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A new species of the Genus *Harpadon* (Aulopiformes, Synodontidae) from the north-eastern Arabian Sea, India

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ABSTRACT

A new species of *Harpadon* Lesueur, 1825 captured from the continental slope area 19° 53' N - 69° 23'E (north-eastern Arabian Sea) is described. The species *Harpadon nudus* sp. nov. was identified possessing a prominent trilobed caudal fin and a wide mouth with strong fang like barbed teeth and has been distinguished from its congeners by the following combination of characters: slender, completely scaleless body with very short pectoral (8.6 - 13.8% SL) and pelvic (16.4 - 21.6% SL) fins, large eyes (9.1 - 15.1% HL) with narrow inter-orbital width (15% of HL) and single pair of nares, situated close to the tip of the narrow snout. Morphologically it differs from the partially scaled species such as *Harpadon nehereus* in having very short pectoral fins not reaching up to its dorsal fin, single pair of nares and a pointed snout in dorsal view. It can be distinguished from *Harpadon microchir* by its greater head length of 22 - 26% SL; absence of scales at the base of the adipose fin and on the lateral line as well as the dorsal fin count of 12 rays. It is differentiated from *Harpadon mortenseni* by its lower lateral line pores count (40 - 43), higher number of branchiostegals (17 to 20), absence of scales on the lateral line or caudal peduncle and absence of vomerine teeth. It is distinct from *Harpadon translucens* which has a translucent body, partially covered with scales in the caudal region and protruding bristle like teeth on the jaw symphysis. It is distinguished from *Harpadon squamosus* which has scales on its head, trunk and caudal region with a relatively deeper body (5.8 in SL), by its slender and elongate body (8 - 10 in SL), short pelvic fins (16.4 - 21.6% SL) not extending to the anal vent and a narrow snout. It is also distinguished from *Harpadon erythraeus* which has a dark body entirely covered with scales and black fins, short head and rounded snout. *H. nudus* sp. nov. stand apart from *H. nehereus* (Kimura 2 Parameter distance 20%), the only species reported from the Arabian Sea and *H. microchir* (K2P 19%) by forming a distinct clade with 100% bootstrap support.

Keywords: Arabian Sea, Bombayduck, *Harpadon*, Mitochondrial COI, Morphometrics, Synodontidae

Introduction

The Genus *Harpadon* Lesueur, 1825 consists of six nominal species *viz., H. nehereus* (Hamilton, 1822) in the Indo-West Pacific, *H. squamosus* Alcock, 1891 from the Bay of Bengal (Eastern Indian Ocean), *H. translucens* Saville-Kent, 1889 from Australia and New Guinea, *H. mortenseni* Hardenberg, 1933 from Bali Sea (Eastern Indian Ocean), *H. erythraeus* Klausewitz 1983 (from the Red Sea) and *H. microchir* Gunther 1878 from Western North Pacific (Eschmeyer, 2013). *Salmo microps* Lesueur, 1825 and *Saurus ophiodon* Cuvier & Valenciennes 1850, caught from the Indian seas have been synonymised with *Harpadon nehereus* which was originally placed in the genus *Osmerus* and also known as the *Nehareus* or *Nehare* (Hamilton, 1822) (Bapat, 1970). Johnson *et al*. (1997) suggested the possibility of an offshore - inshore habitat grouping of the *Harpadon* spp. in the Indo-Pacific region based on phenotypic as well as osteological traits and classified *H. erythraeus*, *H. squamosus* and *H. microchir* as offshore species associated with clear waters of deeper shelf or upper continental slope region while the others (*H. nehereus* and *H. translucens*) occurred in coastal and estuarine areas. In the Arabian Sea (FAO Fishing Area 51), *H. nehereus* (Bombayduck) is the only reported species (Manilo and Bogorodsky, 2003) while the scaly Bombayduck *H. squamosus* was described by Alcock (1891; 1895) from deep sea collection in the Bay of Bengal (15°56' N; 81°30'E) at about 400 m depth. The distinctive *Harpadon* sp. collected during exploratory fishing surveys of the upper continental slope regions in the north-eastern Arabian Sea, first in year 2010 and later in 2013 is described in this study. Hebert *et al*. (2003) and Baldwin and Weigt (2012) emphasised the need to combine traditional morphologic analysis and DNA barcoding which was adopted in this study to identify *Harpadon* species collected from the Indian Exclusive Economic Zone (EEZ).

Materials and methods

The present species was collected during exploratory deep water fishery resources surveys employing trawl nets operated on the upper continental slope of the north-eastern Arabian Sea in the Indian EEZ with the Fisheries and Oceanographic Research Vessel FORV *Sagar Sampada* during 2010-2013. Morphometric measurements were taken using digital calipers following Bapat (1970) and Randall and Pyle (2008). Measurements such as standard length (SL), head length (HL) snout length (SnL), length of lower jaw (Ljl) and upper jaw (UjL), eye diameter (ED), inter-orbital width (IoW), body depth measured vertically from the origin of the pectoral, ventral and dorsal fins (BD P, BD V and BD DF respectively), caudal peduncle length (CPL), pectoral fin length (PF L) and pelvic fin length (VF L) were taken. Distance from the tip of the upper snout to the origin of fins such as dorsal (Pre DF), pectoral (Pre PF), pelvic (Pre VF), adipose fins (Pre AdF) and the distance between the insertion of the dorsal fin to origin of adipose fin (Inter-dorsal) were also noted. Measurements are given either as percentages of HL or SL

Total DNA was extracted from the muscle tissue (preserved in ethanol) using standard phenol/chloroform procedure of Sambrook *et al*. (1989). Mitochondrial cytochrome C oxidase subunit I (COI) gene region was amplified using primers, Fish F1 (5' - TCA ACC AAC CAC AAA GAC ATT GGC AC - 3') and Fish R1 (5' - TAG ACT TCT GGG TGG CCA AAG AAT CA - 3') (Ward *et al.* 2005). Amplifications were performed in 50 µl reactions containing PCR buffer (SIGMA-ALDRICH, USA) at 1× concentration with 1.5 mM $MgCl_2$, 10 pmol of each primer, 0.2 mM of each dNTP, 2.5 U *Taq* DNA polymerase (SIGMA-ALDRICH, USA) and approximately 25 ng of template DNA. The thermal cycling conditions were as follows: an initial denaturation at 95°C for 3 min, denaturation at 95°C for 30 sec, annealing at 50°C for 30 sec, extension at 72°C for 45 sec, repeated for 34 cycles, followed by a final extension for 5 min at 72°C. Following amplification, 2 µl of the PCR products were visualised on 1.5% agarose gel. The remaining PCR products were purified using GenElute PCR Clean-up Kit (SIGMA-ALDRICH, USA) and used for direct cycle sequencing employing the above forward and reverse primers. Sequence result generated was searched for similarity using Basic Local Alignment Search Tool (BLAST) (Altschul *et al*., 1990) through web searches of National Center for Biotechnology Information (USA) website (http://www.ncbi.nih.gov/BLAST/) and also through the Barcode of Life Database (www.barcodinglife.org) species identification portal. All specimens of the new species used for barcoding were retained as voucher specimens.

DNA barcodes of 4 specimens of *Harpadon nehereus* (178-191 mm SL) caught in bag nets and trawl nets operated in the shelf waters at 30 - 50 m depths from the Arabian Sea (20° 45' N 70° 30' E; 19° 04' N 72° 46 'E, 15° 26' N 73° 44' E) were compared with the *H. nehereus* sequences from India (EU148582 - 4) as well as those from China (JN242630, EF609369, EF607399) and Vietnam (EF609369) obtained from GenBank. As the sequences of *H. neherus* generated were found similar to GenBank depositions (EU148582 - 4) from India, these were used for further phylogenetic analysis. The gene sequences of *H. microchir* (AP002919) from Japan (Miya *et al*., 2001), the *Harpadon* sp. collected from same locality (north-eastern Arabian Sea) earlier by the first author (Genbank Accession No. JN120759) were also used in the study. A phylogenetic tree was then constructed based on UPGMA method and the sequence divergence between *Harpadon nudus* sp. nov. with other related species were calculated based on Kimura 2 parameter (K2P) model using MEGA 5 (Tamura *et al*., 2011).

Results and discussion

Taxonomic and morphometric details

Harpadon nudus sp. nov. Ganga and Jinesh
Fig. 1, Table 1.
Class : Actinopterygii
Order : Aulopiformes
Family : Synodontidae
Genus : *Harpadon* Lesueur, 1825

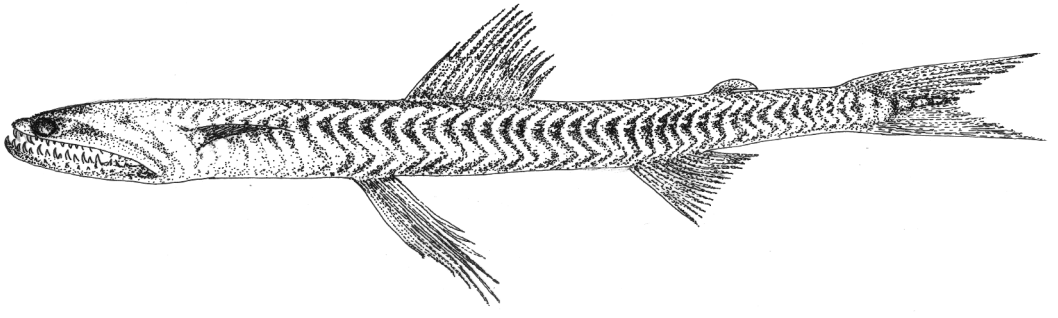


Fig. 1. *Harpadon nudus* sp. nov. (SL 144 mm, holotype GB.8.15.1.2)

Table 1. Measurements of holotype and paratypes (n = 6; SL 90 - 167 mm) of *Harpadon nudus* sp. nov.

Characters	Holotype (GB.8.15.1.2)	Paratypes
As % SL		
Head length	24.7	21.5-26.2
Body depth (pectoral fin)	9.9	9.4-11.7
Body depth (pelvic fin)	11.7	9.0-15.3
Body depth (anal fin)	8.2	6.1-13.5
Pectoral fin length	11.9	8.6-13.8
Pelvic fin length	19.5	16.4-21.6
Pre-dorsal distance	47.9	43.3-48.9
Pre-pectoral distance	22.1	21.4-27.4
Pre-adipose fin distance	81.9	77.4-82.3
Dorsal fin base	13.6	13.1-15.4
Anal fin base	13.6	13.4-16.0
Caudal peduncle length	9.5	10.0-13.6
Inter-dorsal distance	21.8	20.6-24.0
As % HL		
Snout length	12.9	8.4-13.5
Eye diameter	13.4	9.1-15.1
Inter-orbital width	15.1	14.6-21.9
Counts		
Dorsal fin	12	12
Pectoral fin	9	9
Ventral fin	9	9
Anal fin	14	13 - 15
Branchiostegals	17	17 – 20

Holotype: GB.8.15.1.2 deposited in Marine Biodiversity Museum (Designated National Repository/DNR) of ICAR-Central Marine Fisheries Research Institute (ICAR-CMFRI): 144 mm SL, 371 m depth, 19° 53' N-69° 23'E (north-eastern Arabian Sea), on-board FORV *Sagar Sampada*, 25 February 2013 (Fig. 1), collected by Jinesh P.T.

Paratypes: CMFR/PFD/313.3: 127 mm SL, CMFR/PFD/313.5: 130 mm SL; CMFR/PFD/313.6: 126 mm SL; CMFR/PFD/313.7: 90 mm SL; (collection A, sampling details same as for holotype, 4 specimens); CMFR/PFD/281.4: 167 mm SL, CMFR/PFD/281.5: 134 mm SL, trawl nets operated at 275 m depths, 20°26' N - 69°16'E onboard FORV *Sagar Sampada*, 24 October 2010 (collection B, 2 specimens). Co-occurring species caught in the same net were deep-sea shrimps (*Solenocera* spp.).

Other material examined: H. nehereus (GB 8.15.1.3); *H. squamosus* (GB 8.15.1.4) available in DNR of ICAR-CMFRI; three specimens each CMFR/PFD/313.4, 313.6 and 313.7 (90 - 130 mm SL) and CMFR/PFD/281.1 to 281.3 (134 - 178 mm SL) from a separate collection. Other species *H. erythraeus* Holotype SMF 17720 (*Senckenbergiana Biologica* v.64 *H. microchir* Holotype (digital image) Museum of Natural History, London (BMNH 1878.4.5.17) and Plate XLVII, p. 648 in Gunther (1887); *H. translucens* (*Proc. Roy. Soc. Queensland* V6, Pl. 13 *H. mortenseni* (*Treubia Buitenzorg* V 14 (2), p. 221; *H. squamosus* (Plate XXX Fig. 1 in Illustrations of Zoology of the Royal Indian Marine Surveying Steamer Investigator (Fishes), Part III, syntype BMNH 1891.9.2.5 (digital image); Alcock, 1895)

Diagnosis: Caudal fin trilobed with lateral line continuous with central lobe, large mouth gape extending far beyond eye. Jaws bearing characteristic fang like, unequal teeth with barbed tips arranged in 2-3 rows. Teeth present on the roof of the mouth and tongue. Head with a very short snout and eyes placed laterally very close to snout tip. Nostrils placed close to snout tip; branchiostegals thin and numerous (>17); pelvic fins with 9 rays; adipose fin present. Gill rakers spine like.

Fin count: Dorsal (D) 12; Pectoral (P) 9; Pelvic (V) 9; Anal (A) 14 (13 - 15)

Description: A slender species of *Harpadon* with elongated, slightly compressed, smooth and naked (scaleless) head and body; caudal fin deeply forked, conspicuously trilobed and slightly blackish at the tips. A very short, narrow snout, somewhat pointed in dorsal view. Mouth gape is large with jaws extending conspicuously behind the eye; jaws have villiform canine like teeth of unequal size bent backwards with a minute uncinate tip. Eyes large, round and laterally placed above anterior portion of mouth, close to snout. Width of flat inter-orbital space 1.1 - 1.8 times the eye diameter. Pectoral fin very short, 8.4 (7.3 - 11.7) in SL and not reaching to dorsal fin origin. Lateral line pores (40 - 43 count) on body are faint near to head region but fairly prominent in the caudal region and continuous with the central lobe of the caudal fin. No axillary pelvic or pectoral process present. Caudal peduncle long and slender, vertebrae 44 - 45 with neurocranium much nearer to the snout.

Dorsal fin arises in anterior half of the body (measured with caudal) and located posteriorily above the base of the pelvic fin. Pelvic fins short 5.1 (4.9 - 10) in SL and not reaching anal vent situated in front of anal fin. Adipose dorsal fin situated above posterior half of anal fin, closer to caudal fin than dorsal fin; inter-dorsal distance (between insertion of dorsal and origin of adipose fin) is 4.6 (4.2 - 4.9) in SL. Other measurements were: head length 4 (3.8 - 4.7) in SL, body depth at origin of pelvic fin 8.5 (7.7 - 9.7) in SL; body depth at origin of pectoral fin 10.1 (8.5 - 9.5) in SL and body depth at origin of anal fin 12.2 (10.9 - 12.3) in SL; caudal peduncle length 10.5 (8.4 -10.5) in SL.

Eye diameter 7.5 (5.8 - 9.4) in HL and inter-orbital width 6.6 (3.9 - 6.6) in HL. Mouth with large gape, lower jaw longer than upper and maxilla not well developed. Membranous posterior flap of opercle reaches beyond

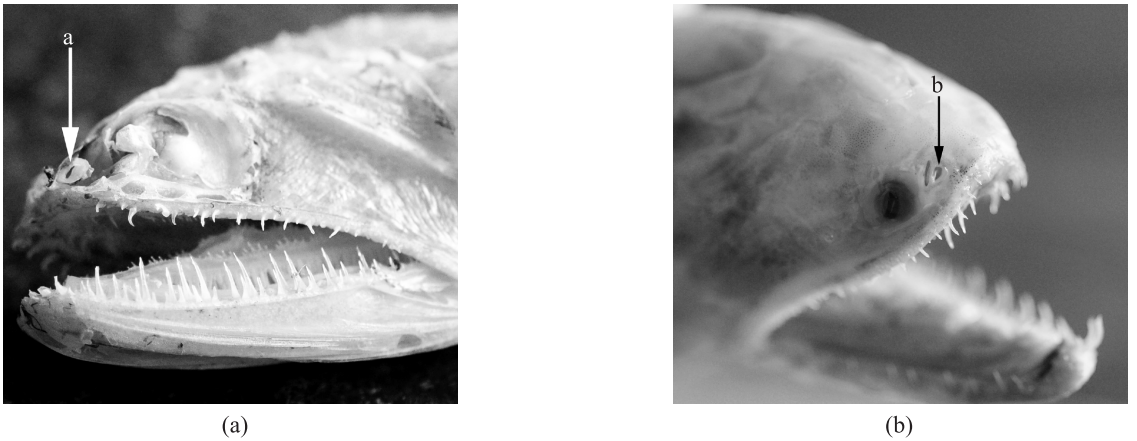
insertion of pectoral fin and is transparent without any blackish tinge at the edges. Branchiostegals very thin and numerous (17-20 nos.) extending beyond the opercle. Vomerine tooth absent, palatine and maxillary teeth present. Fang-like, barbed teeth on the lower jaw are more prominent than those on the upper jaw (Fig. 2). Teeth on the inner row and those at the tip of the upper and lower jaws are longer than rest. Palatine teeth band with two rows of teeth, each having longer anterior tooth and additionally a short band of very small and unequal teeth on the inner side of the band. Nostrils single with dermal flap, adjacent to anterior border of eye and very close to tip of snout which is narrow and pointed in dorsal view. Gill rakers are spine like and present uniformly on the entire first gill arch (Fig. 3), arranged closely in arches of five to six with the middle one being the longest; the inner margin of the arch with small spines (branchial teeth).

Colour of body silvery grey when fresh with paired fins and caudal fin, all light coloured without pigmentation. In fresh condition, the lateral line pores seem to be phosphorescent with golden yellow tinge and when kept in formalin, the entire body turned brownish in colour. Maximum size 220 mm TL (total length) and mature specimens with clearly distinguishable gonads from 160 mm TL onwards.

Etymology: The word "nudus" in Greek meaning "bare" and refers to absence of scales on the body.

DNA barcodes

The sequences of 5 specimens (KF453193 - KF453197) of *H. nudus* sp. nov. collected during the 2013 survey and one specimen (JN120759) during the 2010 survey in the north-eastern Arabian Sea were deposited in GenBank. The BLAST analysis indicated that these five sequence of



(a) (b)

Fig. 2. Head of (a): *Harpadon nudus* sp. nov. with jaws bearing barbed fang like teeth, narrow snout and single pair of nares; (b): *H. nehereus* having rounded snout and two pairs of nares

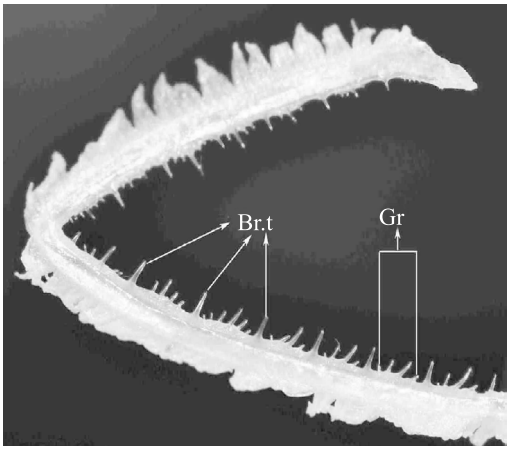


Fig. 3. First gill arch in *H. nudus* sp. nov. showing gill rakers (Gr) and branchial teeth (Br.t) on the outer and inner sides respectively

H. nudus sp. nov. were 99% similar to the *Harpadon* sp. (JN120759) collected in October, 2010 for which sampling was repeated in the same region in 2013. Further, the *H. nudus* sp. nov., *H. microchir* and *H. nehereus* formed separate clades with 100% bootstrap values. The *H. nehereus*from China and Vietnam grouped together and formed a separate, well differentiated clade from the *H. nehereus* in the Indian EEZ with 100% boot strap values indicating the presence of subpopulations in this species (Fig. 4). *H. nudus* sp. nov. showed genetic distance of 1.35 with *H. nehereus* and 0.19 with *H. microchir*.

Comparison with congeners

H. nudus sp. nov. was compared with its six congeners (Fig. 5; Table 2). Morphologically *H. nudus* sp. nov. is distinct from completely scaled species like *H. erythraeus* and *H. squamosus* and partially scaled species such as

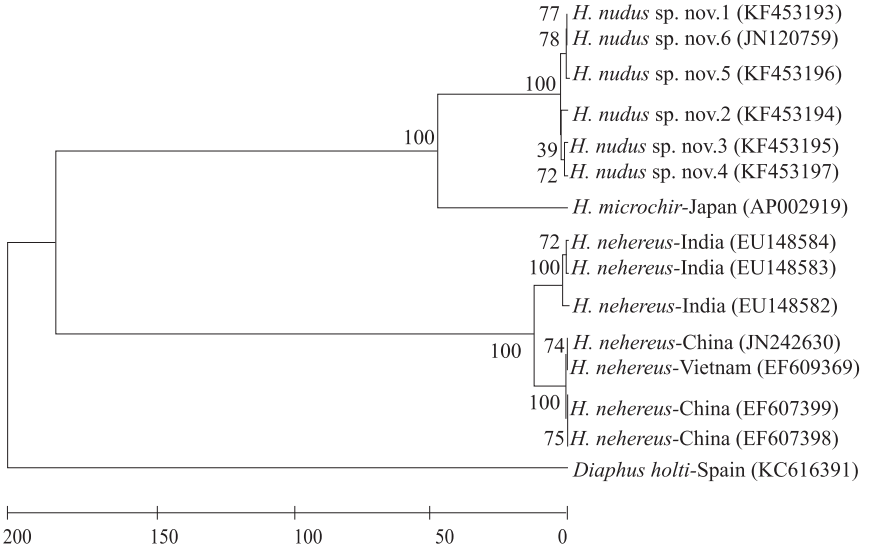
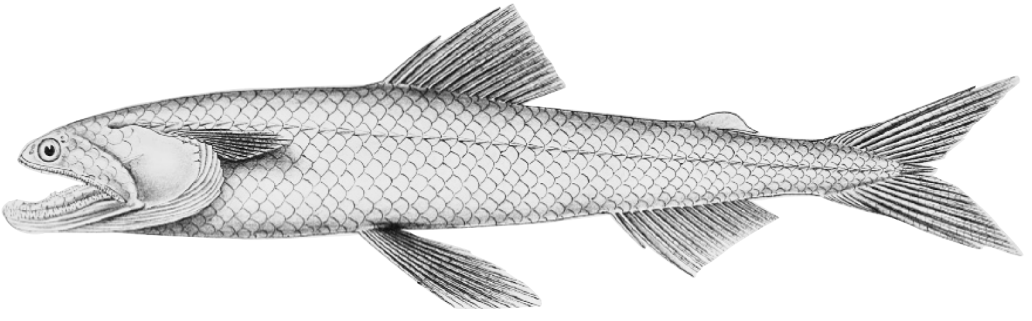
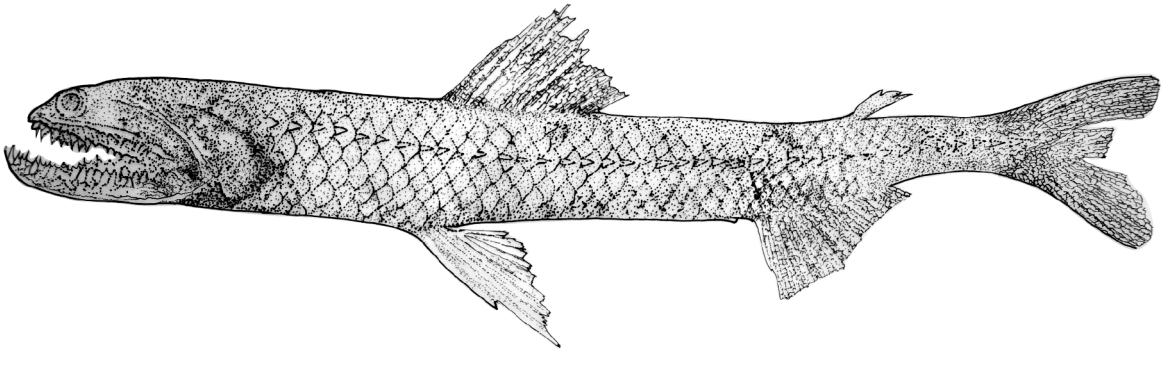


Fig. 4. UPGMA tree showing relationship among various species of the genus *Harpadon* based on mitochondrial COI gene sequences. Scale bar shows evolutionary distance

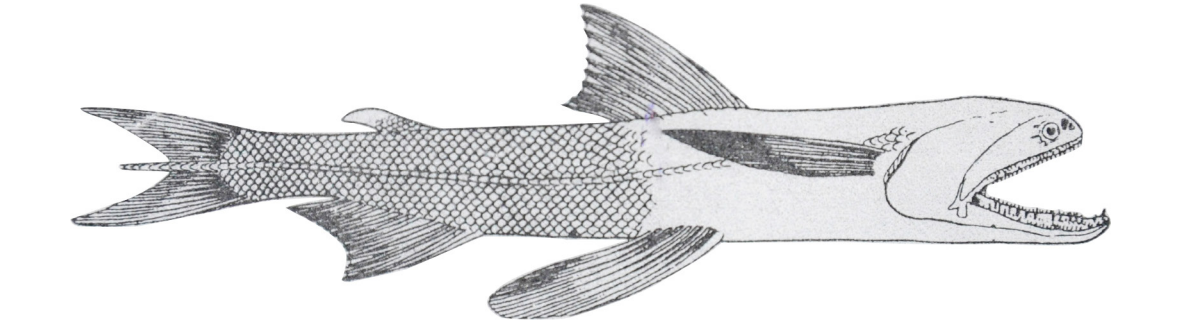
(a)



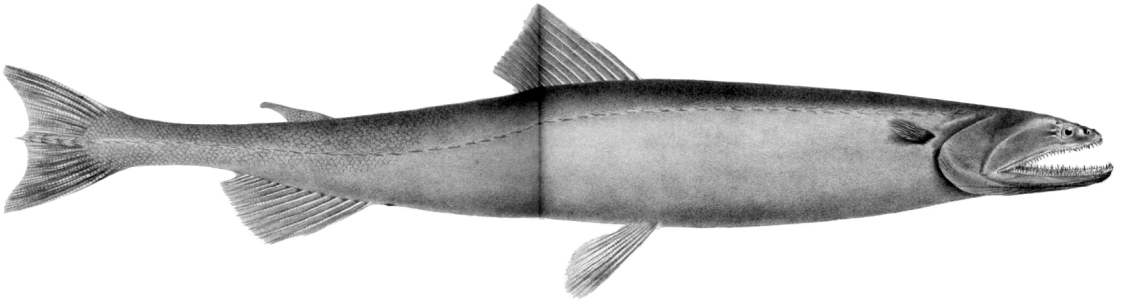
(b)



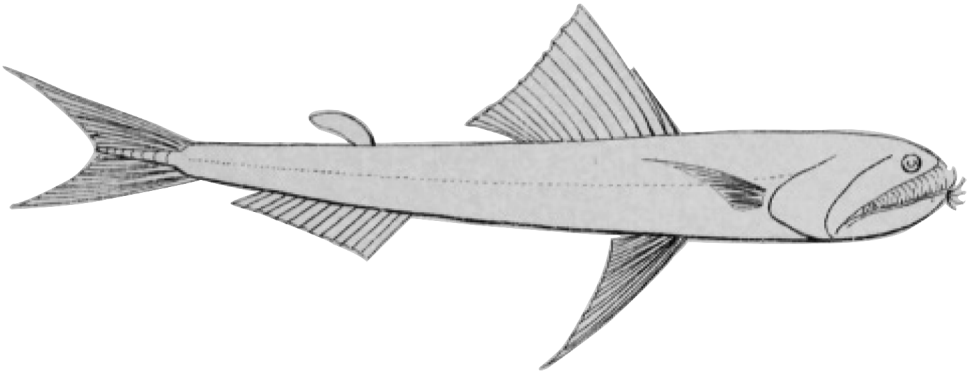
(c)



(d)



(e)



(f)

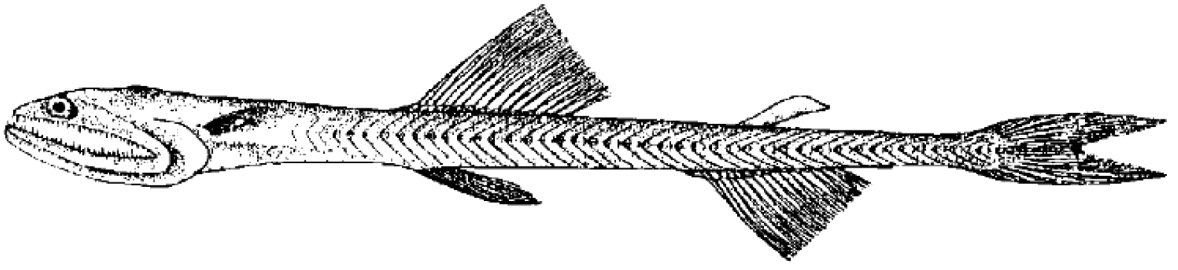


Fig. 5. Known species of *Harpadon*: a. *Harpadon nudus* sp. nov. (formalin preserved); b. *H. squamosus* (in Alcock 1895); c. *H. erythraeus* (redrawn from Klausewitz, W. 1983); d. *H. nehereus* (in Misra, 1952); e. *H. microchir* (in Gunther, 1887), f. *H. translucens* (in Saville-Kent 1889) and g. *H. mortenseni* (in Hardenberg, 1933)

Table 2. Distinguishing characters of *Harpadon* species

Character	*H. nudus* sp. nov.	*H. nehereus*	*H. microchir*[*]	*H. translucens*[*]	*H. mortenseni*[*]	*H. erythraeus*[*]	*H. squamosus*[*]
Body scale pattern	No scales present in head, trunk or caudal region	Scales present in trunk and caudal region only	Dense scales in caudal region and below adipose fin	Small thin scales in trunk and caudal region	Scales only on lateral line and caudal region	Scales present in head, trunk and caudal regions	Scales present in head, trunk and caudal regions
Head region	Long head; 21-26% in SL with snout pointed in dorsal view; interorbital space narrow 1-1 to 1.8 times eye diameter.	Head short, 18 -20% in SL; broad and rounded in dorsal view;wide interorbital space 2 – 2.4 times diameter of the eye	Head small somewhat compressed behind; snout broad and rounded in dorsal view	Head short and blunt with rounded snout	Head long ; greatest body depth behind head region	Head short with a broad rounded snout	Head short being 20% of SL; broad and depressed in dorsal view with wide interorbital space 1.8 -2 times diameter of the eye
Lateral line scales/ pores	40 - 43	44 - 47	>50; lanceolate scales on lateral line	NA	60 – 70?	40 - 42	40 - 43
Branchiostegals	17 - 20 very thin and fragile, long and extends beyond operculum almost upto pectoral fin tip	17 -19 Short not extending beyond operculum	17	NA	14	NA	17 short extending beyond operculum upto pectoral fin origin
Pectoral fin	9 rays present; fin very short (9-14% SL), not reaching dorsal fin.	9 rays present; fin very long (25 – 26% SL) reaching > half of dorsal fin base.	12 rays; fin short , not reaching dorsal fin and < 1/2 of the distance from snout to dorsal fin origin	12 rays ; fin short, reaching dorsal fin and more > ½ distance from snout to dorsal fin origin	short not reaching dorsal fin	12 rays; short not reaching dorsal fin	10 rays; narrow and fragile, 18% SL not reaching dorsal fin origin and predominantly blackish
Pelvic fin	9 rays; fragile and tapering, not reaching anal vent	9 rays; fragile and long, almost reaching anal vent	9 rays, short and not reaching anal vent	NA	9 rays, short and not reaching anal vent	9 rays, short and not reaching anal vent	9 rays; long and almost reaching anal vent
Dorsal fin (DF)	12 rays; DF origin well behind vertical with pelvic fin base	12 – 13 rays; DF origin just posterior to vertical with pelvic fin base	14 rays; DF origin just posterior to vertical with pelvic fin base	14 rays, DF origin just posterior to vertical with pelvic fin base	13 -14 rays; DF origin just posterior to vertical with pelvic fin base	12 -14 rays; DF origin well behind vertical with pelvic fin base.	Rays 12 -14; DF origin just posterior to vertical with pelvic fin base
Caudal fin	Deeply forked	Deeply forked	Deeply emarginate	Deeply forked	Deeply forked	Deeply forked	Deeply forked with inconspicuous median lobe
Eyes	Eyes big ; eye diameter (ED) 9 -15% of HL	ED 8 -12% of HL	NA	NA	NA; iris of eye peacock blue	Eyes moderately big and laterally placed	ED 11% HL
Nares	Single pair	Two pairs	NA	NA	NA	NA	Two pairs
Teeth	Teeth in bands in both jaws with barbed tips; vomerine teeth absent, palatine teeth present in two rows	Teeth in bands in both jaws with barbed tips; vomerine and palatine teeth present	Palatine teeth present in two rows and inside this a shorter row of teeth. Hyoid bone and all branchial arches with clusters of teeth	NA	Strong canine teeth in both jaws, vomer not toothed[*]	Long lanceolate teeth; vomerine and palatine teeth present	Teeth in bands in both jaws with barbed tips; vomerine and palatine teeth present
Body colour (fresh state)	Silvery grey	Translucent or brownish coloured with speckled appearance	Sides silvery back and fins blackish; buccal cavity predominantly blackish	Transparent, glassy body colour with minute specklings	Whitish	Adults uniformly black coloured; juveniles brownish.	Greyish body colour with caudal and paired fins blackish

[*]Descriptive characters taken from original species descriptions; NA: No data available

H. nehereus, *H. microchir*, *H. translucens* and *H. mortenseni* with its slender elongate body, conspicuous absence of scales in the head, trunk and caudal regions and 40 – 43 lateral line pores which are more prominently visible in the posterior trunk and caudal region in freshly caught specimens. *H. nudus* sp. nov. is similar to *H. microchir* in having short pectoral fins, but it differed in having a lower dorsal fin count of 12 (*versus* 14), a vertebral count of 42 - 43 (*versus* > 53; http://fishdb.sinica.edu.tw), with no scales on the caudal portion of the body including the base of the adipose fin land a deeply forked caudal fin. The measurements to scale taken by us from the digital image of the *H. microchir* type (1878.4.5.17) indicated that *H. nudus* sp. nov. has a relatively large head length of 21.5-26.2% of SL (*versus* 14%) and large eyes with eye diameter 9.1-15.1% of HL (*versus* about 9%). The DNA barcodes of *H. nudus* sp. nov. showed a K2P distance of 0.19 with 100% bootstrap value to the *H. microchir* genome data generated by Miya *et al*. (2001) confirming their distinct species identity.

In comparison to *H. nudus* sp. nov., *H. mortenseni* described by Hardenberg (1933) has significantly lower number of branchiostegals (13 *versus* 17-20); higher lateral line scales/pores (60-70 *versus* 40-43) and differed in all meristic counts of fins except the ventral fin (9). *H. translucens* has been described with pectoral fin that extends more than half the length from snout to origin of dorsal fin and characteristic bristle like teeth protruding out at the mouth edges (Saville-Kent, 1889; Russell, 1999). It also differs from *H. nudus* sp. nov. which has a very short pectoral fin (8.6-13.8% SL) and absence of any projecting teeth. Besides, *H. translucens* is reported to occur in estuaries and nearshore habitats of Australia whereas *H. nudus* sp. nov. was distinctly oceanic occurring in the continental slope region at around 300 m depth in the north-eastern Arabian Sea.

Body colouration silvery with light coloured fins, and no dark pigmentation was seen in freshly captured *H. nudus* in contrast to other species (body and fins black in *H. erythraeus*; body hyaline grey with black pectoral, pelvic and caudal fins in *H. squamosus*; very light and almost transparent body in *H. translucens*). *H. nudus* sp. nov. has a slender body with depth 8-10 in SL and pointed snout whereas *H. squamosus* has robust body with greater body depth (5.8 in SL) and a rounded snout.

H. nudus sp. nov., *H. microchir* and *H. nehereus* formed separate clades with 100% bootstrap values (Fig. 6). Within genera K2P distances (19-20%) in *Harpadon* spp. is comparable to other teleostean genera like *Platycephalus*, *Neoplatycephalus*, *Cymbacephalus* (flatheads) which has 15.5% genetic divergence and genus *Squalus* (sharks) showing 4.17% genetic divergence (Ward *et.al.,* 2005). Thus K2P distance values also demonstrate the distinct species identity of *H. nudus* sp. nov.

Molecular genetics combined with traditional taxonomy tools is crucial in delineating species which aids management of important fishery resources of a region as well as in inventorising its biodiversity. Among the six nominal species of the genus *Harpadon* (Eschmeyer, 2013), only *H. nehereus* which is an inshore, shallow water (<50m depths) species often entering estuaries/river deltas with a wide distribution from west coast of India to western Pacific (East China Sea to Sulu Sea) is confirmed from the Arabian Sea (Bapat, 1970; Manilo and Bogorodsky, 2003; Froese and Pauly, 2013) and forms a major commercial fishery, often with annual landings exceeding 1,00,000 t (Ghosh *et al*., 2009). The present study confirms the presence of a new species of Bombayduck in the Indian EEZ from the northeastern Arabian Sea.

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