

A NEW SYNBRANCHID FISH, *MONOPTERUS DIGRESSUS* FROM KERALA, PENINSULAR INDIA

K. C. GOPI

Western Ghats Field Research Station Zoological Survey of India, Calicut-673 002,
Kerala, India

INTRODUCTION

Rosen & Greenwood (1976) in their revisionary work on phylogeny and systematics of synbranchiform fishes treated all synbranchid eels under the single family Synbranchidae. They recognized two subfamilies : the Macrotrematinae containing the monotypic genus *Macrotrema* and the *Synbranchinae* with three genera : *Ophisternon*, *Synbranchus* and *Monopterus*.

Of the four genera, the Old world genus *Monopterus* comprises of altogether eight species (Bailey & Gans, 1998). Excluding *Monopterus boueti* (Pellegrin) from Africa and *Monopterus desilvai* Bailey and Carl Gans from Sri Lanka, the species reported from India include *Monopterus albus* (Zuiew), *Monopterus eapeni* Talwar, *Monopterus cuchia* (Hamilton), *Monopterus fossorius* (Nair), *Monopterus indicus* (Silas and Dawson) and *Monopterus roseni* Bailey and Carl Gans. Of these, the three from Kerala, viz., *M. eapeni*, *M. roseni* (both from Kottayam Dist.), *M. fossorius* (from Thiuvananthapuram Dist.) and the one from Mahabaleswar, Maharashtra, viz., *M. indicus* are endemic to Peninsular India. *M. eapeni* and *M. roseni* are blind cavernicoles living in subterranean waters. A new species, and the third cavernicole of the genus, is described here as *Monopterus digressus* from Calicut Dist., Kerala, Peninsular India. The new species is the fourth species known from Kerala, the fifth from Peninsular India and the seventh from India. The type specimens are deposited in the faunal collections of the Western Ghats Field Research Station, Zoological Survey of India, Calicut.

Monopterus digressus sp. nov.

(Figs. 1–9)

Material examined : *Holotype* : ZSI-WGFRS, 10684, 218 mm in total length (TL), collected from a homestead well at Kuthiravattom, a suburban locality of Calicut, Kerala, India; Alt. 40 m; Date. 12.x.1998; Coll. Salim.

Paratype : 7 specimens, 150–242 mm TL; Collection data same as of holotype.

Diagnosis : A small, blind species of *Monopterus*. Body slim, naked, subcylindrically elongate and cord-like. Head slightly to moderately conspicuous, with muscular occiput. Upper jaw with jowl-like lip, slightly overhanging the lower jaw. Gill aperture ventral, wide, subtriangular or lunate without lateral folds. Branchiostegal membrane internally fused with isthmus, its skin ventrally drawn into shallow longitudinal folds. Paired supratharyngeal pouches present. Lateralis system distinct with prominent cephalic pores. Trunk and tail nearly identical in shape (depth and width) except at the tail extremity. Tail extremity compressed and tapering with rudimentary dorsal and anal fin folds (dermal ridges) confluent at the caudal tip. Branchiostegal rays 6. Vertebrae : Precaudal 86-88, caudal 80-82, total 166-170.

Description : Body : (Figs. 1 & 7) : Slim, naked, subcylindrically elongate and cord or thread-like. Dorsal and ventral profiles, excluding head and tail extremity, nearly parallel. Snout to vent (SV) length 62.7% of TL. Tail long, nearly identical in shape to that of trunk except at posterior extremity, about 37.3% of TL, 59.6% of SV length. Tail extremity well compressed and tapering with rudimentary dorsal and anal fin folds (dermal ridges) confluent at the caudal tip. Body depth (maximum) about 1.8%, at vent 1.75% of TL, 40.4% of head length (HL).

Head : (Figs. 2, 3, 4, 8 & 9) : Small, slightly to moderately conspicuous, with gently arched muscular occiput. HL 4.5% of TL, 7.2% of SV length, its depth 52.4% its own length. Eyes absent. Jaws slightly unequal in forward extension, anteriorly truncated or squarely rounded; upper jaw surrounded with a jowl-like tissue (lip) slightly overhanging the lower jaw. Gape length 31.7% of HL. Teeth on palate, and laterally on jaws uniserial, but anteriorly in two, sometimes three, rows. Anterior nostrils small, at the tip of snout; posterior nostrils large, subrectangular. Distance from snout tip to posterior nostril 0.8% of TL, 18.1% of HL. Cephalic lateralis system distinct with a number of pores (figs. 2, 3 & 4) : dorsally a pair of internasal pores between anterior and posterior nares, a median coronal pore just behind the level of posterior nares and a pair of post nasal pores; ventrally 3 pairs of mandibular pores; a fourth pair, one each, behind the gape angles and a fifth pair, one each on either side, in the mid-lateral position. Files of minute sensory papillae also present, becoming indistinct in mucous coating after the preservation of specimen.

Branchial region : (Figs. 4, 6 & 9) : The gill aperture ventral, wide, subtriangular or lunate, its width 22.4% of HL, 64% of head width, internally divided into a pair of pore-like lateral apertures by a midventral fusion between branchiostegal membrane and isthmus; skin of branchiostegal membrane ventrally drawn into shallow longitudinal folds, skinfolds not extending laterally to angles of gill aperture. Buccopharyngeal cavity ventrally opening to each of the paired branchial chambers through 4 gill slits. The first and the anterior-most one, the hyo-branchial slit (between hyoid and first branchial arches), the largest, followed by the fourth slit (between fourth and fifth arches). The second and third branchial slits (between one and two, and two and three branchial arches respectively) are comparatively smaller. The third and fourth arches lie closely without a slit in

between. Gills are greatly reduced, with only thin flanges of tissues on branchial arches one to three, each one with a single afferent-efferent vessel. The vessel on the fourth arch is thick and continuous, merging dorsomedially with its counterpart to form an unpaired dorsal aorta. A pair of accessory supratharyngeal pouches, each one on either side of head, present; pouches posteriorly extending to slightly beyond neck-line, above angles of gill aperture, anteriorly opening to pharynx by a pair of apertures at the roof of pharynx, opposite to the hyo-branchial slits on the floor of pharynx.

Body devoid of scales (naked). Lateral line extending from head to caudal end, becoming indistinct in the mucous coating after preservation of the specimen. Branchiostegal rays 6. Vertebrae : precaudal 86-88, caudal 80-82, total 166-170.

Colouration : Body colour in life blood-red, caudal extremity transparent, making visible the vertebral column and blood vessels; in alcohol, tawny white or pale flesh in colour.

Morphometric data : Given in thousandths of total length (TL) in Table I; certain morphometric ratios (in percentages) are also presented in Table II.

Etymology : The specific epithet *digressus* is derived from Latin 'digressus', meaning deviation, a reference to this species being different from other closely resembling species of *Monopterus*.

Relationship : *M. digressus* closely resembles *M. eapeni* and *M. roseni*, but differs from both by its characteristic body shape, differences in vertebral count, presence of supratharyngeal respiratory pouches, prominent cephalic lateralis system etc. The body of *M. digressus* is cord-like (uniformly subcylindrical and elongate), rather than whip-like as in *M. eapeni* or *M. roseni*. The count of vertebrae from 3 dissected specimens (TLs : 208 mm., 196 mm., and 180 mm.) of *M. digressus* showed a range of 86-88 precaudal and 80-82 caudal, total 166-170 in contrast to 135 precaudal and 24 caudal, total 159 in *M. eapeni* (Eapen, 1963, Talwar and Jingran, 1991), and 76 precaudal and 71 caudal, total 147 in *M. roseni* (Bailey and Gans, 1998). Accessory supratharyngeal respiratory pouches are distinctly present in *M. digressus*, whereas they are presumed to be absent in *M. eapeni* and *M. roseni* (Talwar and Jingran, 1991; Bailey and Gans, 1998). The lateralis system of the new species is seen with more number of pores on head compared to a lesser number of pores in *M. eapeni* or *M. roseni*. *M. digressus* is further distinguishable from *M. eapeni* by its vestigial dorsal and anal fin folds (ridges) restricted to caudal extremity (vs. dorsal fin fold commencing from opposite to vent and anal fin fold far posterior to vent in *M. eapeni*), and from *M. roseni* by its slightly overhanging upper jaw (vs. both jaws equal in forward extension in *M. roseni*).

M. digressus can be easily separated from the large and robust bodied species such as *M. albus*, *M. cuchia*, *M. fossorius*, *M. indicus* etc. by its smaller size, slim body, absence of eyes and the ratio of precaudal to caudal lengths, besides differences in vertebral count.

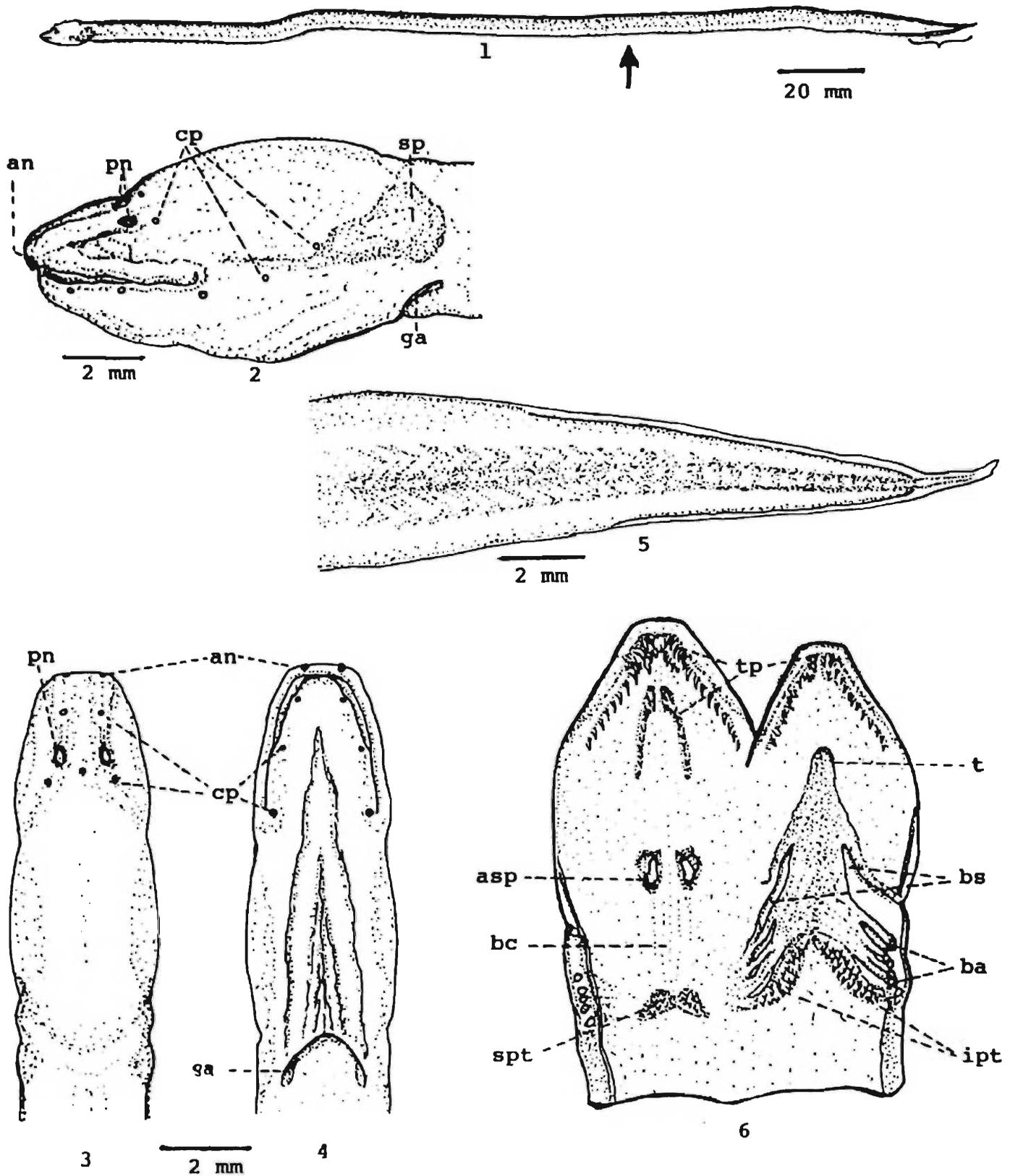
Table I. Morphometric data of *Monopterus digressus* sp. nov. (the holotype and 7 paratypes) and the holotype of *Monopterus roseni* (Bailey and Gans, 1998).

(Measurements in mm and thousandths of total lengths)

	<i>M. digressus</i>				<i>M. roseni</i>
	<i>Holotype</i>	<i>Paratypes</i>			<i>Holotype</i>
		Range	Mean	s.d	
Total length (TL)—in mm	218	150–242			176
: thousandths of TL					
Snout tip to vent	626	624–629	626.6	1.6	619
Tail length	373	371–376	373.1	1.5	381
Snout tip to occiput	042	041–045	042.5	1.1	048
Snout tip to gill aperture at midline	040.2	039–040.4	039.9	0.4	041
Head length (snout tip to angle of gill aperture)	045.4	044–046	045.1	0.6	048
Snout tip to post naris	008.4	008–009	008.1	0.3	011
Gape length (snout tip to angle of gape)	014.6	014–015	014.4	0.5	020
Width of gill aperture	010.2	009–011	10.0	0.5	011
Distance between anterior nares	004	—004	004.0	—	005
Distance between posterior nares	004.5	004–005	004.9	0.3	006
Head depth	025.0	021–025	022.9	1.4	024
Head width	018.0	014–018	016.0	1.3	018
Body depth (maximum)	018.4	017–019	018.0	0.3	019
Body depth (at vent)	017.4	017–018	017.5	0.3	016
Body width (maximum)	017.0	013–017	015.0	1.4	016
Body width (at vent)	016.0	012–016	014.5	1.3	013

Abbreviations used in the figures :

an—anterior nare; *asp*—aperture of suprapharyngeal pouch; *ba*—cut ends of branchial arches; *bc*—buccopharyngeal cavity; *bs*—branchial slit (opening to branchial chamber); *cp*—cephalic pores; *ga*—gill aperture; *ipt*—infrapharyngeal teeth; *pn*—posterior nare; *sp*—suprapharyngeal pouch (externally visible through head integument); *spt*—suprapharyngeal teeth; *t*—tongue; *tp*—tooth patch.



Figs. 1-6. *Monopterus digressus* sp. nov. : 1. Holotype, 218 mm long. The position of vent is indicated by the arrow. 2. Head : Lateral view; 3. Head : Dorsal view; 4. Head : Ventral view; 5. Tail extremity (the bracketed portion of fig. 1 enlarged); 6. Head region dissected open to show the roof and floor of the buccopharyngeal cavity.

Table II. Morphometric ratios (in percentages) of *Monopterus digressus* sp. nov. (the holotype and 7 paratypes) and the holotype of *Monopterus roseni* (Bailey and Gans, 1998).

	<i>M. digressus</i>				<i>M. roseni</i>
	<i>Holotype</i>	<i>Paratypes</i>			<i>Holotype</i>
		Range	Mean	s.d	
Caudal length/snout to vent length	59.67	59.02–60.32	59.59	0.39	61.47
Head length/snout to vent length	7.25	7.11–7.27	7.22	0.05	7.8
Body depth (max.)/head length	40.6	39.63–42.33	40.35	0.91	40.0
Body depth at vent/head length	39.1	37.66–40.21	38.68	0.78	32.94
Head depth/head length	54.94	39.3–59.94	52.43	12.0	50.59
Gape length/head length	31.31	31.31–32.18	31.72	0.3	41.18
Width of gill aperture/head length	22.42	20.88–22.89	22.39	0.8	22.35
Width of gill aperture/head width	56.35	56.35–70.65	64.0	4.91	61.29

REMARKS

Based on the presence or absence of paired suprapharyngeal pouches and scales on body (mostly in the caudal part), Talwar and Jingran (1991) recognized two subgenera : *Amphipnous* Muller with species having these dual characters (*M. cuchia*, *M. fossorius* and *M. indicus*) and *Monopterus* Lacepede comprising of species devoid of these characters (*M. albus*, *M. eapeni* and *M. roseni*).

But, according to Rosen and Greenwood (1976), the development of suprapharyngeal pouches is a derived shared character (synapomorphy) found in the species of *cuchia*, *indicus* and *fossorius*. Considering more synapomorphies of head anatomy, especially of branchial arch elements, branchial vascular system etc., they have indicated in their proposed phylogenies that the species of *Monopterus* form a monophyletic group and that the African species *M. boueti* having neither suprapharyngeal pouch nor body scales, is more closely related to *M. fossorius*, *M. cuchia* and *M. indicus* than to *M. albus* and *M. eapeni*. Bailey and Gans (1998) regard *Amphipnous* a group name of convenience rather than a subgenus.

M. digressus is having paired suprapharyngeal pouches for aerial respiration, but is devoid of scales on body. This combination of characters is, therefore, not in conformity with the grouping of species of *Monopterus* as proposed by Talwar and Jingran (1991). Nelson (1994) mentioned that most of the synbranchid species are, probably, capable of aerial breathing. Therefore, till its relationship to other species, especially to the closely resembling ones, of the genus *Monopterus* is further revealed, the new species is, presently, not placed under any subgenus or subgroup of *Monopterus*.

ACKNOWLEDGEMENTS

I am grateful to the Director, Zoological Survey of India (Z.S.I.), Kolkata, for encouragement and facilities provided. I owe my gratitude to Sri. C. Radhakrishnan, Scientist 'E' and Officer-in-Charge, Western Ghats Field Research Station, Calicut, for his personal interest and guidance throughout my study in presenting this paper. I am indebted to Dr. (Mrs.) K. Rema Devi, Scientist 'C', Z.S.I., Chennai, for reviewing the manuscript and pointing out valuable suggestions for its improvement. My sincere thanks are due to Dr. P. T. Cherian, Scientist 'F' and Officer-in-Charge, Southern Regional Station, Z.S.I., Chennai, for correcting the manuscript.

REFERENCES

- Bailey, R. M. and Gans, C. 1998. Two new synbranchid fishes, *Monopterus roseni* from Peninsular India and *M. desilvai* from Sri Lanka. *Occ. Pap. Mus. Univ. Michigan.* **726** : 1-18, 7 figs.
- Eapen, K. C. 1963. A new species of *Monopterus* from South India. *Bull. Dept. Marine Biol. Oceanogr. Univ. Kerala* **1** : 129-132.
- Rosen, D. E. and Greenwood, P. H. 1976. A fourth Neotropical species of synbranchid eel and the phylogeny and systematics of synbranchiform fishes. *Bull. American Mus. Nat. Hist.* **157**(1) : 1-70.
- Talwar, P. K. and Jhingran, A. G. 1991. *Inland fishes of India and adjacent countries.* Oxford and IBH Publishing Co., New Delhi. Vols. **1&2** : xix+1158.
- Nelson, J. S. 1994. *Fishes of the world.* 3rd ed. New York : John Wiley & Sons. 600 pp.