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## A NEW FISH SPECIES OF THE GENUS *BHAVANIA* (HOMALOPTERIDAE : HOMALOPTERINAE) FROM RIVER NOADHING DRAINAGE, ARUNACHAL PRADESH, INDIA

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### INTRODUCTION

*Bhavana australis* is the only species of genus *Bhavana* so far recorded from the southern states of India (Talwar and Jhingran, 1991). This fish species has a good number of synonymies, *Platycastra australis* (Jerdon, 1849), *Homaloptera maculata* (Day, 1877), *Homaloptera brucei* (Day, 1877), *Bhavana annandalei*, Hora (1920). Subsequently, Hora (1920) revised the genus *Bhavana* (Subfamily : Homalopterinae) on retrieval of the species *Bhavana australis* from the state of Kerala, Karnataka and other southern states of India. Even thereafter several Authors (Hora, 1941; Jayaram, 1981; Menon, 1987; Talwar & Jhingran, 1991) on redescription of the species *Bhavana australis* rather kept in the same genus *Bhavana*. Recently, on reassessment of the faunal wealth of Arunachal Pradesh, India, led to the record of one more species of *Bhavana* from the River Noadhing drainages, Lohit district. The new species has its own special characteristic features which could be readily differentiated from the species *Bhavana australis* on various scores : head dotted with pores and arranged in rows along the margin of orbit; thoracic region with a central pit; lateral line at the origin of ventral fin slightly curved; pectoral fin overlapping the ventral fin anteriorly; caudal emarginate, lower lobe longer than upper; longitudinal band from the base to the tip of lower caudal lobe, eight number of saddle-shaped blotches on the back. On the basis of these distinctive characters, the species has been described as a new species *Bhavana arunachalensis* along with a key to the identification of all the species of genus *Bhavana* in the text.

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Besides, another interesting features been described in the text is regarding the fish zoogeography confirming that the new fish belongs to genus *Bhavanaia*, a south Indian element. And its presence in the fish composition of Arunachal Himalaya appears to be of a rare phenomenon, which supports the 'Indobrahm hypothesis' postulated by Pasco (1919) and Pilgrim (1919). Further the notable works on the fish geography on the Northeastern region of India are of Sen & Dey (1984) and Nath & Dey (2000).

### Key to the species of genus *Bhavanaia* Jerdon

1. Head with pores-like outgrowths, rough and arranged in rows around orbit. Lateral line complete, slightly curved at the origin of ventral fin. Pectoral fin inserted opposite to orbit, extends beyond origin of ventral fin. Eight saddle-shaped blotches on the back; longitudinal band from base to the tip of lower caudal lobe. Caudal emarginate; lower lobe longer than upper ..... *Bhavanaia arunachalensis* sp. nov
- Head with spine-like outgrowths. Lateral line complete, straight. Pectoral fin inserted behind orbit and set apart from ventral fin. Caudal fin forked. Body with black spots and fin with circular bands and bars ..... *Bhavanaia australis* Hora

### MATERIALS AND METHODS

Morphometric measurements and counts were made with dial calipers and recorded to the tenth of a millimeter following the method of Jayaram (1991). The measurement of head length and body parts has been presented as proportion of standard length (SL). The subunits of head are presented as proportion of head length (HL). Counts and measurements were made on the left side of the specimen whenever possible. The system of classification of fish followed is after Nelson (1995).

*Type material* : *Holotype* : Reg. No. APFS/ZSI/P-488 dt. 26<sup>th</sup> July 2005, 111.0 mm TL, O<sup>-</sup> River Noadhing drainage near Namsai, about 30 km. from Tezu, the headquarter of Lohit district, Arunachal Pradesh, India.

*Paratypes* : Reg. No. APFS/ZSI/P-489 dated 26<sup>th</sup> July, 2005, 80.0–111.0 mm TL, 3 ex., O<sup>-</sup>, 4 ex., O<sup>+</sup>; other details as of holotype.

#### *Bhavanaia arunachalensis* sp. nov.

(PLATE-I, Figs. 1–3, and PLATE-II, Figs. 4–6)

*Fin formula* : Barbels vi, Dorsal ii. 7, Pectoral viii. 11, Ventral iii. 8, A.i.6

Body broad and flat anteriorly, tapering towards the tail, its depth 9.0–10.2 in SL. Head broad, flat, moderate in size, its length 4.3–4.8 in SL, its maximum width 1.1–1.3 times and inter-nostril distance 3.0–3.4 time both in HL; gill openings above base of pectoral fins. Eyes fairly small; its

diameter 36.0–43.0 in SL, 8.3–10.0 in HL, inter-orbital distance 2.0–2.6 times in HL. Snout smooth obtusely rounded. Mouth small, ventral, horseshoe shaped, sub equal. Lips thin, upper lip with tubercles longer than lower lip. Barbels six, two pairs rostral, one pair maxillary, all of equal length. Paired fins inserted horizontally, winged shaped and with adhesive apparatus. Pectoral fins overlapping the ventral fin at its origin. Dorsal fin smaller than paired fins, inserted almost opposite to ventral and nearer to snout tip than caudal fin base. Lateral line complete slightly curved at the base of ventral fin. Caudal fin emarginate, lower lobe longer than upper lobe; caudal peduncle 2.8–3.8 times longer than deep. Body scales small, cycloid covering the entire body, scale less at head and abdomen; lateral scale 70–75. Body color grayish with yellowish tinge above lateral line with eight saddle-shaped blotches on the back, longitudinal black band from the caudal base to the tip of lower caudal lobe, fins yellowish. Morphometric data as in Table 1.

From the comparative statement (Table 2) also could be stated that the specific characteristic features in respect of *Bhavana arunachalensis* strongly supports for the establishment as a new species. The comparative chart also revealed that the species *Bhavana arunachalensis* sp. nov. having closer affinity with *Bhavana australis* rather than *Balitora brucei*, commonly available in the hill streams of the North Eastern Regions of India PLATE-II, 6 and to some extent having close affinity with *Balitora burmanica*.

Interestingly, *Bhavana arunachalensis* is a south Indian form and its presence in the fish composition of Arunachal Himalaya however; justify the **Indobrahm Hypothesis** postulated by Pasco (1919) and Pilgrim (1919). According to them it infers that the Arunachal Himalaya was a part of peninsular shield separated by a broad strip of the Ganges-Brahmaputra alluvium (Krishnan, 1953; Sen & Dey, 1984; Nath & Dey, 2000).

## DISTRIBUTION

The fish samples were collected from the river Noadhing drainages near Namsai Lohit district. The location is about 40 km. from Tezu, the district headquarter of Lohit district. The river flows out from Chaukan Pass (1440 m, **msl**) in Tirap district and after traversing c. 205 km. from its source joins the river Lohit, the main tributary of River Brahmaputra at Saikhoaghat (27°32' N and 95°24' E) in Assam. The river at the debouching point at Miao (150 m, **msl**) in Arunachal Himalaya bifurcates into branches, one flowing through Namsai (27°30' N and 96°24' E) in Lohit district as river Noadhing and the other as river Buridhing through Bordumsa (27°29' N and 96°10' E) in Changlang district.

## ETYMOLOGY

The species *Bhavana arunachalensis* is named after the state of Arunachal Pradesh. Shri Kaling Borang, Office Assistant, Department of Fisheries, collected the fish specimens during his stay at Namsai during 2004.

**Table 1. :** Morphometric data for *Bhavana arunachalensis* sp. nov. ( $n = 8$ ) from River Noadhing drainage, Namsai, Lohit District, Arunachal Pradesh.

| Sl. No. | Measurement details (mm) in proportion to | Range     | Mean $\pm$ SD   |
|---------|---|-----------|-----------------|
| 1.      | Head length (HL)                          | 4.3–4.8   | 4.6 $\pm$ 0.18  |
|         | Head width                                | 1.1–1.3   | 1.3 $\pm$ 0.20  |
|         | Eye diameter                              | 8.3–10.0  | 8.8 $\pm$ 0.62  |
|         | Inter-orbital distance                    | 2.0–2.6   | 2.2 $\pm$ 0.24  |
|         | Interorbital width/ Eye diameter          | 3.8–4.1   | –               |
|         | Post-orbital length                       | 1.3–1.5   | 1.4 $\pm$ 0.07  |
|         | Inter-nostril distance                    | 3.0–3.4   | 3.1 $\pm$ 0.15  |
|         | Snout length                              | 1.5–1.8   | 1.7 $\pm$ 0.04  |
| 2.      | Standard Length (SL)                      | 65.0–87.0 | 76 $\pm$ 8.28   |
|         | Body depth                                | 9.0–10.2  | 9.7 $\pm$ 0.43  |
|         | Head Length                               | 4.3–4.8   | 4.6 $\pm$ 0.18  |
|         | Predorsal length                          | 2.0–2.2   | 2.2 $\pm$ 0.09  |
|         | Postdorsal length                         | 1.5–1.7   | 1.6 $\pm$ 0.14  |
|         | Prepectoral length                        | 6.5–8.7   | 7.8 $\pm$ 0.78  |
|         | Preventral length                         | 2.1–2.6   | 2.1 $\pm$ 0.20  |
|         | Preanal length                            | 1.2–1.4   | 1.3 $\pm$ 0.08  |
|         | Caudal length                             | 4.6–5.7   | 5.1 $\pm$ 0.32  |
|         | Anal-fin length                           | 9.4–11.6  | 10.4 $\pm$ 0.42 |
|         | Ventral-fin length                        | 4.0–5.8   | 4.7 $\pm$ 0.27  |
|         | Pectoral-fin length                       | 2.8–3.6   | 2.0 $\pm$ 0.29  |
|         | Dorsal-fin height                         | 5.0–6.3   | 5.5 $\pm$ 0.48  |
|         | Length of dorsal-fin base                 | 6.1–6.7   | 6.4 $\pm$ 0.21  |
|         | Height of caudal peduncle (HCPD)          | 16.0–18.0 | 16.9 $\pm$ 0.72 |
|         | Length of caudal peduncle (LCPD)          | 4.4–5.7   | 5.1 $\pm$ 0.45  |
|         | LCPD/HCPD                                 | 2.8–3.8   | 3.3 $\pm$ 0.32  |
|         | Length of pectoral-fin base               | 5.3–6.5   | 5.8 $\pm$ 0.42  |
|         | Length of ventral-fin base                | 6.0–8.2   | 6.8 $\pm$ 0.95  |

**Table 2.** : Comparative morphological distinction between *Bhavana arunachalensis* and the allied genera/species of subfamily Homalopterinae.

| Sl. No. | Characters            | <i>Balitora burmanica</i>    | <i>Balitora brucei</i>     | <i>Balitora mysorensis</i> | <i>Homaloptera bilineata</i> | <i>Homaloptera modesta</i>   | <i>Homaloptera montana</i> | <i>Homaloptera rupicola</i> | <i>Travancoria jonesi</i>   | <i>Bhavana australis</i>   | <i>Bhavana arunachalensis</i>                      |
|---------|-----------------------|------------------------------|----------------------------|----------------------------|------------------------------|------------------------------|----------------------------|-----------------------------|-----------------------------|----------------------------|--|
| 1.      | Body depth (BD) in SL | 7.8–10.0                     | 8.0–10.0                   | 7.9–8.4                    | 7.5–8.0                      | 8.00                         | 6.4–8.2                    | 5.7                         | –                           | –                          | 9.8–10.2   |
| 2.      | Head length in SL     | 4.4–5.2                      | 5.0–5.4                    | 4.0–4.3                    | 5.0                          | 3.7–4.5                      | 3.8–5.0                    | 3.2–3.8                     | –                           | –                          | 4.3–4.8  |
| 3.      | Head width in HL      | 1.2–1.4                      | 0.9–1.2                    | 1.2–1.3                    | – (Broad shorter than long)  | – (Broad shorter than long)  | – (Broad equal to long)    | – (Broad shorter than long) | – (Broad shorter than long) | – (Broad as long)          | 1.1–1.3 (broad shorter than long)                  |
| 4.      | Gill opening          | Extends to ventral surface   | Extends to ventral surface | Extends to ventral surface | Extends to ventral surface   | Extends to ventral surface   | Extends to ventral surface | Extends to ventral surface  | Extends to ventral surface  | Above base of gill opening | Above base of gill opening                         |
| 5.      | Eye diameter          | 25.0–33.0 in SI              | 30.0–43.0 in SL            | 6.0–6.2 in HL              | 6.5–6.8 in HL                | 4.2 in HL                    | 4.5 in HL                  | 4.0 in HL                   | –                           | –                          | 36.0–43.0 in SL; 8.3–10.0 in HL                    |
| 6.      | Pectoral fins         | Separated from ventral I fin | Separated from ventral fin | Separated from ventral fin | Separated from ventral fin   | Separated from ventral fin   | Extends to ventral fin     | Extends to ventral fin      | Separated from ventral fin  | Separated from ventral fin | Extends beyond ventral fin base                    |
| 7.      | Dorsal fin            | Inserted behind ventral      | Inserted behind ventral    | Inserted behind ventral    | Ahead of ventral             | Inserted opposite to ventral | Inserted behind ventral    | Inserted behind ventral     | Inserted behind ventral     | Inserted behind ventral    | Inserted opposite to ventral                       |
| 8.      | Lateral line          | Complete                     | Slightly curved at ventral | Complete                   | Complete                     | Complete                     | Complete                   | Complete                    | Complete                    | Complete                   | Complete, slightly curved at the origin of ventral |
| 9.      | Lateral line scale    | 62–65                        | 61–66                      | 64–65                      | 64                           | 47                           | 72                         | 42–45                       | 75–77                       | 70–75                      | 70–75  |

Table 2. : (Cont'd.).

| Sl. No. | Characters            | <i>Balitora burmanica</i>                              | <i>Balitora brucei</i>                                 | <i>Balitora mysorensis</i>                                 | <i>Homaloptera bilineata</i>                                | <i>Homaloptera modesta</i>                   | <i>Homaloptera montana</i>                | <i>Homaloptera rupicola</i>             | <i>Travancoria jonesi</i>                       | <i>Bhavana australis</i>                                | <i>Bhavana arunachalensis</i>              |
|---------|-----------------------|--|--|--|---|--|---|---|---|---|--|
| 10.     | Caudal fin            | Forked   | Emarginate (lower lobe longer)                         | Emarginate   | Emarginate  | -  | Emarginate                                | Emarginate                              | Forked  | Forked  | Emarginate (lower lobe longer)             |
| 11.     | Size range in SL (mm) | 75   | 105  | 50   | 40  | 21   | 70  | 25                                      | 80  | 90  | 65.0-87                                    |
| 12.     | Body coloration       | 6 blotches at back; dark mark at dorsal, anal, caudal  | Body with several blotches; caudal with bands          | 7 blotches at back   | Band from snout to dorsal fin base; dorsal with black spots | Body with spots; 3 black spots below eyes    | 10 bars at back                           | Body with spots; fins with bands        | Body with spots; fins with bands                | Body with spots; fins with bands                        | 8 nos. of blotches along back              |
| 13.     | Fin formula           | D.iii.8,<br>A.iii.5,<br>P.viii-x.<br>10-12,<br>V.ii.9. | D.iii.8,<br>A.iii.5,<br>P.ix-x.<br>10-12,<br>V.ii.9-10 | D.ii.iii.8-9,<br>A.ii.5,<br>P.viii-x.<br>10-11,<br>V.ii.9. | D.ii.7,<br>A.ii.5,<br>P.iv.9-10,<br>V.ii.7.                 | D.ii.7,<br>A.ii.4-5,<br>P.v-vi.8,<br>V.ii.6. | D.ii.7,<br>A.ii.5,<br>P.iv.8,<br>V.ii.6-7 | D.ii.7,<br>A.ii.5,<br>P.v.11,<br>V.ii.6 | D.ii.7-8,<br>A.i.4-5,<br>P.vi.9-10,<br>V.ii.6-7 | D.ii.7-9,<br>A.i.5-6,<br>P.vi-iii.<br>9-11,<br>V.ii.7-8 | D.ii.7.<br>A.i.6,<br>P.viii.11,<br>V.iii.8 |

## DISCUSSION

The new fish species *Bhavana arunachalensis* has a close resemblance with the lone species *Bhavana australis* especially in the presence of wing shaped paired fins; gill opening above base of pectoral fin, lateral line scales 70–75; pectoral fin rays (viii.11); dorsal fin ray (ii.7); anal fin ray (i.6); head broad and body flat upto the origin of anal fin; size range recorded 65.0–87.0 mm SL in *arunachalensis* (versus 90.0 mm SL size in *australis* of Talwar & Jhingran, 1991). But *Bhavana arunachalensis* could be differentiated from the known species *Bhavana australis* on various scores : Head with pores-like outgrowths in *arunachalensis* (versus head with spine-like outgrowths in *australis*); mouth horse-shaped, lips thin in *arunachalensis* (versus mouth small, lips thick and fleshy in *australis*); lateral line decurved at the origin of ventral fin in *arunachalensis* (versus lateral line straight in *australis*); pectoral fins extending to the base of ventral fin in *arunachalensis* (versus pectoral and ventral fins set apart in *australis*); dorsal fin shorter than paired fins, inserted nearer to tip of snout than caudal fin base in *arunachalensis* (versus dorsal fin inserted almost midway between tip of snout and caudal fin base in *australis*); caudal fin emarginate in *arunachalensis* (versus caudal fin forked in *australis*); presence of eight saddle-shaped blotches at the back in *arunachalensis* with longitudinal band between nape and tip of lower caudal lobe (versus presence of black spots on the dorsal surface with bands and bars in the fins in *australis*).

Furthermore, *Bhavana arunachalensis* apparently appears to have close affinity with *Balitora* spp. on several characters, especially in the body depth (BD) 9.0–10.2 times in SL in *arunachalensis* (versus BD 8.0–10.0 in SL in *brucei*; 7.8–10.0 in SL in *burmanica*; 7.9–8.4 in SL in *mysorensis*); HL 4.3–4.8 in SL, HB 1.1–1.3 in HL in *arunachalensis* (versus HL 5.0–5.4 in SL, HB 0.95–1.2 in HL in *brucei*; HL 4.4–5.2 in SL, HB 1.2–1.4 in HL in *burmanica*; HL 4.0–4.3 in SL, HB 1.2–1.3 in HL in *mysorensis*). But also could be reasonably differentiated at various levels : Pectoral fins overlapping ventral fin in *arunachalensis* (versus pectoral and ventral fins set apart in *brucei*, *burmanica*, *mysorensis*); lateral line scales 70–75 in *arunachalensis* (versus lateral line scales 61–66 in *brucei*; 62–65 in *burmanica*, 64–65 in *mysorensis*); anus inserted far away from anal fin in *arunachalensis* (versus anus closer to anal fin in *brucei*, *burmanica*); thoracic region with a central pit in *arunachalensis* (versus central pit absent in *brucei*); body with eight blotches at the back and longitudinal band from the base to the tip of lower caudal lobe in *arunachalensis* (versus six blotches and caudal fin with vertical bands in *burmanica*; body with several blotches extending from back to lateral sides and caudal fin with bands in *brucei*; seven blotches at the back and a diffused band along lateral line in *mysorensis*).

The diagnostic features had vividly shown that the species under report, *Bhavana arunachalensis* could be readily separated as a new species from the only one known species of *Bhavana australis* as well as other related genera/species of subfamily Homalopterinae (of Jayaram, 1981; Menon, 1987; Talwar and Jhingran, 1991; Karmakar and Das, 2005). Besides the (Table 2) morphological distinction of a few important characters between *Bhavana arunachalensis* and the known species

*Bhavanaia australis* and the other allied genera/species of subfamily Homalopterinae may perhaps ventilate some more light on the establishment of *B. arunachalensis* as a new species.

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