



Diagnosis and interrelationships of fishes of the genus *Channa* Scopoli (Teleostei: Channidae) of northeastern India

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Abstract: Diagnostic characters of nine species of the genus *Channa* Scopoli of northeastern India are given. Examination of morphological and osteological characters revealed that the fish under study comprised two phyletic groups: *marulius* and *gachua*. The *Marulius* group is characterized by having a very prominent V-shaped sharp isthmus, cephalic sensory pores arranged in groups, absence of scales on the lower jaw, a sharp prominent spinelike hypurapophysis, more branchial toothplates than epibranchial, and an elongated urostyle. The *Gachua* group is characterized by a U-shaped isthmus, cephalic sensory pores evenly arranged in a single row, the presence of one or two large cycloid scales on each side of the lower jaw, absence of a sharp prominent spine-like hypurapophysis, absence or presence of one tooth plate in the epibranchial, and absence of an elongated urostyle. An elongated bone is present in between two last hemal spines of all species examined. A key to known species of *Channa* of northeastern India is also given

Keywords: *Channa*, diagnosis, interrelationship, northeastern India

Abbreviations: MUMF - Manipur University Museum of Fish; GUMF - Guwahati University Museum of Fish

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INTRODUCTION

Genus *Channa* Scopoli, 1777 of the family Channidae is distinguished from other genera of the family in having long, soft dorsal and anal fins, scales on the head mostly cycloid and that on the body, mostly ctenoid, caudal fin rounded, curved lateral line. The genus is also characterized by a suprapharyngeal accessory respiratory organ which facilitates an air-breathing mode of life. Northeastern India is rich in swamps and lakes, and in Channid fauna. Under the All India co-ordinated project on air breathing fishes, Dehadrai (1975) made extensive studies on the cage culture of some of the species of this region. However, taxonomy and phylogeny of the Channid fishes of the region is poorly understood.

The Channidae are represented by 26 species, of which 23 occur in Asia and the rest in Africa (Musikasinthorn 2000). Hamilton (1822) described *Ophiocephalus barca* (now *Channa*) from Brahmaputra river near Goalpara, Assam. Hora (1921) listed *C. punctatus* (Bloch) from Chindwin basin, Manipur. Shaw and Shebbeare (1937) listed and gave brief descriptions of six species from northern Bengal, viz., *C. amphibius* (McClelland), *C. gachua* (Hamilton), *C. marulius* (Hamilton), *C. stewartii* (Playfair) and *C. striata* (Bloch). Later reports on the fishes of Manipur by Menon (1952), and Menon (1954) did not include additional species of the genus. Sen (1985) listed and gave diagnostic characters of six species of the genus. Vierke (1991) described *C. bleheri* from Assam.

Musikasinthorn (2000) described *Channa aurantimaculata* from Dibrugarh, Assam. Vishwanath's (2000 & 2002) works respectively on the fishes of Manipur and northeastern India did not include any additional species. Thus nine species of *Channa* are known from northeastern India.

In the present study, detailed morphology and osteology of nine species, viz., *Channa amphibius*, *C. aurantimaculata*, *C. barca*, *C. bleheri*, *C. gachua*, *C. marulius*, *C. punctatus*, *C. stewartii* and *C. striata* were carried out. Diagnostic characters and interrelationships of the species are presented here. A key to identification of the known species of *Channa* of the region is also included.

MATERIALS AND METHODS

Fresh specimens were collected from different fishing sites of northeastern India. Measurements and counts followed Kullander and Britz (2002). Cleared and stained specimens were used for osteological studies. Clearing and staining of specimens followed Hollister (1934). Radiographs were taken using DX-300 X-ray machine and developed digitally using Centricity CR SP100, and used for vertebral count in species for which limited specimens were available. Identification and nomenclature of bones as well as vertebral counts followed Greenwood (1976). For branchial tooth plate count, the first



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gill arch of the left side of the specimens was taken. Plates starting from hypobranchial to epibranchial of the outer side were counted

***Channa amphibeus* (McClelland)
(Image 1)**

Ophicephalus amphibeus McClelland 1845: 274-279 (type locality: vicinity of Chail River, one of the tributaries of the Teesta at the foot of the Bouton mountains).

Materials examined: 1 ex., (date unknown), 184.6mm SL, northern Bengal, India, coll. G.E. Shaw & E.O. Shebbeare, ZSI F 11435/1, neotype designated by P. Musikasinthorn 2000.

Distribution: Chel River basin, in the Brahmaputra River drainage of northeastern India and Bhutan.

Diagnosis: A species of *Channa* with lateral line scales 81, predorsal scales 17, maxilla extending beyond the posterior margin of eye, circumpeduncular scales 31, cephalic sensory pores single, two large scales, two large scales on each side of lower jaw under surface dorsal fin rays 50, anal fin rays 35, pectoral fin rays 15, pelvic fin rays six, cheek scales nine, body depth greatest at insertion of anal fin, body width greatest at insertion of pectoral fin. Snout somewhat pointed in dorsal view. Orbit not reaching dorsal contour of head in lateral view, upper and lower lips flattened.

Colour: In alcohol: body uniformly light brown, ventral surface whitish. Eleven vertical brown bars on upper half of body, extending below lateral line. Edges of dorsal, anal and caudal fins whitish.

Remarks: Diagnosis based on neotype and Shaw & Shebbeare (1937).

***Channa aurantimaculata* Musikasinthorn
(Image 2)**

Channa aurantimaculata, Musikasinthorn, 2000: 27. (type locality: streams near Dibrugarh town, Dibrugarh, Assam)

Materials examined: 2 exs., 29.i.2007, 121.9-131.2mm SL, Teju River, Teju district, Arunachal Pradesh, India, coll. K. Nebeshwar, MUMF-Per/0001; 3 exs., 17.xii.2006, 125-130mm SL, Dibrugarh, Assam, India, (coll. unknown), GUMF uncat.

Distribution: India: Teju River, Arunachal Pradesh; Brahmaputra river basin at Dibrugarh, northern Assam.

Diagnosis: A species of *Channa* with lateral line scales 51-54, dorsal fin rays 45-47, anal fin rays 28-30, mouth large, eyes moderate, caudal fin rounded, cheek scales 8-12, upper jaw length more than 45% HL, 3-4 bars on the pectoral fin, pectoral fin rays 14-16, two large cycloid scales on each side of the lower jaw undersurface, pelvic fin length less than half the pectoral fin length, cephalic sensory pores single, maxilla extending clearly beyond posterior margin of eye, total vertebrae count 51 (Image 3), branchial tooth plate count 6.

Colour: Upper half of body dark brown to black with 7 or 8 large irregular orange blotches; pectoral fins with a black blotch at base and 5 vertical broad vivid black bands.

Remarks: It is endemic to Brahmaputra River basin. The report extends its distribution to Arunachal Pradesh.

***Channa barca* (Hamilton)
(Image 4)**

Channa barca Hamilton, 1822:67, 367. (type locality: Brahmaputra R. near Goyalpara, Assam, India)

Materials examined: 1 ex., 6.v.2007, 295mm SL, Fringe area of Pobitora wildlife Sanctuary, Morigaon, Assam, India, coll. M.M. Goswami, MUMF-Per/0044; 3 exs., same data as above, 295.3-297.0mm SL, GUMF uncat.

Distribution: India. Bangladesh (Eschmeyer 2007)

Diagnosis: A species of *Channa* with lateral line 62-63, dorsal fin rays 50-51, anal fin rays 33-34, mouth large, caudal fin rounded, scales above the lateral line 5.5-6.5, predorsal scales 15-16, cephalic sensory pores single, two large cycloid scales on each side of the lower jaw undersurface, caudal fin rounded, total vertebrae count 56.

Colour: Dorsal and flanks covered with numerous black spot, pectorals reddish with numerous black spots.

Remarks: The species is burrowing in habit, and lives in vertical burrows (Goswami et al. 2006).

***Channa bleheri* Vierke
(Image 5)**

Channa bleheri Vierke, 1991:22. (type locality: Assam).

Material examined: 1 ex., 29.i.2007, 149.1mm SL, Dikrong River, Doymukh, Arunachal Pradesh, India, coll. K. Nebeshwar, MUMF-Per/0003; 1 ex., 6.xii.2006, 148.4mm SL, streams near Dibrugarh market, Assam, India, coll. M.M. Goswami, GUMF.

Distribution: India: Assam, Brahmaputra basin, Arunachal Pradesh

Diagnosis: A species of *Channa* with a slightly broad head, pelvic fin absent, sides of lower jaw have one large cycloid scale, 4-11 red or orange markings on caudal fin, eyes moderate, and caudal fin rounded, mouth large, 6-7 markings on the pectoral fin, maxilla and premaxillary processes extending beyond the posterior margin of the orbit, snout blunt, cephalic sensory pores single, lateral line complete with 46-50 scales, anal fin rays 25 and pectoral fin rays 14, total vertebral count 43, branchial toothplate count five. Tooth plates are present only on the outer side of the first gill arch and absent on the inner side of the same arch.

Colour: Grey to brown on sides, pale yellow to white ventrally, pectoral fin with 7 to 8 bars of alternating black and white bars.

Remarks: The report extends its distribution to Arunachal Pradesh.

***Channa gachua* (Hamilton)
(Image 6)**

Ophicephalus gachua, Hamilton, 1822:68, 367. (type locality: Ponds and ditches of Bengal)

Materials examined: 8 exs., 3.iii.2004, 112.8-112.9mm SL, Nambul River, Singda, Manipur, India, coll. S. Sanjabihari, MUMF-Per/0004; 3 exs., 29.i.2007, 112.8-112.82mm SL, Deopani River, Rowang, Lower Devang valley District, Arunachal Pradesh, India, coll. K. Nebeshwar, MUMF-Per/0046.

Distribution: Afghanistan in the west to Indonesia through South and Central Asia (Eschmeyer 2007)

Diagnosis: A species of *Channa* with dorsal fin rays 32-37; lateral line scales 39-48, pelvic fin shorter than half the pectoral fin length, pectoral fin rays 15-17, anal fin rays 21-27, and caudal fin rays 12, maxilla and premaxillary process extending to vertical level of the posterior end of the orbit, one or two large cycloid scale on each side of lower jaw undersurface,



Image 1. Side view of *Channa amphibeus* (ZSI F 11435/1, 184.6mm SL)

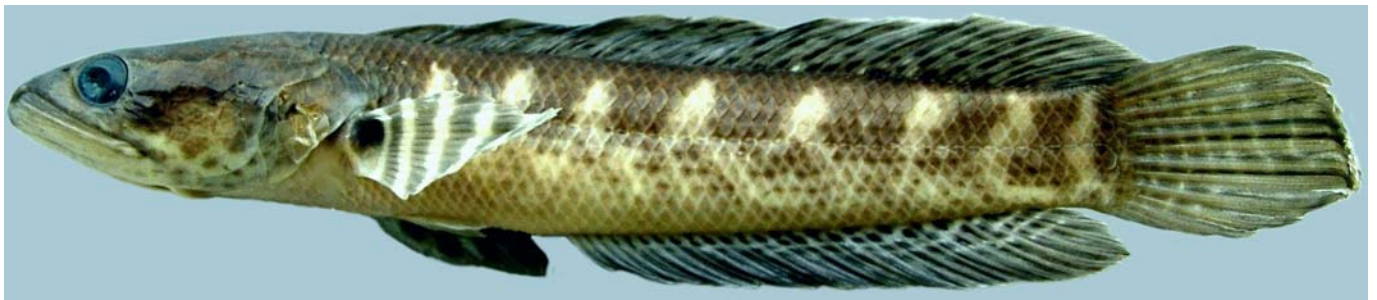


Image 2. Side view of *Channa aurantimaculata* (GUMF uncat.)

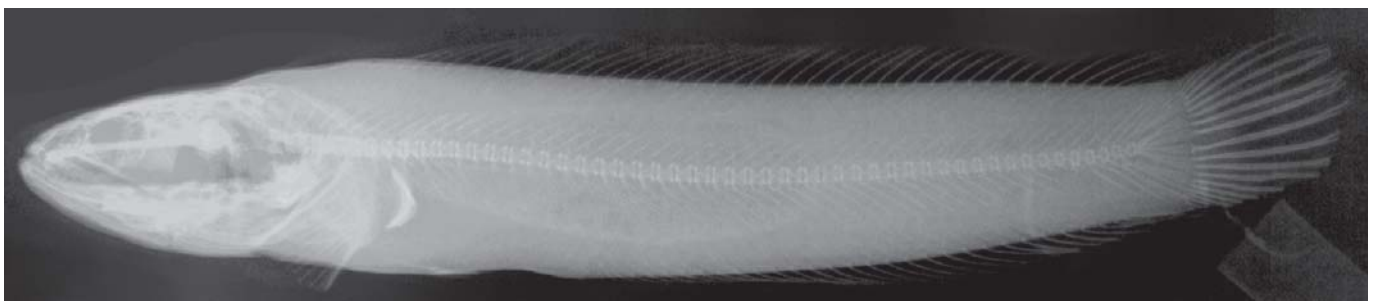


Image 3. Radiograph showing skeleton of *Channa aurantimaculata* (MUMF-Per/0001, 131.2mm SL)



Image 4. Side view of *Channa barca* (MUMF-Per/0044, 295.0mm SL)



Image 5. Side view of *Channa bleheri* (GUMF uncat)



Image 6. Side view of *Channa gachua* (MUMF uncat., juvenile)



Image 7. Side view of *Channa marulius* (GUMF uncat)



Image 8. Side view of *Channa punctatus* (GUMF uncat.)

cephalic sensory pores single, total vertebral count 43, branchial toothplate count 9.

Colour: Dorsal, anal and caudal fin margins white. There is often a large ocellus with a light edge on the last five dorsal rays in the young, body black getting lighter ventrally and abdomen creamish.

Remarks: The materials examined agree with the characters of ZSI specimen (ZSI- F- 2705/1), 1 ex, (date unknown), Bulagunj, Sulhet (Sylhet, Bangladesh), 246mm SL.

***Channa punctatus* (Bloch)**
(Image 7)

Ophicephalus punctatus, Bloch, 1793:139 [type locality: no locality].

Materials examined: 8 exs., 3.iii.2004, 95.6-105.9mm SL, Nambul River, Singda, Manipur, India, coll. S. Sanjabihari, MUMF-Per/0013; 3 exs., 29.i.2007, 96.0-101.1mm SL, Teju River, Teju district, Arunachal Pradesh, India, coll. K. Nebeshwar, MUMF-Per/0049.

Distribution: Afghanistan to Myanmar through Sri Lanka. Pakistan. Nepal. Bangladesh and Yunnan (China) (Eschmeyer, 2007).

Diagnosis: A species of *Channa* with scales on cheek 4-6, pelvic fin longer than half pectoral fin length, pectoral fin with no bars, lateral line scales 35-40, dorsal fin rays 28-32, lower jaw with 3-6 canines behind a single row of villiform teeth, anal fin rays 19-21, body with two rows of bars, maxilla and premaxillary processes extending to vertical level of beyond the middle of orbit, sides of lower jaw with one large cycloid scale, cephalic sensory pores single, total vertebral count 35, branchial toothplate count eight.

Colour: Brown to dark green on flanks, pale yellow ventrally, several dark spots on body.

Remarks: The materials examined agree with the characters of ZSI specimen (ZSI- F-7688/1), 1 ex. from Bhagmati River., Purnea, Champaran, Bihar, India, 144.6mm SL.

***Channa stewartii* (Playfair)**
(Image 8)

Ophiocephalus stewartii, Playfair, 1867:14 (type locality: Cachar, Assam)

Materials examined: 4 exs., 29.i.2007, 102.9-113.5mm SL, Deopani River, Rowing, Lower Devang valley District, Arunachal Pradesh, India, coll. K. Nebeshwar, MUMF-Per/0021; 3 exs., (date unknown), 110.8-112.8mm SL, Assam, India, coll. M.M. Goswami, GUMF uncat.

Distribution: India: Manipur - Barak River (Brahmaputra drainage); Eastern Himalaya, Nepal. (Eschmeyer 2007).

Diagnosis: A species of *Channa* with small black spots scattered on sides of body, dorsal fin rays 37-41, and anal fin rays 24-27, lateral line scales 45-53, eyes moderate, mouth large, pelvic fin about 1/3 as long as pectoral fin, 4-5 bars on the pectoral fin, head slightly broad with blunt snout, sides of lower jaw with two large cycloid scale, cephalic sensory pores single, total vertebral count 44, branchial toothplate count seven.

Colour: Light ash to dark brown. Almost all the scales with well defined circular black spots, pectoral fins spotted in zones.

Remarks: They are normally found only in the lower altitudes in the Barak and its tributaries. Often found feeding on young shoots of bamboo plants in swampy areas from rivers.

***Channa marulius* (Hamilton)**
(Image 9)

Ophicephalus marulius, Hamilton, 1822:65, 367. (type locality: India)

Materials examined: 1 ex., 29.i.2007, 151.6 mm SL, Teju River, Teju district, Arunachal Pradesh, India, coll. K. Nebeshwar, MUMF-Per/0025; 5 exs., 5.iv.2004, 97.8-151.4mm SL, Chindwin Basin, Moreh, India, coll. Vishwanath and party, MUMF-Per/0026; 5 exs., 19.iii.1999, 488.0mm SL, Barak River, Vanchengphai, Tamenglong district, India, coll. K. Nebeshwar, MUMF uncat.

Distribution: Pakistan in the west through South China, Thailand, Laos and Vietnam (Eschmeyer 2007).

Diagnosis: A species of *Channa* with a large black ocellus on upper caudal fin base; 3 white spots on body. Dorsal fin rays 50-55, anal fin rays 31-35, sides of lower jaws with no scales, lateral line scales 60-70, 4-5 ocelli, presence of a sharp distinct pointed ridge of isthmus and anterior to it many longitudinal striae are present, lower jaw with 7 to 18 canines behind a single row of villiform teeth which deepens to 5 or 6 rows on symphysis, teeth on vomer, cephalic sensory pores not single, total vertebral count 62, branchial toothplate count 16.

Colour: A well-marked ocellus, brown surrounded by a ring paler than the ground-colour, on the upper half of the base of caudal fin. Five or six dark oval blotches on flank which terminate below lateral line, below lateral line between blotches pale yellow with reddish tinge distinct white spots scattered on body. An orange band running from eye to middle of caudal fin in Juveniles.

Remarks: This species is avoided in culturable waters because of its carnivorous habit. It grows to large size as for instance it has been reported that in Maharashtra this snake head grows up to 180cm in length and attains about 30kg in weight.

***Channa striata* (Bloch)**
(Image 10)

Ophicephalus striatus Bloch, 1793: 141(type locality: Tranquebar, India)

Materials examined: 8 exs., 21.iii.2007, 164.8-187mm SL, streams near Imphal valley, Manipur, India, coll. Geetakumari Kh, MUMF-Per/0031; 4 exs., 6.vii.2006, 170.0-185.5mm SL, Gomti River, Barak Basin, Agartala, India, coll. W. Vishwanath, MUMF uncat.; 2 exs., 8.viii.2006, 185.5-186.6mm SL, Ujjain market, Guwahati, India, coll. W. Vishwanath, MUMF uncat.

Distribution: Pakistan in the west through China, Thailand, Malaysia and Indonesia; (Eschmeyer 2007).

Diagnosis: A species of *Channa* with dorsal fin rays 42-45, anal fin rays 25-29, lateral line scales 55-65, mouth large, and lower jaw 4-7 canines behind a single row of villiform teeth, dorsal and anal fins slightly darker in color than body maxilla and premaxillary process extending to vertical level of beyond posterior margin of orbit, presence of a sharp pointed ridge at the mid-ventral part of isthmus and anterior to it many longitudinal striae are present, cephalic single pores not single, total vertebral count 54, branchial tooth plate count 13.

Colour: Body with chevron-shaped bars pointing forward, more distinct lower part. Dorsal fin with 5 inter-radial bands on the last 4 rays and 5th to 7th rays has one band at base.

Remarks: The materials examined agree with the characters



Image 9. Side view of *Channa stewartii* (MUMF-Per/0021, 102.9mm SL)



Image 10. Side view of *Channa striata* (GUMF uncat.)



Image 11. a - *Channa striata* (MUMF-Per/0032, 164.8 mm SL), opercula stretched to show V-shaped isthmus; b - *Channa gachua* (MUMF-Per/0004, 112.8 mmSL) to show U-shaped isthmus

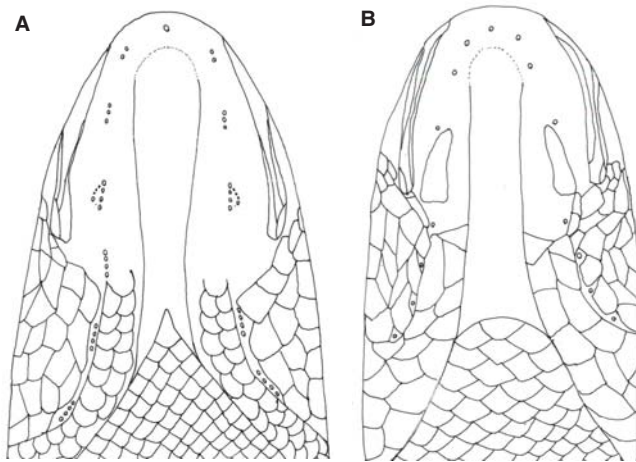


Figure 1. Ventral view of a. *Channa marulius* and b. *Channa gachua* showing sensory pores and sides of lower jaw. (MUMF-Per/0025, 151.6mm SL) and (MUMF-Per/0004, 112.8mm SL) respectively.

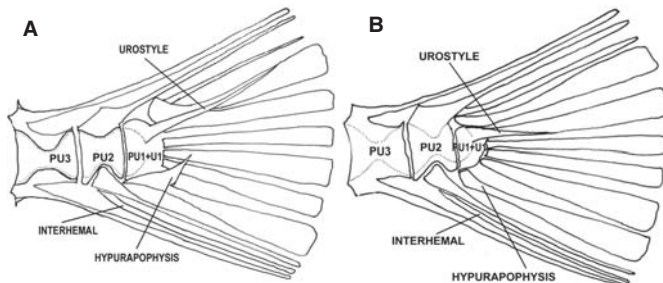


Figure 2. Caudal skeleton of a. *Channa marulius* (MUMF-Per/0025, 151.6mm SL) and b. *Channa gachua* (MUMF-Per/0004, 112.8mm SL)

of ZSI specimen (ZSI-F-12922-12923 collected by Dr. H.S. Preethi from near its type locality, i.e., Cheyvers River near Razampeta, 196.3– 247.6 mm SL.

Morphology

Isthmus: (Image 11) The isthmus is V-shaped, sharp; pointed heading towards the posterior side of the head (in preserved specimen) in *marulius* group and it is U-shaped in *gachua* group.

Sensory pores: (Fig. 1) The cephalic sensory pore which is present on the ventral side of the head is in group in case of *marulius* and it is single in *gachua* group.

Scales on the lower jaw: (Fig. 1) Scales are absent on the lower jaw of *marulius* group and one or two pairs of scales are present on each side of the lower jaw of *gachua* group.

Osteology

Toothplates: In *marulius* group 3–4 branchial tooth plates are present in the epibranchial region and the tooth present in this group is very prominent canine and conical like whereas in *gachua* group only one or no tooth plates are found in the epibranchial region and less prominent compared to the tooth present in the *marulius* group.

Caudal skeleton: (Fig. 2)

Hypurapophysis: In *marulius* group hypurapophysis are very prominent and spine like facing towards the urostyle, and in *gachua* group hypurapophysis are weakly developed.

“Interhemal spine”: In all the species studied, an elongated bone is found between last two hemal spines (PU2 and PU3). The bone is here termed as “interhemal spine”.

Urostyle: The urostyle is long and elongated in *marulius* group whereas in *gachua* group it is short.

DISCUSSION

Hora's (1921) list of fishes from Chindwin basin, Manipur included *C. harcourtbutleri* (Annandale). The species was later synonymised with *C. gachua* by Hora & Mukerji (1934). Distribution of *C. harcourtbutleri* in Manipur, India is doubtful. While resurrecting synonymy of the species with *C. gachua*, Ng et al. (1999) reported the species to be distributed in Inle lake, Mynamar only. Sen's (1985) list of *Channa* of northeastern India included *C. orientalis* which is distributed in Sri Lanka only. Courtenay et al. (2004) clearly noted that *C. orientalis* is endemic to Sri Lanka which has been always confused with *C. gachua*.

While examining *Channa gachua* from different parts of South and Southeast Asia, Ng et al. (1999) observed many small black spots on the body of Indochinese specimens but not in those of Indian and Sundaic specimens. They suspected

Key to species of genus *Channa* of north-east India

1. V- shaped sharp isthmus, cephalic sensory pores arranged in groups 8
U- Shaped isthmus, cephalic sensory pores arranged singly 2
2. Pelvic fin present, tooth plates present on both sides of the first gill arch 3
Pelvic fin absent, tooth plates present only on the outer side of the first gill arch *C. bleheri*
3. Pectoral fin with transverse black bars 4
Pectoral fin with no transverse black bars 7
4. Numerous black spots on sides of body 5
No numerous black spots on sides of body 6
5. Pectoral fin with dotted black bars, lateral line scales 62-63 *C. barca*
Pectoral fin with solid black bars, lateral line scales 45-49 *C. stewartii*
6. 7-8 large irregular bars on upper half of body, lateral line scales 52-54 *C. aurantimaculata*
No bars on upper half of body, lateral line scales 45-46 *C. gachua*
7. Lateral line scales 35-40, dorsal-fin rays 28-32 *C. punctata*
Lateral line scales 81; dorsal-fin rays 50 *C. amphibeus*
8. Presence of ocellus on the caudal fin, 4-5 ocelli on sides of the body *C. marulius*
No ocellus on the caudal fin, body with chevron-shaped bars pointing upward *C. striata*

Table 1. Morphological characters of *Channa* species (% SL, except SL in mm) under study(1 - *C. amphibeus*; 2 - *C. aurantimaculata*; 3 - *C. barca*; 4 - *C. bleheri*; 5 - *C. gachua*; 6 - *C. marulius*; 7 - *C. punctatus*; 8 - *C. striata*; 9 - *C. stewartii*)

Characters	1	2	3	4	5	6	7	8	9
N	1	5	4	2	11	11	11	14	7
Standard length	184.6	121.9-131.2	295-297	148.4-149.1	112.8-246	97.8-151.6	95.6-144.0	164.8-187.0	102.9-113.5
Body depth	17.6	13.5-17.02	15.03-17.32	17.1-17.6	18.06-18.8	16.4-16.9	19.5-21.9	15.7-16.7	16.42-18.3
Head length	27.6	28.6-28.9	20.98-23.76	25.2-25.9	28.9-30.05	29.7-31.4	35.4-35.9	32.5-32.9	29.9-31.3
Head depth at nape	50.4	43.8-47.01	60.1-61.1	61.1-62.4	56.04-60.2	42.34-43.24	52.9-53.5	41.7-41.9	46.6-55.7
Head depth at eye		28.7-34.5	34.8-34.9	34.3-36.8	33.6-36.3	23.1-24.6	31.3-34.1	28.03-28.8	31.6-33.3
Head width(max)	59.6	62.2-69.02	58.6-58.8	75.2-76.1	65.5-70.0	50.5-56.3	56.4-59.4	49.7-53.4	63.5-68.8
Head width(eye)		50.9-52.9	45.7-46.0	50.19-51.03	45.4-48.9	39.9-40.7	37.6-41.2	38.4-41.4	46.7-51.03
Snout length	22.0	23.9-24.7	19.6-19.9	24.10-25.13	24.2-27.2	20.5-22.2	19.1-20	20.9-21.3	23.9-25.07
Eye diameter	14.7	14.9-15.06	11.92-12.75	13.2-13.5	15.04-17.4	13.7-19.2	13.7-15.9	12.2-12.8	15.8-18.08
Interorbital space	23.5	34.9-36.9	28.30-33.33	38.3-39.4	36.5-38.2	29.5-30.6	26.6-29.5	28.9-31.8	33.6-35.7
Dorsal fin base length	75.0	59.4-63.6	67.90-70.68	63.4-64.4	58.25-61.6	59.7-61.7	50.9-56.3	53.5-56.4	57.7-63.1
Pectoral fin length	16.8	16.7-19.36	15.40-15.59	17.3-17.4	17.5-20.12	14.2-14.9	18.8-21.9	16.7-17.33	17.5-19.9
Ventral fin length	5.6	8.08-8.24	6.70-6.80	Absent	8.15-9.8	10.5-14.2	14.16-15.06	12.14-13.7	7.9-9.93
Anal base fin length	46.6	39.8-39.9	42.72-44.23	40.1-41.4	36.5-43.7	37.5-39.4	38.7-42.2	32.9-36.4	39.7-40.8
Upper jaw length	48.4	41.5-48.09	45.69-55.8	46.2-47.4	38.6-42.2	42.6-43.9	34.2-36.8	44.09-44.5	42.2-43.7
Lower jaw length	47.4	44.6-48.6	46.6-46.9	47.4-48.7	46.18-46.3	32.2-33.2	41.5-44.4	45.9-46.9	41.5-48.1
Pelvic to anal distance	14.3	12.9-14.3	14.1-14.9		15.9-18.9	22.3-25.4	14.2-19.7	16.22-17.9	14.8-16.12
Scales in transverse. Row		15½- 16½	15 ½	11½	11½ -13 ½	21½-22 ½	13½-14 ½	18½	13 ½-14½
Dorsal fin rays	50	45-47	50-51	37	32-37	50-55	28-32	42-45	37-41
Pectoral fin rays	15	14-16	15-16	14	17	17	15-16	17-18	16
Anal fin rays	35	28-30	33-34	25	21-27	31-35	19-21	25-29	24-27
Caudal fin rays		15	13	14	12	14	15	15	14
Lateral line	81	51-54	62-63	46-50	39-48	60-70	35-40	55-65	45-53
Vertebrae		51	56	43	43	62	35	54	44

involvement of more than one species. As Hamilton (1822) described the species from northern Bengal, which belongs to Ganga drainage, the specimens under the present study, which is within the range of its natural distribution, should be *C. gachua* sensu stricto. The specimens from Manipur also agree with the description of Brahmaputra specimens.

The morphological and osteological comparison of the present 9 species of *Channa* examined indicates that they constitute 2 phyletic groups each consisting of species sharing these morphological features almost completely. The two groups are *marulius* group and *gachua* group. The *marulius* group comprises of *C. marulius* and *C. striata* and *gachua* group comprises of *C. amphibeus*, *C. aurantimaculata*, *C. barca*, *C. bleheri*, *C. gachua*, *C. punctatus* and *C. stewartii*. The morphological similarity as seen among species in each group is sufficient to suggest that members of the same group are descendents from a common direct ancestral stock.

Morphologically the members of the *marulius* group is differentiated from the *gachua* group in having a prominent V-shaped sharp isthmus, grouped sensory pores arrangement, absence of big cycloid scales on the lower jaw whereas the members of *gachua* group have U-shaped isthmus, single sensory pores arrangement, presence of one or two big cycloid scales on each side of the lower jaw.

Gill rakers are absent in Channid fishes studied. Instead, branchial tooth plates are present on the gill arches Greenwood (1976). The number of tooth plates ranges from 5-16 in different Channid species. *Marulius* group has 3-4 numbers of branchial tooth plates in the epibranchial, presence of a prominent spine shaped hypurapophysis in the parhypural and presence of an elongated urostyle whereas the members of the *gachua* group has one or no branchial tooth plates in the epibranchial region, no spine shaped hypurapophysis and presence of a short urostyle. Tooth plates count are highest in

marulius group.

Although *C. bleheri* is included in the *gachua* group, the species does not have pelvic fin. Another very significant character of the species is that tooth plates are present only on the outer side of the first gill arch and absent on the inner side of the same arch. Examination of more specimens would come out with interesting results.

In caudal skeleton of the genus studied, the last three caudal vertebrae support the caudal fin. The last fused centrum bears one parhypural, five hypural plates, one urostyle and one epural. The epural bone is thin, backwardly curved and located anteriorly to the urostyle. An elongated bone which has no connection with any of the centrum is present between the hemal spine of preuralcentrum 2 and preuralcentrum 3 (i.e anterior to parhypural). Distal tip of this bone supports the caudal-fin ray ventrally. The bone is referred as "interhemal spine". The presence of interhemal spine is a very specific character found in all the species of *Channa* under study. The illustration of Day (Plate IC, 1909) also have the interhemal spine however, he treated it as hypural.

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Author contribution:

W. VISHWANATH The study: Supervision of taxonomy and phylogeny of freshwater fishes of northeastern India. Current paper: Supervised the work and helped in identifying the species. KH. GEETAKUMARI The study: Undergoing research in the Perciformes fishes of northeastern India. Current paper: As a part of the research work, all the channid fishes of the region has been collected and identified. The paper is a part of the results.

