

***Garra deccanensis*, a new species of labeonine fish (Teleostei: Cyprinidae) from Peninsular India**

Shrikant Jadhav*, **Madasamy Karuthapandi***, **Bungdon Shangningam****,
Deepa Jaiswal* and **C. Shiva Shankar***

Garra deccanensis, a new species, is described from the Godavari and Krishna Rivers, Andhra Pradesh and Telangana States of India. The new species is distinguished from its congeners in having a combination of following characteristics: snout with a prominent short, unilobed proboscis; 15–18 small to medium-sized unicuspид acanthoid tubercles on transverse lobe; 31–32 lateral-line scales; 9–10 predorsal scales, 16 circumpeduncular scales and two black spots, one at the upper angle of the gill opening and the other behind the median posterior margin of the opercle. Based on mitochondrial cytochrome oxidase subunit 1 gene partial sequence, *G. deccanensis* differs from all congeners for which genetic data are available by a raw genetic distance of 6.0–17.8 %.

Introduction

The elongate, small to medium-sized fishes of the labeonine genus *Garra* usually inhabit rapidly flowing rivers and mountain streams, where they cling to the substratum by means of an ‘adhesive’ or ‘suctorial’ disc on the gular region and unciliferous pads on the ventral surfaces of their wide, horizontally-orientated paired fins (Nebeshwar & Vishwanath, 2017). Most have a dull brown to black body with more or less distinct darker stripes between scale rows on the posterior half of the body (Kottelat, 2020). They are widely distributed from Southern China and Borneo

in the east, through southern Asia, the Arabian Peninsula and the Middle East, to Eastern, Central and West Africa (Zhang & Chen, 2002).

Nineteen species of *Garra* are known to occur in Peninsular India (Sudasinghe et al., 2021), of which *G. emarginata*, *G. hughii*, *G. kalakadensis*, *G. menoni*, *G. mlapparaensis*, *G. palaruvica*, *G. surendranathanii*, *G. joshuai*, *G. arunachalamii* and *G. palaniensis* are included in the ‘smooth snout’ species group; and *G. mcclellandi*, *G. mullya*, *G. nethravathiensis*, *G. jerdoni*, *G. platycephala* and *G. periyarensis*, in the ‘transverse-lobe’ species group; while *G. bicornuta*, *G. stenorhynchus* and *G. triangularis*, belong to the ‘snout with proboscis

* Zoological Survey of India, Freshwater Biology Regional Centre, Inner Ring Road, Attapur, Hyderabad-500048 India. E-mails: shrikantjadhavzsi@gmail.com (SJ, corresponding author), kpandi83@gmail.com (MK), deepajzs@gmail.com (DJ), cshivashankarchinna@gmail.com (CSS).

** Zoological Survey of India, Freshwater Fish Section, 27 JL Nehru Road, Kolkata-700053 India.
 E-mail: bdshangningam@gmail.com (BS).

Literature cited

- Barman, A. S., M. Singh, S. K. Singh, H. Saha, Y. J. Singh, M. Laishram & P. K. Pandey. 2018. DNA barcoding of freshwater fishes of Indo-Myanmar biodiversity hotspot. *Scientific Reports*, 8: 8579.
- Edgar, R. C. 2004. MUSCLE: multiple sequence alignment with high accuracy and high throughput. *Nucleic Acids Research*, 32: 1792–1797.
- Englmaier, G. K., N. Vinuela Rodriguez, H. Waibdacher, A. Palandacic, G. Tesfaye, W. Gessl & P. Meulenbroek. 2020. New data on *Garra makiensis* (Cyprinidae, Labeoinae) from the Awash River (Ethiopia) with remarks on its relationships to congeners on the Arabian Peninsula. *Zookeys*, 984: 133–163.
- Ezung, S., B. Shangningam & P. P. Pankaj. 2021. A new fish species of genus *Garra* (Teleostei: Cyprinidae) from Nagaland, India. *Journal of Threatened Taxa*, 13: 18618–18623.
- Geiger, M. F., F. Herder, M. T. Monaghan, V. Almada, R. Barbieri, M. Bariche, P. Berrebi, J. Bohlen, M. Casal-Lopez, G. B. Delmastro, G. P. Denys, A. Dettaï, I. Doadrio, E. Kalogianni, H. Karst, M. Kottelat, M. Kovacic, M. Laporte, M. Lorenzoni, Z. Marcic, M. Ozulug, A. Perdices, S. Perea, H. Persat, S. Porcelotti, C. Puzzi, J. Robalo, R. Sanda, M. Schneider, V. Slechtova, M. Stoumboudi, S. Walter & J. Freyhof. 2014. Spatial heterogeneity in the mediterranean biodiversity hotspot affects barcoding accuracy of its freshwater fishes. *Molecular Ecology Resources*, 14: 1210–1221.
- Gong, Z., J. Freyhof, J. Wang, M. Liu, F. Liu, P. Lin, Y. Jiang, & H. Liu. 2018. Two new species of *Garra* (Cypriniformes: Cyprinidae) from the lower Yarlung Tsangpo River drainage in southern Tibet, China. *Zootaxa*, 4532: 367–384.
- Hamidan, N. A., M. F. Geiger & J. Freyhof. 2014. *Garra jordanica*, a new species from the Dead Sea basin with remarks on the relationship of *G. ghorensis*, *G. tibanicus* and *G. rufa* (Teleostei: Cyprinidae). Ichthyological Exploration of Freshwaters, 25: 223–236.
- Hashemzadeh Segherloo, I., L. Bernatchez, K. Golzarianpour, A. Abdoli, C. R. Primmer & M. Bakhtiary. 2012. Genetic differentiation between two sympatric morphs of the blind Iran cave barb *Iranocypris typhlops*. *Journal of Fish Biology*, 81: 1747–1753.
- Hoang, D. T., O. Chernomor, A. von Haeseler, B. Q. Minh, L. S. Vinh. 2018. UFBoot2: improving the ultrafast bootstrap approximation. *Molecular Biology and Evolution*, 35: 518–522.
- Kalyaanamoorthy, S., B. Q. Minh, T. K. F. Wong, A. von Haeseler & L. S. Jermiin. 2017. ModelFinder: Fast model selection for accurate phylogenetic estimates. *Nature Methods*, 14: 587–589.
- Kottelat, M. 2001. Fishes of Laos. Wildlife Heritage Trust, Colombo, 196 pp.
- Kottelat, M. 2020. *Ceratogarra*, a genus name for *Garra cambodgiensis* and *G. fasciicauda* and comments on the oral and gular soft anatomy in labeonine fishes (Teleostei: Cyprinidae). *Raffles Bulletin of Zoology*, Supplement, 35: 156–178.
- Lyon, R. G., M. F. Geiger & J. Freyhof. 2016. *Garra sindhi*, a new species from the Jebel Samhan Nature Reserve in Oman (Teleostei: Cyprinidae). *Zootaxa*, 4154: 79–88.
- McClelland, M. 1838. Observation on six new species of Cyprinidae with an outline of a new classification of the family. *Journal of Asiatic Society of Bengal*, 7: 941–948.
- Menon, A. G. K. 1964. Monograph of the cyprinid fishes of the genus *Garra*, Hamilton. *Memoirs of Indian Museum*, 14: 173–260.
- Milne, I., D. Lindner, M. Bayer, D. Husmeier, G. McGuire, D. F. Marshall & F. Wright. 2009. TOPALi v2: a rich graphical interface for evolutionary analyses of multiple alignments on HPC clusters and multi-core desktops. *Bioinformatics*, 25: 126–127.
- Minh, B.Q., H. A. Schmidt, O. Chernomor, D. Schrempp, M. D. Woodhams, A. von Haeseler & R. Lanfear. 2020. IQ-TREE 2: new models and efficient methods for phylogenetics inference in the genomic era. *Molecular Biology and Evolution*, 37:1530–1534.
- Mousavi-Sabet, H., S. Vatandoust, Y. Fatemi & S. Eaggerdi. 2016. Tashan Cave a new cave fish locality for Iran; and *Garra tashanensis*, a new blind species from the Tigris River drainage (Teleostei: Cyprinidae). *Fish Taxa*, 1: 133–148.
- Moyon, W.A. & L. Arunkumar. 2018. *Garra moyonkhulleni*, a new labeonine species (Cyprinidae: Labeoinae) from Manipur, Northeastern India. *International Journal of Fisheries and Aquatic Studies*, 6: 107–115.
- Nebeshwar, K., K. Bagra & D. N. Das. 2012. *Garra kalpangi*, a new cyprinid fish species (Pisces: Teleostei) from upper Brahmaputra basin in Arunachal Pradesh, India. *Journal of Threatened Taxa*, 4: 2353–2362.
- Nebeshwar, K. & W. Vishwanath. 2013. Three new species of *Garra* (Pisces: Cyprinidae) from north-eastern India and redescription of *G. gotyla*. *Ichthyological Exploration of Freshwaters*, 24: 97–120.
- Nebeshwar, K. & W. Vishwanath. 2017. On the snout and oromandibular morphology of genus *Garra*, description of two new species from the Koladyne River basin in Mizoram, India, and redescription of *G. manipurensis* (Teleostei: Cyprinidae). *Ichthyological Exploration of Freshwaters*, 28: 17–53.

- Page, L. M., B. C. Ray, S. Tongnunui, D. A. Boyd & Z. S. Randall. 2019. *Garra surinbinnani*, a new species of labeonine from the Mae Khlong basin of Thailand (Teleostei: Cyprinidae). Ichthyological Exploration of Freshwaters, 117: 1–15.
- Pandey, P. K., Y. S. Singh, P. S. Tripathy, R. Kumar, S. K. Abujam & J. Parhi. 2020. DNA barcoding and phylogenetics of freshwater fish fauna of Ranganadi River, Arunachal Pradesh. Gene, 754: 144860.
- Patil, T. S., R. A. Jamdade, S. M. Patil, S. P. Govindwar & D. V. Muley. 2018. DNA barcode-based delineation of freshwater fishes from northern Western Ghats of India, one of the world's biodiversity hotspots. Biodiversity Conservation, 27: 3349–3371.
- Pinder, A. C., A. Manimekalan, J. D. Knight, P. Krishnan-kutty, J. R. Britton, S. Philip, N. Dahanukar & R. Raghavan. 2018. Resolving the taxonomic enigma of the iconic game fish, the hump-backed mahseer from the Western Ghats biodiversity hotspot, India. PLoS ONE, 13: e0199328.
- Rahman, M. M., M. Noren, A. R. Mollah & S. O. Kullander. 2019. Building a DNA barcode library for the freshwater fishes of Bangladesh. Scientific Reports, 9: 9382.
- Rambaut, A. 2009. FigTree, vers. 1.4.3. Available from <http://tree.bio.ed.ac.uk/software/figtree>
- Rath, S., B. Shangningam & L. Kosygin. 2019. *Garra simbalbaraensis*, a new species of cyprinid fish (Teleostei: Cyprinidae) from Himachal Pradesh, India. Zootaxa, 4652: 487–496.
- Rodgers, W. A., H. S. Panwar & V. B. Mathur. 2002. Wildlife protected area network in India: a review (executive summary). Wildlife Institute of India, Dehradun, 44 pp.
- Roni, N., Y. Chinglemba, Y. Rameshori & W. Vishwanath. 2019. A new species of the genus *Garra* Hamilton (Teleostei: Cyprinidae) from Northeast India. Zootaxa, 4619: 545–554.
- Roni, N. & W. Vishwanath. 2018. A new species of the genus *Garra* (Teleostei: Cyprinidae) from the Barak River drainage, Manipur, India. Zootaxa, 4374: 263–272.
- Ronquist, F., M. Teslenko, P. Van Der Mark, D. L. Ayres, A. Darling, S. Höhna, B. Larget, L. Liu, M. A. Suchard & J. P. Huelsenbeck. 2012. MrBayes 3.2: efficient Bayesian phylogenetic inference and model choice across a large model space. Systematic Biology, 61: 539–542.
- Sayyadzadeh, G. & H. R. Esmaili. 2021. Does the *Garra* population (Teleostei: Cyprinidae: Labeoninae) from the Kol River drainage, Persian Gulf basin merit formal description? Zootaxa, 5048: 265–278.
- Schwarz, G. 1978. Estimating the dimension of a model. Annals Statistics, 6: 461–464.
- Shangningam, B., S. Rath & L. Kosygin. 2021. A new fish species of *Garra* from the Western Ghats, India (Teleostei: Cyprinidae). Ichthyological Exploration of Freshwaters, IEF-1168: 1–7.
- Sonet, G., J. Snoeks, Z. T. Nagy, E. Vreven, G. Boden, F. C. Breman, E. Decru, M. Hanssens, A. Ibala Zamba, K. Jordaens, V. Mamonekene, T. Musschoot, J. Van houdt, M. Van steenberge, S. Lunkayilakio Wamuini & E. Verheyen. 2018. DNA barcoding fishes from the Congo and the Lower Guinean provinces: assembling a reference library for poorly inventoried fauna. Molecular Ecology Resources, 19: 728–743.
- Sudasinghe, H., N. Dahanukar, R. Raghavan, T. Senavirathna, D. J. Shewale, M. S. Paingankar, A. Amarasinghe, R. Pethiyagoda, L. Rüber & M. Meegaskumbura. 2021. Island colonization by a 'rheophilic' fish: the phylogeography of *Garra ceylonensis* (Teleostei: Cyprinidae) in Sri Lanka. Biological Journal of the Linnean Society, 132: 872–893.
- Tamura, K., G. Stecher & S. Kumar. 2021. MEGA11: molecular evolutionary genetics analysis version 11. Molecular Biology and Evolution, 38: 3022–3027.
- Thoni, R. J., D. B. Gurung & R. L. Mayden. 2016. A review of the genus *Garra* Hamilton 1822 of Bhutan, including the descriptions of two new species and three additional records (Cypriniformes: Cyprinidae). Zootaxa, 4169: 115–132.
- Vatandoust, S., H. Mousavi-Sabet, M. F. Geiger & J. Freyhof. 2019. A new record of Iranian subterranean fishes reveals the potential presence of a large freshwater aquifer in the Zagros Mountains. Journal of Applied Ichthyology, 35: 1269–1275.
- Yang, L., M. Arunachalam, T. Sado, B. A. Levin, A. S. Golubtsov, J. Freyhof, J. P. Friel, W. J. Chen, M. Vincent Hirt, R. Manickam, M. K. Agnew, A. M. Simons, K. Saitoh, M. Miya, R. L. Mayden & S. He. 2012. Molecular phylogeny of the cyprinid tribe Labeonini (Teleostei: Cypriniformes). Molecular Phylogenetics and Evolution, 65: 362–379.
- Zhang, E. 2005. *Garra bispinosa*, a new species of cyprinid fish (Teleostei: Cypriniformes) from Yunnan, Southwest China. Raffles Bulletin of Zoology, Supplement, 13: 9–15.
- Zhang, E. & Y. Y. Chen. 2002. *Garra tengchongensis*, a new cyprinid species from the upper Irrawaddy River basin in Yunnan, China (Pisces: Teleostei). Raffles Bulletin of Zoology, 50: 459–464.
- Zheng, L.-P., J.-X. Yang, X.-Y. Chen & W.-Y. Wang. 2010. Phylogenetic relationships of the Chinese Labeoninae (Teleostei, Cypriniformes) derived from two nuclear and three mitochondrial genes. Zoologica Scripta, 39: 559–571.

Received 8 January 2022

Revised 19 February 2022

Accepted 15 September 2022

The whole contribution can be purchased as PDF file.

Availability

Generally all our publications are available as PDF files; full publications as a general rule after the printed version is out of print. If you have questions concerning particular contributions please contact us by e-mail:
pdf@pfeil-verlag.de.

The PDF files are protected by copyright.

The PDF file may be printed for personal use. The reproduction and dissemination of the content or part of it is permitted. It is not allowed to transfer the digital personal certificate or the password to other persons.

Prices

Books: Prices are to be found in the catalog.

Articles in journals and single contributions or chapters in books:

10 EURO basic price per order (including the first 10 pages),
and

0,50 EURO per page, beginning with the 11th page.

Page numbers are found in the contents of the publications.

Orders

Use our order form for PDF files or send your order informal per e-mail (pdf@pfeil-verlag.de). The only accepted payment is by credit card. While using the order form for PDF files, your data will be transmitted by secure link (ssl). You also may send the informations informally by e-mail, fax, phone or mail.

Handling

As soon as possible, depending on our business hours and your order, you will receive your PDF file together with the certificate and password by e-mail.

Larger PDF files can be downloaded from our webspace, if necessary.

Your invoice will be sent out by e-mail after we charged your credit card.

To open the encrypted PDF files you have to install your personal certificate after your first order. All PDF files with the same certificate can be opened from that time on.

Dieser Beitrag kann als PDF-Datei erworben werden.

Verfügbarkeit von PDF-Dateien

Prinzipiell sind von allen unseren Publikationen PDF-Dateien erhältlich. Komplette Publikationen in der Regel erst nachdem die gedruckte Version vergriffen ist. Anfragen bezüglich bestimmter Beiträge richten Sie bitte per E-Mail an pdf@pfeil-verlag.de.

Die PDF-Dateien sind urheberrechtlich geschützt.

Ein Ausdruck der PDF-Dateien ist nur für den persönlichen Gebrauch erlaubt.

Die Vervielfältigung von Ausdrucken, erneutes Digitalisieren sowie die Weitergabe von Texten und Abbildungen sind nicht gestattet.

Das persönliche Zertifikat und das Passwort dürfen nicht an Dritte weitergegeben werden.

Preise

Bücher: Die Preise sind dem Katalog zu entnehmen. Zeitschriftenbeiträge und einzelne Kapitel aus Sammelbänden bzw. Büchern:

10 EURO Grundbetrag pro Bestellung (einschließlich der ersten 10 Seiten),
und

0,50 EURO pro Seite ab der 11. Seite.

Den Umfang der Beiträge entnehmen Sie bitte den Inhaltsverzeichnissen.

Bestellungen

Bestellungen sind mit dem PDF-Bestellformular oder formlos per E-Mail (pdf@pfeil-verlag.de) an uns zu richten. Die Bezahlung ist ausschließlich per Kreditkarte möglich. Bei Verwendung unseres Bestellformulars werden die Kreditkartendaten über eine gesicherte Verbindung (ssl) übermittelt. Sie können die Daten aber auch formlos per E-Mail, Fax, Post oder telefonisch übermitteln.

Abwicklung

So bald wie möglich, aber abhängig von unseren Bürozeiten und der gewünschten Bestellung, schicken wir Ihnen die PDF-Datei(en) zusammen mit Ihrem persönlichen Zertifikat und dem zugehörigem Passwort per E-Mail. Größere Dateien bieten wir Ihnen gegebenenfalls zum Herunterladen an.

Der fällige Betrag wird von Ihrer Kreditkarte abgebucht und Sie erhalten die Rechnung ebenfalls per E-Mail.

Um die verschlüsselten PDF-Dateien öffnen zu können, muss bei der ersten Bestellung das passwortgeschützte persönliches Zertifikat installiert werden, welches anschließend auf dem Rechner verbleibt. Alle mit diesem Zertifikat verschlüsselten Dateien können anschließend auf diesem Rechner geöffnet werden.