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CHANNA PARDALIS, A NEW SPECIES OF SNAKEHEAD (TELEOSTEI: CHANNIDAE) FROM MEGHALAYA, NORTHEASTERN INDIA

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Abstract: *Channa pardalis*, a new species of snakehead, is described from Khasi Hills, Meghalaya, northeastern India. This species can be distinguished from its congeners by a unique colour pattern consisting of numerous large black spots on the post-orbital region of the head, opercle and body; a broad white and black margin to the dorsal, anal and caudal fins; 36–37 dorsal fin rays; 24–25 anal fin rays; 44–45 pored scales on the body and two scales on the caudal fin base; 4½ scales above lateral line and 6½ scales below lateral line; 45 vertebrae and the palatine with two rows of teeth: outer row with numerous minute teeth and inner row with short, stout inward curved teeth.

Keywords: *Channa melanostigma*, *Channa stewartii*, eastern Himalaya, northeastern India, taxonomy.

Snakeheads of the family Channidae are characterized by accessory air-breathing organs, which are modified expanded epibranchials situated in the suprabranchial cavity in the head (Liem 1980). These fish are distributed in tropical Africa, parts of the Middle East and Asia, and inhabit a wide variety of freshwater habitats ranging from hill streams to derelict swamps (Geetakumari & Vishwanath 2011). Currently there are 35 valid species in the genus *Channa*, many of which are valued as food fish and a few that are popular in the aquarium trade. The Eastern Himalayan region harbors 10 endemic species of snakeheads (Britz 2013), some of which were

recently discovered (Musikasinthorn 2000; Geetakumari & Vishwanath 2011; Britz 2013).

Playfair (1867) described *Ophiocephalus stewartii* (currently assigned to *Channa*) from Cachar, Assam, characterized by “some larger teeth in the lower jaw and on the vomer and the palatine bone...most of the scales behind the roots of the pectorals have a round black spot in the centre...in young examples the pectorals have transverse darker cross bands...etc” (Fig. 1). For more than 150 years, *C. stewartii* was the only known *Channa* species with round black spots on the body until Britz (2008) described *C. ornatipinnis* and *C. pulchra* from Myanmar with spots on the body similar to *C. stewartii*. Subsequently, Geetakumari & Vishwanath (2011) described *C. melanostigma* from Arunachal Pradesh, northeastern India, a species similar to *C. stewartii*. Recently, I had an opportunity to examine a colourful species of *Channa* from the Khasi Hills, Meghalaya, northeastern India, with large well-defined black spots on post-orbital region of the head, opercle and body. Detailed comparison with topotypic *C. stewartii* revealed that this was a species hitherto unknown to science, which is described herein as *Channa pardalis* sp. nov.

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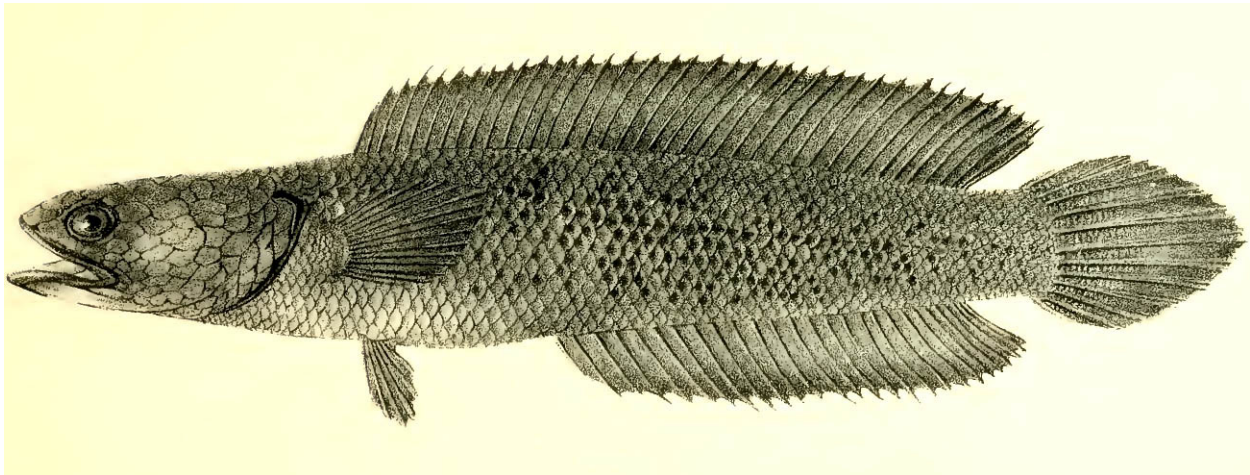


Figure 1. Original drawing of *Ophiocephalus stewartii* in Playfair (1867: Pl. 3). Image flipped to face left.

MATERIAL AND METHODS

Collected specimens were fixed in 10% formalin and preserved in 70% alcohol. Specimens examined in this study are registered in the collections of the Bombay Natural History Society (BNHS), Mumbai, India; Southern Regional Centre, Zoological Survey of India, Chennai, India (ZSI/SRC). Additional material are in the collection of J.D. Marcus Knight (MKC), Chennai, India. Methods for taking counts and measurements follow Musikasinthorn (1998) and Britz (2008). Measurements were made with digital calipers to the nearest 0.1 mm. Numbers in parenthesis after a count denotes the frequency of that count. Osteological preparations were made following the single-staining procedure of Taylor & Van Dyke (1985) and osteological nomenclature follows Britz (2008). Vertebrae were counted from two cleared and stained specimens (MKC 429 and 437). Photographs were taken with Olympus SP570 UZ digital camera using super-macro mode. Data from Musikasinthorn (2000) and Britz (2008, 2013) were used for comparison. Original descriptions of *Ophiocephalus aurantiacus*, *O. kelaartii*, *O. gachua* var. *basalis*, *Ophicephalus montanus* and *O. nigricans* were also used for comparison.

Channa pardalis sp. nov. (Image 1, 2A)

urn:lsid:zoobank.org:act:394A6CAB-1802-48FF-AD89-5264F466474B

Holotype: BNHS FWF 181, 127.5mm SL; streams in Nongstoin (25.52°N & 91.27°E; ~1,400m), West Khasi Hills, Meghalaya, India, coll. A. Rao, December 2012.

Paratypes: BNHS FWF 182, 141.1mm SL; ZSI/SRC F 8954, 139.3mm SL, Collection information same as holotype.

Additional material: MKC 429, 102.1mm SL; MKC 437, 114.2mm SL, both the specimens were cleared and stained for osteology. Collection information same as holotype.

Diagnosis: *Channa pardalis* sp. nov. is diagnosed from all other species of *Channa* in having a unique colour pattern consisting of numerous large black spots on the post-orbital region of the head, opercle and body; a broad white and black margin to the dorsal fin, anal fin and caudal fin; 36–37 dorsal fin rays; 24–25 anal fin rays; 44–45 pored scales on the body and two scales on the caudal fin base; 4½ scales above lateral line and 6½ scales below lateral line; 45 vertebrae and the palatine with two rows of teeth: outer row with numerous minute teeth and inner row with short, stout inward curved teeth.

Description

See Table 1 for morphometric data and images 1 and 2A for general appearance. Body elongate, round in cross section anteriorly its width a little less than its depth; gradually becoming laterally compressed towards caudal peduncle. Dorsal profile of head gently curved anteriorly, ventral profile almost straight. Caudal peduncle deep, its depth greater than its length. Head large, dorso-ventrally flattened, about one-third standard length its widest portion between eye and opercle. Eyes small, located anteriorly on head, their diameter less than the snout length.

Mouth large, oblique, lips thick, angle of gape extending beyond the posterior margin of the eye. Lower jaw projecting slightly beyond upper jaw. Scales on cheeks in 4(1)–5(4) rows. Both jaws with multiple rows of sharp, pointed teeth. Two rows of teeth on the lower jaw, an outer row of numerous minute slender pointed teeth



Image 1. *Channa pardalis* holotype, BNHS, FWF 181, 127.5mm SL.

and single inner row of large uniform sized teeth. Vomer with six small sharp, pointed teeth and four canine-like teeth. Two rows of teeth on the palatine, outer row with numerous minute teeth and inner row with short, stout inward curved teeth. Fifth ceratobranchial slender, with numerous long sharp inward pointing teeth (Image 3A).

Lateral line with 44(2)–45(3) pored scales on the body and two scales on the caudal fin base, extending from shoulder girdle in a horizontal line, dropping one scale row at scale 14(1) or 15(4), then continuing horizontally to caudal peduncle. 4½ scales above lateral line and 6½ scales below lateral line at anal-fin origin. Pre-dorsal scales 14(1) – 15(4). Vertebrae 45 (40 abdominal +5 caudal). Dorsal-fin rays 36(1) – 37(4); anal-fin rays 24(4) – 25(1); pectoral fin rays 14; caudal-fin rays 13(6+7).

Colouration

In alcohol (Image 1), dorsum, sides of head and body uniformly dark grey gradually becoming lighter towards the throat and abdomen. Fifteen to twenty well defined black spots on the post-orbital region of the head, opercle and with numerous black spots along the flanks extending into the dorsal fin and caudal fin, which sometimes fade to become dark grey and on prolonged preservation become inconspicuous. Dorsal, anal and caudal fins dark grey with a broad white and black margin. Pectoral fin cream with three or four dark grey semi-circular bands. Pelvic fin grey with a white margin.

Live specimens (Image 2A) are bluish-grey in colour; top of the head and opercular region bright blue. 15–20 well defined black spots on the post-orbital region of the head and opercle. Body with bluish dorsum gradually becoming grey towards the abdomen, with numerous

Table 1. Morphometric data of *Channa pardalis* sp. nov. (n = 5). Ranges include values of holotype.

Specimen	Holotype BNHS FWF 181	Paratype BNHS FWF 182	Paratype ZSI/SRC F 8954	MKC 429	MKC 437	Range (mean ± SD)
Standard length in mm	127.5	141.1	139.3	102.1	114.2	102.1–141.1
In percent SL						
Head length	28.3	30.9	30.2	32.6	33.5	28.3–33.5 (31.1 ± 2.0)
Head depth	13.2	13.9	13.4	13.1	13.7	13.1–13.9 (13.5 ± 0.3)
Head width	19.2	20.3	19.1	20.4	20.8	19.1–20.8 (19.9 ± 0.7)
Body depth	14.1	15.3	14.4	13.8	15.8	13.8–15.8 (14.7 ± 0.8)
Body width	12.6	12.6	12.6	12.2	12.8	12.2–12.8 (12.5 ± 0.2)
Pre-dorsal length	34.1	33.0	35.0	35.1	38.2	33.0–38.2 (35.0 ± 1.9)
Pre-anal length	48.7	52.9	52.7	54.0	57.4	48.7–57.4 (53.1 ± 3.1)
Pre-pectoral length	29.4	31.4	30.2	28.6	32.4	28.6–32.4 (30.4 ± 1.5)
Pre-pelvic length	33.1	34.9	35.3	34.5	38.3	33.1–38.3 (35.2 ± 1.9)
Dorsal fin length	60.9	61.3	60.6	64.0	64.1	60.6–64.1 (62.2 ± 1.7)
Anal fin length	41.0	40.6	39.4	39.5	42.8	39.4–42.8 (40.7 ± 1.3)
Pectoral fin length	19.8	18.4	18.8	19.7	19.9	18.4–19.9 (19.3 ± 0.6)
Pelvic fin length	9.0	8.7	8.2	9.4	9.2	8.2–9.4 (8.9 ± 0.4)
Caudal peduncle length	8.2	8.2	8.0	8.8	8.7	8.0–8.8 (8.4 ± 0.3)
Caudal peduncle depth	9.8	11.8	11.5	9.7	9.9	9.7–11.8 (10.6 ± 1.0)
Snout length	6.3	5.9	6.2	5.6	6.6	5.6–6.6 (6.1 ± 0.3)
Eye diameter	4.3	4.7	4.3	4.1	4.4	4.1–4.7 (4.4 ± 0.2)
Pre-orbital depth	8.3	9.6	8.5	8.9	9.1	8.3–9.6 (8.9 ± 0.4)
Post-orbital depth	11.4	11.9	11.3	11.8	12.0	11.3–12.0 (11.7 ± 0.3)
Post-orbital length	18.9	20.2	21.3	21.4	22.1	18.9–22.1 (20.7 ± 1.2)
Inter-orbital width	10.4	10.4	10.2	10.6	10.6	10.2–10.6 (10.4 ± 0.1)
Upper jaw length	13.7	13.5	14.3	13.9	15.1	13.5–15.1 (14.2 ± 0.6)
In percent HL						
Snout length	22.4	19.2	20.7	17.4	19.7	17.4–22.4 (19.9 ± 1.8)
Eye diameter	15.2	15.3	14.4	12.6	13.2	12.6–15.3 (14.1 ± 1.2)
Head depth	46.8	45.0	44.3	40.2	40.9	40.2–46.8 (43.4 ± 2.8)
Head width	67.8	65.8	63.9	62.9	62.0	62.0–67.8 (64.5 ± 2.4)
Pre-orbital depth	29.3	30.8	28.3	27.3	27.9	27.3–30.8 (28.7 ± 1.5)
Post-orbital depth	40.4	38.6	37.5	36.9	35.7	35.7–40.4 (37.8 ± 1.8)
Post-orbital length	66.7	65.4	71.6	65.9	66.8	65.4–71.1 (67.3 ± 2.3)
Inter-orbital width	36.8	33.9	34.1	32.9	31.7	31.7–36.8 (33.9 ± 1.9)
Upper jaw length	48.4	43.7	47.5	42.6	45.2	42.6–48.4 (45.5 ± 2.4)

black spots along the flanks extending into the dorsal fin and caudal fin. Dorsal fin, anal fin and caudal fin bright blue with a broad white and black margin. Pectoral fin with bright blue spot at the base, and with three or four alternating pale orange and grey semi-circular bands which fade towards the distal part of the fin which is dark grey. Pelvic fin grey with a white margin. Sclera dark orange with two orange patches: one on the anterior margin of the orbit and the other below the orbit.

Etymology

The specific epithet '*pardalis*' is a Latin adjective meaning 'Leopard' referring to the conspicuous spots the species has, similar to a leopard.

Distribution

Channa pardalis sp. nov. is currently known only from the Khasi Hills, Meghalaya, northeastern India.



Image 2. *Channa pardalis*: A, paratype, ZSI/SRC F 8954, 139.3mm SL, showing live colouration, West Khasi Hills, Meghalaya. *C. stewartii*: MKC 100, Cachar, Assam, B, 109.2mm SL, showing live colouration, C, 128.6mm SL, showing colouration in preservative. *C. melanostigma*: MKC 012, Tinsukia, Assam, D, 118.1mm SL showing live colouration, E, 122.9mm SL, showing colouration in preservative.

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Image 3. Fifth ceratobranchial of *Channa* species: A - *C. pardalis*; B - *C. stewartii*; C - *C. melanostigma*; D - *C. gachua*.

Note

Channa pardalis sp. nov. is known in the ornamental fish trade as *Channa* sp. Meghalaya leopard.

DISCUSSION

Britz (2008) proposed the '*Channa gachua* species group' comprised of species with pectoral fins having a varying number of dark and light semicircular bands. In addition to *C. orientalis*, *C. gachua*, *C. burmanica*, *C. bleheri* and *C. barca*, Britz (2008) also included *C. stewartii*, *C. aurantimaculata*, *C. ornatipinnis* and *C. pulchra* to the '*C. gachua* species group'. Two other recently described species, i.e., *C. melanostigma* and *C. andrao* also belong to the *C. gachua* species group. *Channa pardalis* sp. nov. in view of its pectoral fins having the characteristic semicircular dark and light bands, unquestionably belongs to this group.

Channa pardalis can be distinguished from *C. orientalis*, *C. burmanica*, *C. bleheri* and *C. andrao* by the presence of pelvic fins, and from *C. ornatipinnis* and *C. pulchra* by the pectoral fin having three or four alternating pale orange and grey semi-circular bands which fade towards the distal part of the fin (vs. four to five semicircular, narrow white bands alternating with brown or black bands). *Channa pardalis* can be further distinguished from both *C. ornatipinnis* and *C. pulchra* in having $6\frac{1}{2}$ (vs. $7\frac{1}{2}$) scales below lateral line at anal-fin origin, absence of

black blotches on the anterior third of the dorsal fin and absence of parallel, oblique, linear white marks at anal fin base.

Though *C. pardalis* superficially resembles both *C. stewartii* and *C. melanostigma*, it can be easily distinguished from both by the presence of 15–20 well-defined black spots on the post-orbital region of the head and opercle, $6\frac{1}{2}$ (vs. $7\frac{1}{2}$) scales below lateral line at anal-fin origin, 45 (vs. 48 and 50–51) vertebrae respectively and a more slender fifth ceratobranchial (Image 3 A–C). *Channa pardalis* can be further distinguished from *C. stewartii* by having 36–37 (vs. 39–40) dorsal fin rays and 44–45 + 2 (vs. 47–48 + 2) lateral line scales, and from *C. melanostigma* by the absence (vs. presence) of 14–15 distinct zigzag cross bars on the caudal fin.

Channa pardalis can be distinguished from *C. aurantimaculata* and *C. barca* in having 36–37 (vs. 45–52) dorsal fin rays and 44–45 + 2 (vs. > 50) lateral line scales. Though *C. pardalis* is a part of the *C. gachua* species group it can be distinguished from *C. gachua* by the presence of numerous large black spots on the post-orbital region of the head, opercle and body, 45 (vs. 42) vertebrae and 36–37 (vs. 34–35) dorsal fin rays and a more slender fifth ceratobranchial (Image 3 A, D).

There are quite a few names buried in the synonymy of *C. gachua*. Of these *Ophiocephalus aurantiacus* Hamilton, 1822 (type locality: Goyalpara on the northeastern

frontier of Bengal), *Ophicephalus marginatus* Cuvier, 1829 (type locality: Vizagapattam: see Kottelat 2000) and *O. fuscus* Cuvier, 1831 (type locality: Bengal) are from India. *Channa pardalis* can be distinguished from *O. aurantiacus* by having a bluish dorsum gradually becoming grey towards the abdomen, with numerous black spots along the flanks extending into the dorsal fin and caudal fin, vs. the whole body and fins being of the colour of orange-peel, with some irregular stains of a redder hue, especially on the sides of the head, and on the pectoral and tail fins. *Channa pardalis* can be distinguished from *C. fuscus* and *C. marginatus* (which were similar to *C. gachua*), in having more than 40 lateral line pored scales and by the presence of conspicuous black spots on the post-orbital region of the head, opercle and on the body.

Two other names, *Ophicephalus montanus* M'Clelland & Griffith, 1842 (type locality: Afghanistan?) and *Ophiocephalus kelaartii* Günther, 1861 (type locality: Sri Lanka) are also currently synonyms of *C. gachua* (Kottelat 2013). *Channa pardalis* can be distinguished from *O. montanus* by having 36–37 (vs. 32) dorsal fin rays and 24–25 (vs. 17) anal fin rays. *Channa pardalis* can further be distinguished from *O. kelaartii* by having 44–45 + 2 (vs. 38) lateral line scales and 24–25 (vs. 22) anal fin rays. One other similar species is *Ophiocephalus gachua* var. *basalis* Günther, 1861 (type locality: East Indies) which is most probably *C. gachua* (Kottelat 2013) as Günther mentions that this species has a black ocellus edged with white on the hindmost part of the dorsal fin when young, typical of *C. gachua*. *Channa pardalis* can be distinguished from *O. gachua* var. *basalis* in having 24–25 (vs. 21–23) anal fin rays and 4½ (vs. 3) scales above lateral line. One other species, *Ophicephalus nigricans* Cuvier & Valenciennes 1831 is currently a synonym of *Channa barca*. *Channa pardalis* can be distinguished from *O. nigricans* by having 36–37 (vs. 50) dorsal fin rays.

As mentioned by Britz (2008) the monophyly of the *Channa gachua* species group needs to be confirmed through phylogenetic studies. Further exploration of remote areas in northeastern India and adjoining areas may probably bring to light more snakehead species new to science or possibly find that some of the species currently synonymous with *C. gachua* to be valid species.

COMPARATIVE MATERIAL

Channa stewartii: MKC 100, 2, 109.2–128.6 mm SL, Cachar, near the border with Meghalaya, Assam, December 2010, A. Rao (128.6mm SL specimen was cleared and stained); MKC 192, 5, 78.1–121.2 mm SL, Jaigaon, Jalpaiguri district, West Bengal, March 2011, A. Rao (121.2mm SL specimen was cleared and stained).

Channa melanostigma: MKC 012, 4, 66.2–122.9 mm SL, Brahmaputra River, Tinsukia, Assam, November 2011, A. Rao (two specimen 120.2 and 122.9 mm SL were cleared and stained).

Channa gachua: MKC 191, 10, 56.6–98.2 mm SL, Ganrapota, North 24 Parganas, West Bengal, March 2011, A. Rao (two specimen 78.9 and 90.9 mm SL were cleared and stained). MKC 182, 1, 52.1mm SL, Meghalaya, India, March 2011, A. Rao. MKC 430, 1, 49.7mm SL, Kaveripattanam, Tamil Nadu, India, July 2015, Nikhil Sood; MKC 431, 6, 56.3–97.9 mm SL, Visakhapatnam, India, July 2015, Pranay Kumar.

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