or sucking disc) on the dorsal surface of the head for the attachment (Nelson 2006). They show moderate to strong host specificity and major hosts are sharks, rays, marine mammals, turtles and other teleosts (Friedman et al. 2013) and occasionally free swimming (Collette 2016). This host association helps them from predators; also get benefited by means of transport as well as to obtain food in the form of parasites from the host body or food remains from the symbionts (López et al. 2009).

Of the eight species of remoras (Gray et al. 2009), four species, Live shark sucker, *Echeneis naucrates* (Linnaeus, 1758), Common remora, *Remora remora* (Linnaeus, 1758), *R. albescens* (Temminck and Schlegel, 1850) and marlin sucker, *R. osteochir* (Cuvier, 1829) were recorded in Indian waters. Whereas Andaman and Nicobar Islands have two species of remoras namely *E. naucrates* and *R. remora* (Rajan et al. 2013). Present study adds three more remoras to the fish fauna of these Islands namely spearfish remora *R. brachyptera* (Lowe, 1839), *R. osteochir* and white suckerfish, *R. albescens* (Temminck and Schlegel, 1850). Detailed descriptions on the morphological characters of these three species are provided.

Material and Methods

Samples were collected during the survey voyages of MFV Blue Marlin, tuna longliner, Fishery Survey of India, Port Blair in Andaman and Nicobar waters during 2017-2018. *Remora osteochir* was recovered from Indo-Pacific blue marlin, *Makaira mazara* (Jordan & Snyder, 1901) hooked from off South Rutland Island (11°21.8'N, 91°48.5'E) on 28 January 2018, whereas, *R. brachyptera* was collected from the body surface of Indo-Pacific sailfish, *Istiophorus platypterus* (Shaw, 1792) hooked from off Hut Bay Island (11°07.3'N, 92°03.8'E.) on 29

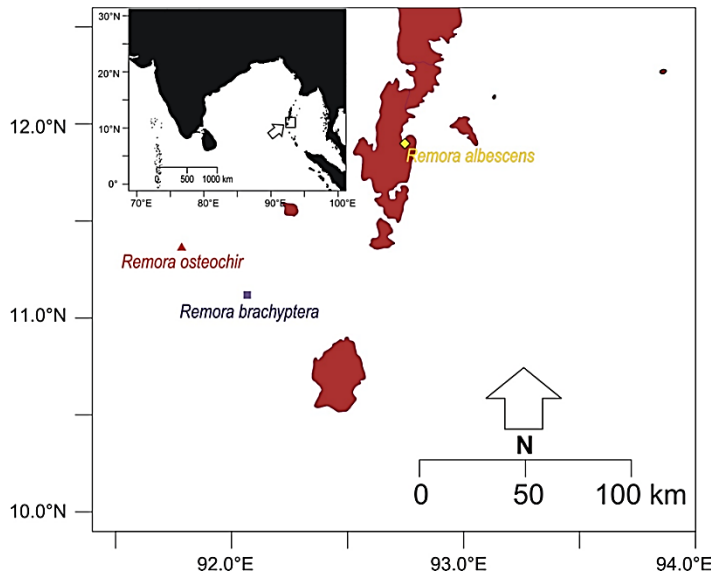


Figure 1. Map showing the collection locations of *Remora brachyptera*, *R. osteochir* and *R. albescens*.



Figure 2. *Remora brachyptera*, FSI/PB/T/02/2018 A, lateral view B, Head disc.

January 2018. *Remora albescens* was collected from the gill chamber of devil fish *Mobula mobular* (Bonnaterre, 1788) landed by gillnet fishermen at the Junglighat fish landing centre, Port Blair on 12 January 2018 (Fig. 1). The main morphometric and meristic characters were studied following Myoung et al. (2015).

Abbreviations: FSI/PB, Museum of Fishery Survey of India, Port Blair, India; TL, Total length; SL, Standard length.

Results

Remora brachyptera (Lowe, 1839)

Material examined: FSI/PB/T/01/2018, 1, 138.8 mm SL, 158.5 mm TL (Table 1). Body was uniformly white in live; colour changes to brown during preservation in ethanol (Fig. 2).

Diagnosis: Dorsal fin rays 28; anal fin ray 24; pectoral fin rays 25; pelvic fin rays I, 5; adhesion disc laminae, 18. Body stout, elongated and cylindrical, and anterior half of the body nearly compressed from dorsal side. Adhesion disc flat and oval in shape, starting behind snout and extends to more than one-fourth of body length. Posterior margin of adhesion disc with a conical extension at centre reaching slightly behind to end of pectoral fin. Skin thick and leathery. A pair of small to moderate sized eyes positioned in anterior half of head and horizontally falls at axis drawn from tip of snout to centre of caudal peduncle. Both opercles meet antero-ventrally at isthmus well ahead of jaw joint. Though pre-opercle not distinguished from opercle, pre-opercular

Table 1. Comparison of morphometric and meristic characters of the presently described specimen of *Remora brachyptera* with previously reported values of (Paulin and Habib 1982; Myoung et al. 2015; Collette 2016; Bañón et al. 2017).

Character	Morphometry		
	Absolute value (mm)	%SL	Meristic counts
Total length (TL)	158.5		
Standard length (SL)	138.8		
Head length	35.9	25.9	
Orbit diameter	4.8	3.5	
Snout length	17.9	12.9	
Head width at orbit	21.7	15.7	
Disc length	40.3	29.1	
Disc width	20.1	14.5	
Pre-dorsal length	79.5	57.3	
Body depth	21.2	15.3	
Dorsal fin length	49.1	35.4	
Anal fin length	42.3	30.5	
Pectoral fin length	16.1	11.6	
Pelvic fin length	14.5	10.5	
Caudal fin length	26.5	19.1	
Caudal peduncle depth	8.8	6.4	
Disc laminae			18
Dorsal fin rays			28
Anal fin rays			24
Pectoral fin rays			25
Pelvic fin rays			I,5
Gill rakers			1+11

lines running ventrally, parallel to opercular edges. Mouth opening nearly oblique. Lower jaw projects ahead of upper jaw and fine, conical and curved teeth in many continuous rows present on both the jaws. Upper jaw conical anteriorly whereas lower jaw round. Second dorsal fin originates well ahead but ends at same level to that of anal fin. Both second dorsal fin and anal fin with fleshy bases. Caudal fin truncated to emarginated while pectoral fins, which originate well ahead of pelvic fins, conical in shape. Pelvic fins positioned ventrally and attached completely with body by their inner margins. No spines observed in any of fins though pelvic fins supported by a nearly stout, unbranched first ray. Pelvic fin with one stout unbranched ray followed by 4 branched rays. Lateral line originated immediately above pectoral fin, runs along pectoral fin area, then turns gently downwards to reach middle of body axis, from where running parallel to body axis, reaching end of caudal peduncle.

Remora osteochir (Cuvier, 1829)

Material examined: FSI/PB/T/02/2018, 1, 122.9 mm SL, 155 mm TL (Table 2). In fresh condition, the upper portion of body was greenish black while the lower portion was dark grey and all the fins were brownish black (Fig. 3). No colour change is observed while storing in ethanol.

Diagnosis: Dorsal fin rays 25; anal fin rays 24; pectoral fin rays 22; pelvic fin rays I, 5; disc laminae, 17. Body elongated and cylindrical, broad at head origin and gradually tapering towards caudal peduncle. Anterior half of body dorsoventrally flattened with an elongated and slender oval sucking disc situated behind snout till 1/3 of standard length. Disc broader at rear end and its posterior end extended well beyond pectoral fin. Both dorsal and anal fins originated at same level, well behind middle of body with fleshy bases. Inner margin of pelvic fin attached to body. Mouth opening nearly oblique with lower jaw projecting anteriorly. Fine curved teeth present on both jaws in many rows. Upper jaw conical anteriorly whereas lower jaw rounded. Pectoral fin originating

Table 2. Comparison of morphometric and meristic characters of the presently described specimen of *Remora osteochir* with previously reported values (Paulin and Habib 1982; Tuncer et al. 2012; Myoung et al. 2015).

Character	Morphometry			
	Absolute value (mm)	%SL	Meristic counts	Previously reported values (% SL)
Total length (TL)	155			
Standard length (SL)	122.9			
Head length	24	19.6		19.4-22.4
Orbit diameter	2.8	2.3		2.0-3.0
Snout length	11.7	9.6		9.4-10.5
Head width at orbit	17.6	14.4		14.3-14.7
Disc length	48.5	39.5		37-49
Disc width	21.3	17.4		17.2-19.2
Pre-dorsal length	71.15	57.9		62.4-63.1
Body depth	11.4	9.3		9.6-11.4
Dorsal fin length	40.5	33		33.4-36.2
Anal fin length	37.3	30.4		31.1-35.5
Pectoral fin length	15.8	12.9		13.6-15.8
Pelvic fin length	15.11	12.3		12.8-12.9
Caudal fin length	22.2	18.1		18.5-19.5
Caudal peduncle depth	3.6	3		3.4-3.9
Disc laminae			17	17-20
Dorsal fin rays			25	21-27
Anal fin rays			24	18-28
Pectoral fin rays			22	20-24
Pelvic fin rays			1,5	1,5
Gill rakers			2+12	2+12-17

**Figure 3.** *Remora osteochir*, FSI/PB/T/01/2018 A, lateral view B, Head disc.

well ahead of pelvic fin. Pelvic fin situated ventrally, abdominal in position with one stout unbranched ray followed by five branched rays. Eyes small to moderate, lateral in position placed on line drawn from tip of snout to middle of caudal peduncle. Caudal fin slightly forked and caudal peduncle long and stout. Body devoid of conspicuous scales with thick and leathery skin. Both opercles meet antero-ventrally at isthmus just ahead of jaw joint. Though pre-opercle not distinguished, pre-opercular lines observed ventrally running parallel to opercular edges. Though spinous dorsal absent, white dotted marks visible (total 7) (in between sucking disk to rayed dorsal fin). Body greenish black dorsally and faded uniformly downwards with white patches at bases of paired fins. Lateral line originated immediately above pectoral fin, runs along pectoral fin area, then turns sharply downwards to reach middle of body axis, from where running parallel to body axis, reaching end of caudal peduncle.

Table 3. Comparison of morphometric and meristic characters of the presently described specimen of *Remora albescens* with previously reported values (Franke and Acero 1990; Cervigón 1993; Venkatraman et al. 2008; Lopez et al. 2009).

Character	Morphometry		
	Absolute value (mm)	%SL	Meristic counts Previously reported values (% SL)
Total length (TL)	116		
Standard length (SL)	101.5		
Head length	26.2	25.8	26.6-26.9
Orbit diameter	3.04	2.9	3-3.15
Inter-orbital space	22.3	22	21.95-22.89
Head width at orbit	24.8	24.4	24.09-24.29
Disc length	38.3	37.7	33.64-36.42
Disc width	27	26.6	22.89-24.45
Pre-dorsal length	73	71.9	72.42-72.89
Body depth	15.7	15.4	10.74-15.16
Dorsal fin length	18.2	18	17.27
Anal fin length	15.0	14.7	14.56
Pectoral fin length	15.5	15.3	14.75
Pelvic fin length	9.6	9.4	8.99
Caudal fin length	14.5	14.3	13.47
Caudal peduncle depth	8.1	8	4.2-7.75
Disc laminae		13	13
Dorsal fin rays		21	21
Anal fin rays		20	20
Pectoral fin rays		19	19
Pelvic fin rays		I,5	I,5
Caudal fin rays		15	15

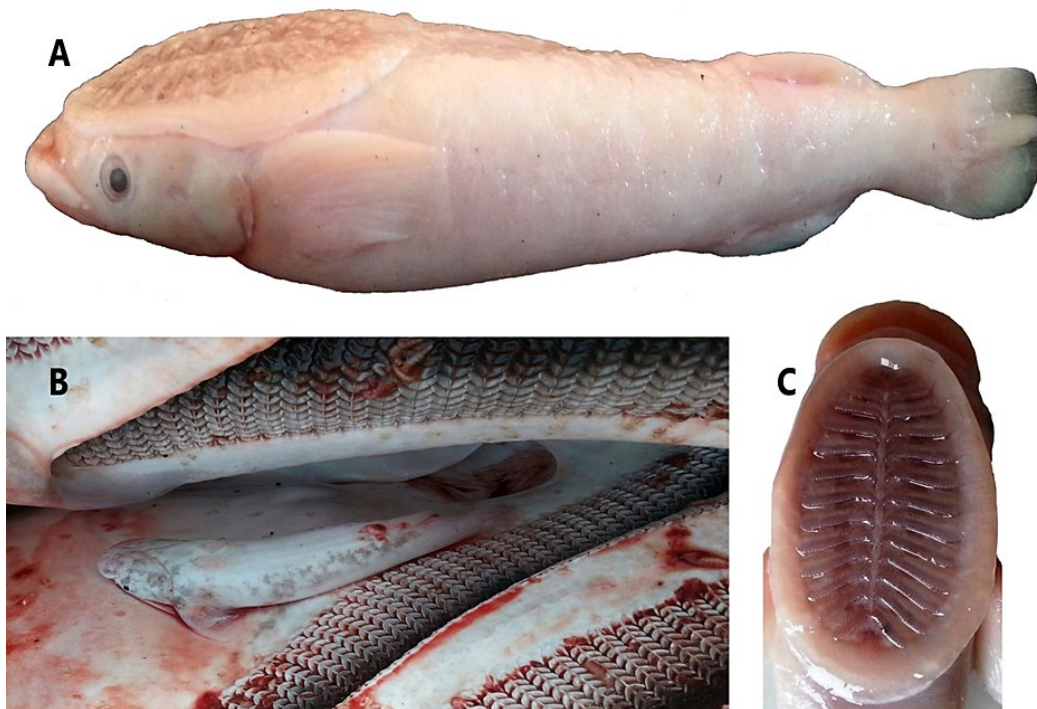


Figure 4. *Remora albescens*, FSI/PB/T/03/2018 A, lateral view B, Attached to the gill chamber of *M. mobular* C, Head disc.

Remora albescens (Temminck and Schlegel, 1850)

Material examined: FSI/PB/T/03/2018, 1, 101.5 mm SL, 116 mm TL (Table 3). Body was light grey to whitish on the dorsal side of the head and body and scattered darkening on the ventral side (Fig. 4).

Diagnosis: Dorsal fin rays 21; anal fin rays 20; pectoral fin rays 19; pelvic fin rays I, 5; Disc laminae 13. Body cylindrical, broad at head origin and gradually tapering towards caudal peduncle. Moderately elongated and

oval sucking disc with thirteen-disc lamina extend well behind pectoral origin, disc broader at rear end. Both dorsal and anal fins originate at same level, well behind middle of body with fleshy bases. Dorsal fin originated well behind middle of body. Anal fins originate at same level of dorsal and both with fleshy base. Mouth opening nearly oblique with lower jaw projecting anteriorly with patches of villiform teeth. Pelvic fin situated ventrally, abdominal in position. Disc length 37.7 and width 26.6 % of SL, respectively. Pelvic fins placed far forward and narrowly attached to abdomen. Eyes moderate, lateral in position placed on line drawn from tip of snout to middle of caudal peduncle. Caudal fin slightly truncate and fleshy; caudal peduncle depth is 8.0% of SL. Body devoid of conspicuous scales with thick and leathery skin. Both opercles meet antero-ventrally at isthmus just ahead of jaw joint.

Discussion

Remora brachyptera, *R. osteochir* and *R. albescens* enjoy worldwide distribution in tropical and warm temperate waters (O'Toole 2002). In the Indian Ocean, *R. brachyptera* has been reported from Mozambique, Réunion, South Africa and Australia (Collette 2010; Froese and Pauly 2020). Present study confirms the range extension of *R. brachyptera* to Indian Exclusive Economic Zone (EEZ). *Remora osteochir* had been reported from Lakshadweep waters (Jones and Kumaran 1966) and from off Goa from west coast of India. This is the first record of *R. osteochir* from the Andaman and Nicobar waters. Whereas the *R. albescens* has been recorded from the Cochin, Arabian Sea (Kishor et al. 2014) and Chennai, Bay of Bengal (Venkatraman et al. 2008).

The preferred hosts of *R. brachyptera* and *R. osteochir* are billfishes and they constitute about 95% of the available host records (Cressey and Lachner 1970; O'Toole 2002) while the other hosts include sharks, rays, reef fishes and pelagic fishes (Cressey and Lachner 1970; O'Toole 2002; Dennis et al. 2004; Mucientes et al. 2008) (Table 4). The Atlantic blue marlin, *Makaira nigricans* (Lacépède, 1802) is the usual host of *R. osteochir* and the present study records *M. mazara* as a new host for *R. osteochir*. White suckerfish, *R. albescens* are usually attached with the manta rays and mobula rays (O'Toole 2002), but occasionally attaches to sharks and teleosts like black marlin *Istiompax indica* (Cuvier, 1832) (Robins et al. 1986); Sphyrænidae (Lozano and Rey 1960). This study reports the devilfish, *Mobula mobular* as a new host to *R. albescens* along with a new geographic record of *R. albescens* i.e. Andaman and Nicobar waters (Table 4).

Remoras have a symbiotic relationship with the hosts and they gain by increased protection from predators, free transportation and improved access to food. In return, they act as a cleaner fish and remove parasites from the host (O'Toole 2002). Parasitic copepods commonly infest the gill filaments of sharks and affect the oxygen uptake (Benz 1980); certain species like *R. brachyptera* have been evolved to survive in the gill chamber of their hosts, but their parasitic diet is uncertain (O'Toole 2002). Diet studies of *R. albescens* indicate that this species feeds little on external copepods and their common host manta rays are not heavily parasitized externally (Cressey and Lachner 1970). Further detailed studies on the gut content of the remoras are in need for the better understanding of remora- host association.

The body colour of *R. brachyptera* is usually white as in the present specimen or occasionally pale blue and brown (Myoung et al. 2015; Bañón et al. 2017). Body colour of *R. osteochir* was greenish black in the dorsal surface that fades to dark grey in the ventral side, which is in agreement with the earlier reports (Tuncer et al. 2012). Almost all the meristic and morphometric characters of the present specimens are within the range of earlier reports of *R. brachyptera* (Paulin and Habib 1982; Myoung et al. 2015; Collette 2016; Bañón et al. 2017), *R. osteochir* (Paulin and Habib 1982; Tuncer et al. 2012; Myoung et al. 2015), *R. albescens* (Franke and Acero 1990; Cervigón 1993; Venkatraman et al. 2008; López et al. 2009).

Present *R. brachyptera* specimen has comparatively smaller anal length (30.5% SL); pectoral fin length (11.6% SL) than the North Atlantic specimens (Banon et al. 2017). Whereas disc length (29.1% SL) and disc

Table 4. Reported hosts of *Remora brachyptera*, *R. osteochir* and *R. albescens* (+ = reported; - = not reported).

Species	<i>R. brachyptera</i>	<i>R. osteochir</i>	<i>R. albescens</i>	References
<i>Carcharhinus falciformis</i>	+	-	-	O'Toole 2002
<i>C. obscurus</i>	-	-	+	Schmidt 1969
<i>Negaprion brevirostris</i>	-	-	+	Schmidt 1969
<i>Galeocerdo cuvier</i>	-	-	+	Schmidt 1969
<i>Isurus oxyrinchus</i>	+	+	-	O'Toole 2002
<i>I. paucus</i>	+	-	-	O'Toole 2002
<i>Prionace glauca</i>	+	-	-	O'Toole 2002
<i>Sphyrna zygaena</i>	+	-	-	O'Toole 2002
<i>S. tudes</i>	-	-	+	Lozano and Rey, 1960
<i>Mobula birostris</i>	-	-	+	Kishor et al. 2014
Manta ray	+	-	+	O'Toole, 2002
<i>M. hypostoma</i>	-	-	+	Lozano and Rey 1960
<i>M. mobular</i>	-	-	+	This report
<i>Istiophorus albicans</i>	+	+	-	O'Toole 2002
<i>I. platypterus</i>	+	+	-	Cressey and Lachner 1970
<i>Istiompax indica</i>	+	+	-	O'Toole 2002; Robins et al. 1986
<i>Makaira nigricans</i>	+	+	-	O'Toole 2002
<i>M. mazara</i>	-	+	-	This report
<i>Kajikia albida</i>	+	+	-	O'Toole 2002
<i>K. audax</i>	+	+	-	O'Toole 2002
<i>Tetrapturus angustirostris</i>	-	+	-	O'Toole 2002
<i>T. belone</i>	+	+	-	O'Toole 2002
<i>T. pfluegeri</i>	-	+	-	O'Toole 2002
<i>Tetrapturus sp.</i>	-	+	-	O'Toole 2002
<i>Xiphias gladius</i>	+	+	-	O'Toole 2002
<i>Epinephelus lanceolatus</i>	+	-	-	O'Toole 2002
<i>Acantocybium solandri</i>	-	+	-	Strasburg 1964; O'Toole 2002
<i>Coryphaena hippurus</i>	-	+	-	Dennis et al. 2004
<i>Masturus lanceolatus</i>	+	-	-	O'Toole 2002
<i>Mola mola</i>	+	+	-	O'Toole 2002
Float	+	+	-	O'Toole 2002

width (14.5% SL) is shorter in comparison with New Zealand specimen (Paulin and Habib 1982). *Remora osteochir* mentioned in the present study has relatively shorter head length (19.6% SL) and disc length (39.5% of SL) in comparison to New Zealand specimen (Paulin and Habib 1982). Further, they have shorter dorsal fin length (33% SL); anal fin length (30.4% SL) and pectoral fin length (12.9% SL) than the specimen described from Turkey (Tuncer et al. 2012). *Remora albescens* have a shorter head (25.8% SL) and long disc (37.7% SL) than the specimen described from Colombia (López et al. 2009).

Conflict of Interest statement: The authors declare that they have no conflict of interest (financial, academic, commercial, political or personal). No funding has been received for the conduct of this study and preparation of this manuscript.

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