

Shantanu Kundu, Ph.D.

PERSONAL DETAILS

Date of birth: November 13, 1984
Citizenship: Indian
Present Address: Centre for DNA Taxonomy, Molecular Systematics Division,
Zoological Survey of India, M Block, New Alipore,
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Google Scholar h-index: **09**, ResearchGate Score: **28.88**, Citations: **297**

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WORK EXPERIENCE

2014-2021 Postdoctoral Research in Genomics, Molecular Systematics at
Zoological Survey of India, India.

A total of seven years' experience project funded by different Government of India schemes (DBT, DST-SERB, MoEF&CC-NMHS, CSIR).

Description of jobs handled: Integrated taxonomy and genetic diversity of different vertebrates and invertebrates fauna from India especially from the Ganges-Brahmaputra river basin, eastern Himalaya as well as Indo-Burma biodiversity hotspots in India, environmental DNA metabarcoding, de-novo mitogenome assembly through next-generation sequencing (NGS), examination of archival samples, assessment and conservation of threatened vertebrate fauna in the Indian Himalayan regions through long-term monitoring and capacity building.

EDUCATION

2014 Doctoral (Ph.D.) in Biotechnology, Assam Central University, India.
Thesis title: "Molecular characterization of turtles and tortoises using species-specific DNA marker in East and Northeast India".

2008 Masters in Science (M.Sc.) in Microbiology, Periyar University, India.
Projects completed: "Inhibitory influences of spices on experimentally induced skin carcinogenesis through modulation of P53, apoptosis and lipid peroxidation" from CNCI, Kolkata, India in 2007.
&
"Genotypic and Phenotypic detection of Methicillin resistant *Staphylococcus aureus* (MRSA) isolated in and around Salem hospitals" from K.S.R College of Arts and Science, Tamil Nadu, India in 2008.

RESEARCH INTERESTS

Illuminate animal biodiversity to save our living planet; species-discovery, interaction, and dynamics; genomics, phylogenetics, and evolutionary biology; biogeography, ecology, and conservation.

TECHNICAL SKILLS

Survey and exploration, cataloguing and vouchering of faunal collections in the National Zoological Collections, Knowledge of Biodiversity, natural history, taxonomy, biogeography, and conservation, Molecular biology experiments (DNA extraction from different biological resources, RFLP, PCR, Sanger sequencing, chromatography), Next-generation sequencing data analysis, Genomics and bioinformatics, microbiological tools and techniques (pure culture, sensitivity and motility test, microscopy, and biochemical assay), wildlife forensics, academic and outreach activities, laboratory management, train the academicians, students, and forest personals, guidance of masters and doctoral students for dissertation work, successfully handling the external projects, writing of research articles, books, and project management and problem-solving skills etc.

REFEREED PUBLICATIONS

1. Sixty (60) Research articles with cumulative clarivate current year impact factor = 70.045 published in peer-reviewed reputed national/international journals.
2. Four (04) books (Type specimens of National Zoological Collections, Genotypic data of Indian Fauna, and Testudines of the Northeast India: Classical and Molecular taxonomy)
3. Two (02) Book Chapters, three (03) Proceedings articles, and eleven (11) abstracts published in national/international platforms.

INVITED LECTURES AND SEMINARS

4. 'Train the Trainer: Educator Training Workshop in Primate Research Centre, Northeast India (National level).
5. Resource Person Award on DNA Barcoding Training Workshop on 05-03-2014 at University of Chittagong, Bangladesh (International Level).
6. Resource Person Award on DNA Barcoding Hands-on Training on 08-03-2016 at Zoological Survey of India, Kolkata, India (National level).
7. Resource Person Award on MoEF&CC Green Skill Development Program (GSDP) Foundation Course: Biodiversity and Conservation on 12-06-2017 at Zoological Survey of India, Kolkata, India (National level).
8. Resource Person Award on Hands-on training on DNA Barcoding in Assessment of Faunal Diversity on 09-03-2018 at Zoological Survey of India, Kolkata, India (National level).
9. Resource Person Award on Workshop on Advance Molecular Bio-techniques on 17-11-2018 at Chhatrapati Shahu Ji Maharaj University, Uttar Pradesh, India (National level).
10. Key Resource Person Award on Hands on training workshop on DNA Barcoding on 11-04-2019 at University in Kurukshetra, Haryana, India (National level).

AWARDS / PATENT

1. Indian Science Congress Association (ISCA) Best Poster Presentation Award on 07-01-2011 at SRM University, Chennai, India (National level).
2. Travel Grant from Assam University for attending the 22nd Pacific Science Congress in Malaysia on 14-06-2011 to 17-06-2011 at Kuala Lumpur, Malaysia (National Level).
3. Best Oral Presentation Award on 08-03-2013 at Mizoram University, Aizawl, India (National level).

PROFESSIONAL ASSOCIATION

1. Member of IUCN/SSC Tortoise and Freshwater Turtle Specialist Group (TFTSG).
2. Life member of Social, Environmental, and Biological Association (SEBA), Kolkata.
3. Life member of DNA Society of India, Kolkata.

LANGUAGE SKILLS

English (fluent), Bengali (mother tongue), Hindi (fluent), Assamese and Odia (basic knowledge)

PROFESSIONAL ACTIVITIES

1. Completed 15 days SERB-DST sponsored Sixth School in Herpetology training from Wildlife Institute of India, Dehradun, India in 2013.
2. Completed one day hands-on training in Computational Statistics in Biological Sciences from Department of Biotechnology, Assam University, India in 2012.
3. Completed three days hands-on training in Molecular Phylogenetics and Evolution from Department of Biotechnology, Mizoram University, India in 2010.
4. Reviewed more than 35 research articles invited from different reputed International journals.

REFEREES

1. Dr. Kailash Chandra, Scientist G and Director, Zoological Survey of India, M Block, New Alipore, Kolkata-700053, INDIA, Mobile No. +91- 8902462801, Email: kailash611@rediffmail.com.
2. Dr. Abhik Gupta, Professor and Pro Vice-Chancellor, Assam University, Silchar 788 011, INDIA, Mobile No. +91-9101335904 / +91-9706075395, Email: abhik.eco@gmail.com.
3. Dr. Vikas Kumar, Scientist E, Centre for DNA Taxonomy, Molecular Systematics Division, Zoological Survey of India, M Block, New Alipore, Kolkata-700053, INDIA, Mobile No. +91-9674944233, Email: vikaszsi77@gmail.com.
4. Dr. Basant Kumar Tiwary, Professor, Centre for Bioinformatics, School of Life Sciences, Pondicherry University, Chinna Kalapet, Kalapet, Puducherry 605014, INDIA, Telephone No: +91-4132654945, Email: basant@bicpu.edu.in, basant68@email.com

DECLARATION

I hereby declare that all the statements made and information furnished in this application are true and complete to the best of my knowledge and belief. I understand that the competent authority can take appropriate action against me and/or my candidature in case any of the information is found to be incorrect at any stage.

Date: 15.03.2021

Place: Kolkata, India

Shantanu Kundu

(SHANTANU KUNDU)

Applicant's signature

LIST OF PUBLICATIONS

Research articles: (cumulative clarivate current year impact factor = 70.045)

1. Kamalakannan M, Sivaperuman C, **Kundu S**, Gokulakrishnan G, Venkatraman C, Chandra K. 2021. Discovery of A New Mammal Species (Soricidae: Eulipotyphla) From Narcondam Volcanic Island, India. Research Square. DOI:10.21203/rs.3.rs-141904/v1.
2. **Kundu S**, Tyagi K, Alam I, Maheswaran G, Kumar V, Chandra K. 2020. Complete Mitochondrial Genome of *Chroicocephalus brunnicephalus* from India: Phylogeny with other Larids. Mitochondrial DNA Part B: Resources. DOI: 10.1080/23802359.2020.1866448 (IF: **0.885**).
3. **Kundu S**, Kumar H, Tyagi K, Chandra K, Kumar V. 2020. DNA barcoding of selected short-horned grasshoppers (Orthoptera: Acrididae) from Indian Himalayan region, Mitochondrial DNA Part B, 5: 3618-3623 (IF: **0.885**).
4. **Kundu S**, Lalremsanga HT, Biakzuala L, Chandra K, Kumar V. 2020. DNA barcoding reveals distinct population of *Dopasia gracilis* (Squamata: Anguidae) in Mizoram, Northeast India. Mitochondrial DNA Part B: Resources. 5: 3229-3233 (IF: **0.885**).
5. Pakrashi A, **Kundu S**, Saini J, Tyagi K, Chandra K, Kumar V. 2020. Molecular identification of selected bees from the Indian Himalaya: A preliminary effort. Journal of Asia-Pacific Entomology. 23: 883-889 (IF: **1.101**).
6. **Kundu S**, Lalremsanga HT, Purkayastha J, Biakzuala L, Chandra K, Kumar V. 2020. DNA barcoding elucidates the new altitude record and range-extension of lesser-known Bullfrog (*Hoplobatrachus litoralis*) in northeast India. Mitochondrial DNA Part B: Resources. 5: 2668-2672 (IF: **0.885**).
7. **Kundu S**, Lalremsanga HT, Rahman MM, Ahsan MF, Biakzuala L, Kumar V, Chandra K, Siddiki AMAMZ. 2020. DNA barcoding elucidates the population genetic diversity of venomous cobra species (Reptilia: Elapidae) in Indo-Bangladesh region. Mitochondrial DNA Part B: Resources. 5: 2525-2530 (IF: **0.885**).
8. **Kundu S**, Kumar V, Tyagi K, Chandra, K. 2020. The complete mitochondrial genome of the endangered Assam Roofed Turtle, *Pangshura sylhetensis* (Testudines: Geoemydidae): Genomic Features and Phylogeny. PLoS ONE. 15: e0225233 (IF: **2.74**).
9. **Kundu S**, Lalremsanga HT, Tyagi K, Biakzuala L, Kumar V, Chandra K. 2020. Mitochondrial DNA discriminates distinct population of two deadly snakes (Reptilia: Elapidae) in Northeast India. Mitochondrial DNA Part B: Resources. 5: 1530-1534 (IF: **0.885**).
10. **Kundu S**, Tyagi K, Kamalakannan M, Kumar V, Venkatraman C, Sivaperuman C, Chandra K. 2020. Molecular investigation of non-volant endemic mammals through mitochondrial cytochrome b gene from Andaman and Nicobar archipelago. Mitochondrial DNA Part B: Resources. 5: 1447-1452 (IF: **0.885**).
11. Kumar V, Tyagi K, Chakraborty R, Prasad P, **Kundu S**, Tyagi I, Chandra K. 2020. The Complete Mitochondrial Genome of endemic giant tarantula, *Lyrognathus crotalus* (Araneae: Theraphosidae) and comparative analysis. Scientific Reports. 10: 74. (IF: **3.998**).
12. Tyagi K, Kumar V, Poddar N, Prasad P, Tyagi I, **Kundu S**, Chandra K. 2020. The gene arrangement and phylogeny using mitochondrial genomes in spiders (Arachnida: Araneae). International Journal of Biological Macromolecules. 7: 146: 488-496. (IF: **5.162**).
13. **Kundu S**, Kumar V, Tyagi K, Chandra K. 2019. Further specimens and phylogenetic position of the recently described catfish species *Mystus prabini* (Siluriformes: Bagridae). Fish Taxa: Journal of Fish Taxonomy. 4: 140-144.
14. Tyagi K, Kumar V, **Kundu S**, Pakrashi A, Prasad P, Caleb JTD, Chandra K. 2019. Identification of Indian Spiders through DNA barcoding: Cryptic species and species complex. Scientific Reports 9: 14033 (IF: **3.998**).

15. **Kundu S**, Kumar V, Tyagi K, Chakraborty R, Chandra K. 2019. The first complete mitochondrial genome of the Indian Tent Turtle, *Pangshura tentoria* (Testudines: Geoemydidae): Characterization and comparative analysis. Ecology and Evolution. 9: 10854-10868. (IF: 2.392).
16. Chakraborty R, Singha D, Kumar V, Pakrashi A, **Kundu S**, Chandra K, Patnaik S, Tyagi K. 2019. DNA barcoding of selected *Scirtothrips* species (Thysanoptera) from India. Mitochondrial DNA Part B: Resources. 4: 2710-2714 (IF: 0.885).
17. **Kundu S**, Tyagi K, Pakrashi A, Kumar B, Laishram K, Rath S, Das U, Chandra K. 2019. DNA barcoding of freshwater fishes from the transboundary river of Indo-Bhutan: multiple clades and cryptic diversity. Mitochondrial DNA Part B: Resources. 4: 2527-2532 (IF: 0.885).
18. **Kundu S**, Kumar V, Tyagi K, Rath S, Pakrashi A, Saren PC, Laishram K, Chandra K. 2019. Mitochondrial DNA identified two bat species in northeast India: electrocution mortality and biodiversity loss. Mitochondrial DNA Part B: Resources. 4: 2454-2458 (IF: 0.885).
19. **Kundu S**, Chandra K, Tyagi K, Pakrashi A, Kumar V. 2019. DNA barcoding of freshwater fishes from Brahmaputra River in Eastern Himalaya biodiversity hotspot. Mitochondrial DNA Part B: Resources. 4: 2411-2419 (IF: 0.885).
20. **Kundu S**, Tyagi K, Mohanty SR, Roy S, Mohapatra A, Kumar V, Chandra K. 2019. DNA barcoding inferred maternal philopatric affinity of ocean maskray (*Neotrygon indica*) in the Bay of Bengal. Mitochondrial DNA Part B: Resources. 4: 1924-1929 (IF: 0.885).
21. Mohapatra A, **Kundu S**, Mohanty SR, Mishra SS, Kumar V, Tripathy B, Chandra K. 2019. DNA barcoding adjudicate two different morphs of *Bascanichthys deraniyagalai* (Anguilliformes: Ophichthidae): Re-description and first record from Chilika Lagoon, India. Mitochondrial DNA Part B: Resources. 4: 1357-1361 (IF: 0.885).
22. **Kundu S**, Pakrashi A, Laskar BA, Rahaman I, Tyagi K, Kumar V, Candra K. 2019. DNA barcoding reveals distinct population of *Plotosus canius* (Siluriformes: Plotosidae) in Sundarbans waters. Mitochondrial DNA Part B: Resources. 4: 1167-1171 (IF: 0.885).
23. **Kundu S**, Kumar V, Tyagi K, Rath S, Pakrashi A, Saren PC, Laishram K, Chandra K. 2019. Mitochondrial DNA detects *Arctonyx collaris* from burnt body parts: A wildlife forensic case study in Indo-Burma biodiversity hotspot. Mitochondrial DNA Part B: Resources. 4: 1172-1176 (IF: 0.885).
24. Kumar V, Tyagi K, **Kundu S**, Chakraborty R, Singha D, Chandra K. 2019. The first complete mitochondrial genome of marigold pest thrips, *Neohydatothrips samayunkur* (Sericothripinae) and comparative analysis. Scientific Reports. 9:191 (IF: 3.998).
25. Kumar V, Chandra K, **Kundu S**, Tyagi K, Laskar BA, Singha D, Chakraborty R, Pakrashi A. 2018. Utility of mitochondrial DNA in wildlife forensic science: reliable identification of confiscated materials from Eastern India. Mitochondrial DNA Part B: Resources. 4: 583-588 (IF: 0.885).
26. **Kundu S**, Rath S, Laishram K, Pakrashi A, Das U, Tyagi K, Kumar V, Chandra K. 2018. DNA barcoding identified selected ornamental fishes in Murti river of East India. Mitochondrial DNA Part B: Resources. 4: 594-598 (IF: 0.885).
27. **Kundu S**, Kumar V, Tyagi K, Pakrashi A, Laskar BA, Chandra K. 2018. DNA barcoding reveals association of Glossiphoniidae species on endangered freshwater turtles in northeast India. Acta Parasitologica. 64: 213-217 (IF: 1.019).
28. **Kundu S**, Sharma G, Balakrishnan S, Tyagi K, Chandra K, Kumar V. 2018. DNA barcoding identified two endangered dolphins: threats on living aquatic mammals in India. Mitochondrial DNA Part B: Resources. 4: 77-80 (IF: 0.885).
29. Kumar V, **Kundu S**, Chakraborty R, Sanyal A, Raha A, Sanyal O, Ranjan R, Pakrashi A, Tyagi K, Chandra K. 2018. DNA barcoding of Geometridae moths (Insecta: Lepidoptera): A preliminary effort from Namdapha National Park, Eastern Himalaya. Mitochondrial DNA Part B: Resources. 4: 309-315 (IF: 0.885).
30. **Kundu S**, Kumar V, Tyagi K, Chakraborty R, Singha D, Rahaman I, Pakrashi A, Chandra K. 2018. Complete mitochondrial genome of Black Soft-shell Turtle

- (*Nilssonia nigricans*) and comparative analysis with other Trionychidae. Scientific Reports. 8: 17378 (IF: 3.998).
31. Singha D, Kumar VV, Chakraborty R, **Kundu S**, Hosamani A, Kumar V, Tyagi K. 2018. Molecular footprint of *Frankliniella occidentalis* from India: a vector of Tospoviruses. Mitochondrial DNA Part B: Resources. 4: 39-42 (IF: 0.885).
 32. Chakraborty R, Tyagi K, **Kundu S**, Rahaman I, Singha D, Chandra K, Patnaik S, Kumar V. 2018. The complete mitochondrial genome of Melon thrips, *Thrips palmi* (Thripinae): Comparative analysis. PLoS ONE. 13: e0199404 (IF: 2.74).
 33. **Kundu S**, Rath S, Tyagi K, Chakraborty R, Pakrashi A, Kumar V, Chandra K. 2018. DNA barcoding of *Cloridopsis immaculata*: genetic distance and phylogeny of stomatopods. Mitochondrial DNA Part B: Resources. 3: 955-958 (IF: 0.885).
 34. Caleb J, Chatterjee S, Tyagi K, **Kundu S**, Kumar V. 2018. A new generic record and two new species of jumping spiders (Araneae: Salticidae) from India. Acta Arachnologica 67: 7-12.
 35. **Kundu S**, Kumar V, Laskar BA, Tyagi K, Chandra K. 2018. Pet and turtle: DNA barcoding identified twelve Geoemyd species in northeast India. Mitochondrial DNA Part B: Resources. 3: 513-518 (IF: 0.885).
 36. **Kundu S**, Kumar V, Tyagi K, Chandra K. 2018. Environmental DNA (eDNA) testing for detection of freshwater turtles in a temple pond. Herpetology Notes, 11: 369-371.
 37. Laskar BA, Kumar V, **Kundu S**, Darshan A, Tyagi K, Chandra K. 2018. DNA barcoding of fishes from River Diphlu within Kaziranga National Park in northeast India. Mitochondrial DNA Part A: DNA Mapping, Sequencing, and Analysis. 30: 126-134 (IF: 1.073).
 38. Laskar BA, Kumar V, **Kundu S**, Tyagi K, Chandra K. 2018. Taxonomic quest: validating two mahseer fishes (Actinopterygii: Cyprinidae) through molecular and morphological data from biodiversity hotspots in India. Hydrobiologia. 815: 113-124 (IF: 2.385).
 39. Rath S, Kumar V, **Kundu S**, Tyagi K, Singha D, Chakraborty R, Chatterjee S. 2018. DNA testing of edible crabs from seafood shops on the Odisha coast, India. Biomolecular concepts. 9: 12-16.
 40. **Kundu S**, Kumar V, Laskar BA, Tyagi K, Chandra K. 2018. Morphology and genetic variation in the endangered tortoise Manouria emys: distinct lineages or plastron anomalies? Mitochondrial DNA Part B: Resources. 3: 166-170 (IF: 0.885).
 41. **Kundu S**, Rath S, Tyagi K, Chakraborty R, Kumar V. 2018. Identification of penaeid shrimp from Chilika Lake through DNA barcoding. Mitochondrial DNA Part B: Resources. 3: 161-165 (IF: 0.885).
 42. Chatterjee S, Caleb J, Tyagi K, **Kundu S**, Kumar V. 2018. First report of *Hyptiotes affinis* Bösenberg & Strand, 1906 (Araneae: Uloboridae) from India. Munis Entomology and Zoology Journal 13: 211-213.
 43. Caleb J, Chatterjee S, Tyagi K, **Kundu S**, Kumar V. 2017. Two new jumping spiders of the genera *Epocilla* Thorell, 1887 and *Mogrus* Simon, 1882 from India (Araneae: Salticidae). Arthropoda Selecta. 26: 329-334.
 44. Tyagi K, Kumar V, Singha D, Chandra K, Laskar BA, **Kundu S**, Chakraborty R, Chatterjee S. 2017. DNA Barcoding studies on Thrips in India: Cryptic species and Species complexes. Scientific Reports. 7: 4898 (IF: 3.998).
 45. Laskar BA, Kumar V, Darshan A, **Kundu S**, Das DN. 2016. DNA barcoding of *Amblyceps* congeners (Siluriformes: Amblycipitidae) from Brahmaputra drainage in northeast India. Mitochondrial DNA Part A: DNA Mapping, Sequencing, and Analysis. 28: 698-702 (IF: 1.073).
 46. Laskar BA, Kumar V, **Kundu S**, Tyagi K, Singha D, Chakraborty R, Chatterjee S, Saha S. 2016. DNA barcoding of Gobiid fishes (Perciformes: Gobiidae) from eastern and northeastern India with new record of a Gobionellinae species for the region. Mitochondrial DNA Part A: DNA Mapping, Sequencing, and Analysis. 28: 584-587 (IF: 1.073).
 47. **Kundu S**, Kumar V, Laskar BA, Chandra K, Tyagi K. 2016. Mitochondrial DNA effectively detects non-native Testudines: Invisible wildlife trade in northeast India. Gene Reports. 4: 10-15.

48. Chandrasekara KN, Kumar R, Kumar V, Banerjee D, **Kundu S**, Ghosh B, Tyagi K. 2015. DNA barcoding reveals host associated genetic diversity of 'tea mosquito bug' *Helopeltis theivora* (Miridae: Heteroptera) from India. *Journal of Asia-Pacific Entomology*. 18: 541–545 (**IF: 1.101**).
49. Banerjee D, Kumar V, Maity A, Ghosh B, Tyagi K, Singha D, **Kundu S**, Laskar BA, Naskar A, Rath S. 2015. Identification through DNA barcoding of Tabanidae (Diptera) vectors of surra disease in India. *Acta Tropica*. 150: 52-58 (**IF: 2.555**).
50. **Kundu S**, Laskar BA, Venkataraman K, Banerjee D, Kumar V. 2015. DNA barcoding of *Nilssonina* congeners corroborates existence of wild *N. nigricans* in northeast India. *Mitochondrial DNA Part A: DNA Mapping, Sequencing, and Analysis*. 27: 2753-2756 (**IF: 1.073**).
51. **Kundu S**, Das KC, Ghosh SK. 2013. Taxonomic rank of Indian tortoise: revisit with DNA barcoding perspective. *DNA Barcodes* 1: 39-45.
52. Laskar BA, Bhattacharjee MJ, Dhar B, Mahadani P, **Kundu S**, Ghosh SK. 2013. The Species Dilemma of Northeast Indian Mahseer (Actinopterygii: Cyprinidae): DNA Barcoding in Clarifying the Riddle. *PLoS ONE*. 8: e53704 (**IF: 2.74**).
53. **Kundu S**, Maity P, Rizvi AN, Tyagi K, Chandra K, Kumar V. 2020. Detection of Helminth Parasites in Commercialized Turtles: Threats to Native Testudines in Northeast India. *Records of the Zoological Survey of India*. 120: 99-103.
54. **Kundu S**, Kumar V, Murthy BHCK, Chandra K. 2018. Archival sea turtles in National Zoological Collections of Zoological Survey of India. *Records of Zoological Survey of India*. 118: 39-43.
55. **Kundu S**, Kumar V, Murthy BHCK, Chandra K. 2018. Non-Native Chelonians in the National Zoological collections of Zoological Survey of India. *Records of Zoological Survey of India*. 118: 33-38.
56. Chatterjee S, Caleb J, Tyagi K, **Kundu S**, Kumar V. 2017. First report of *Menemerus nigli* (Araneae: Salticidae) from India. *Halteres*. 8: 109-111.
57. Chatterjee S, Caleb J, Tyagi K, **Kundu S**, Kumar V. 2017. First report of *Psechrus inflatus* Bayer (Araneae: Psechridae) from India. *Records of Zoological Survey of India*. 117: 391-393.
58. Rath S, Kumar V, **Kundu S**, Tyagi K, Laskar BA. 2017. DNA based investigation of century old freshwater sponge species from Indian Museum tank. *Ecology, Environment and Conservation*. 24: 785-789.
59. **Kundu S**, Das KC, Ghosh SK. 2013. Amino acid analysis of Cytochrome C Oxidase subunit I (COI) of Indian Testudines. *Journal of Environment and Sociobiology*. 10: 43-48.
60. **Kundu S**, Das KC, Ghosh SK. 2013. Identification of commercialized turtle samples through DNA barcoding. *Journal of Environment and Sociobiology*. 10: 37-42.

Books:

61. **Kundu S**, Kumar V, Murthy BHCK, Chandra K. 2018. Chelonian Types of National Zoological Collections. Published by The Director, Zoological Survey of India, Kolkata. ISBN: ISBN-978-81-8171-499-2.
62. **Kundu S**, Ghosh SK. 2018. Testudines of the Northeast India: Classical and Molecular Taxonomy. Published by LAMBERT Academic Publishing, Haroldstraße 14, D-40217 Düsseldorf, Germany. ISBN: 978-620-2-06618-1.
63. Kumar V, Tyagi K, **Kundu S**, Caleb J, Laskar BA, Chandra K. 2018. Genotypic data Indian Fauna: Series 2. Published by The Director, Zoological Survey of India, Ministry of Environment, Forest and Climate Change, Govt. of India, New Delhi. ISBN: 978-81-8171-494-7.
64. Kumar V, Tyagi K, **Kundu S**, Laskar BA, Banerjee D. 2016. Genotypic data Indian Fauna: Series 1. Published by The Director, Zoological Survey of India, Ministry of Environment, Forest and Climate Change, Govt. of India, New Delhi. ISBN: 978-81-8171-439-8.

Book Chapters:

65. Ghosh PR, **Kundu S**, Das KC, Laskar BA, Devi KB, Ghosh SK. 2012. Sampling and Vouchering ISBN: 978-819-229-894-8. In book: A text book on DNA Barcoding. Chapter 3. Publisher: Books Space, Kolkata. ISBN: 978-819-229-894-8.
66. Bhattacharjee MJ, **Kundu S**, Devi KM, Dhar B, Mondal R, Mahadani P, Ahanthem M, Ghosh SK. 2012. Molecular Biology in DNA barcoding. In book: A text book on DNA Barcoding. Chapter 4. Publisher: Books Space, Kolkata. ISBN: 978-819-229-894-8.

Proceedings articles:

67. **Kundu S**, Das KC, Lalremsanga HT, Gupta A, Ghosh SK. 2013. A new report for all representatives of Asian forest tortoise has their footmarks in northeast India. Conference: Bioresource Inventory and Emerging Conservation Strategies with special reference to Northeast India at Mizoram University. Volume: Bioresources and Traditional Knowledge of Northeast India. Chapter-3 Animal Bioresources, The Mizo Post-Graduate Science Society (MIPOGRASS), ISBN: 987-81-924321-3-7.
68. Das KC, **Kundu S**, Ghosh SK, Gupta A. 2012. Traditional Knowledge on Zootherapeutic Uses of Turtle is an Issue for International Conservation. Conference: RANPR: MIPOGRASS at Mizoram University. Volume: Recent Advances in Natural Products Research: ISBN: 987-81-924321-2-0.
69. Ghosh SK, Bhattacharjee MJ, Devi KM, Ahanthem M, **Kundu S**, Mahadani P, et al. 2011. DNA Barcoding: Digital Taxonomy of Bioresources. Conference: Strategic physiological research for sustainable animal biodiversity, Society of Animal Physiologist of India at Kolkata.

Abstracts:

70. **Kundu S**, Kumar V, Tyagi K, Chandra K. 2019. DNA Barcoding elucidates the enigma of freshwater vertebrates: taxonomic quandary and conservation. Conference: iBOL 2019 - The 8th International Barcode of Life Conference At: Trondheim, Norway.
71. Kumar V, Chandra K, Tyagi K, **Kundu S**, Laskar BA, Singha D, Chatterjee S, Chakraborty R. 2017. Barcoding fauna of India: An initiative by Zoological Survey of India. 7th International Barcode of Life Conference At: Kruger National Park, South Africa. Volume: 60(11): 881-1019.
72. Chakraborty R, Tyagi K, **Kundu S**, Chandra K, Kumar V. 2017. First mitochondrial genome of marigold pest thrips, *Neohydatothrips samayunkur* (Thysanoptera: Sericothripinae). Conference: International Conference in Zoological Sciences At: Department of Zoology and Environmental Sciences, Punjabi University, Patiala, Punjab, India.
73. **Kundu S**, Tyagi K, Chandra K, Kumar V. 2017. Environmental DNA (eDNA) corroborate the footmarks of threatened Testudines from anonymous habitats in northeast India. Conference: International Conference in Zoological Sciences At: Department of Zoology and Environmental Sciences, Punjabi University, Patiala, Punjab, India.
74. **Kundu S**, Laskar B A, Singha D, Tyagi K, Kumar V. 2015. DNA Barcoding of archival Chelonians: initiatives at Zoological Survey of India. Conference: 6th International conference of Barcode of Life conference At: University of Guelph, Canada.
75. **Kundu S**, Laskar BA, Das KC, Lalremsanga HT, Ghosh SK. 2013. DNA barcoding of freshwater turtle and tortoise in the biodiversity hotspot of India. Conference: Sixth School in Herpetology At: Wildlife Institute of India, Dehradun, India.
76. Ghosh SK, **Kundu S**, Das KC, Bhattacharjee MJ, Mahadani P, Ghosh PR. 2011. DNA barcoding of endangered softshell turtles (Testudines: Trionychidae) and their conflict position in classical taxonomy (Cyclanorbinae and Trionychinae) from mega

- biodiversity hot spots of north eastern India. Conference: 4th International conference of Barcode of Life conference At: Adelaide, Australia.
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GenBank Accession Numbers:

A total of **1996 number of DNA sequences of different faunal systems** have been generated throughout India and successfully submitted to the global GenBank database.

<https://www.ncbi.nlm.nih.gov/nuccore/?term=Kundu+S+Assam+University>

<https://www.ncbi.nlm.nih.gov/nuccore/?term=Kundu+S+ZSI>



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Ministry of Environment, Forests & Climate Change



Zoological Survey of India
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फ.स./No. F.223-147/2019-Tech./१२५०

दिनांक/Dated: 24th November, 2020

EXPERIENCE CERTIFICATE

This is to certify that **Dr. Shantanu Kundu** is working as CSIR-Senior Research Associate (Pool Scientist Scheme) in the project entitled "Integrated Taxonomy and Genetic diversity of Freshwater turtles from Ganges- Brahmaputra River Basin with special reference to Environmental DNA (eDNA) Metabarcoding and Mitogenome assembly through Next-Generation Sequencing (NGS)" under the funding support of CSIR Pool-Scientist Scheme Government of India, New Delhi, executed by the Zoological Survey of India.

(1)	Name of post held	CSIR-Senior Research Associate
(2)	From dd/mm/yy	01/08/2019
(3)	To dd/mm/yy	Continuing
(4)	Total period dd/mm/yy	1 year, 03 months, 23 days
(5)	Nature of Appointment-Permanent, Regular, Temporary, Part-time, Contract, Guest, Honorary etc.	Fellowship
(6)	Department/Specially/Field of experience	Centre for DNA Taxonomy, Molecular Systematics Division, Zoological Survey of India, Kolkata.
(7)	Monthly remuneration (total)	Rs.56,100/- per month (Basic Pay+DA+HRA) as per CSIR norms, Govt. of India.
(8)	Duties performed/experience gained in brief in each post (please give details, if need be, in attached sheet) (in case of Medical posts, please mention field of specialization)	Survey and Conservation, Management of Biodiversity, Molecular Biology experiments, NGS data analysis, Complete Mitochondrial Genome analysis, and Bioinformatics studies.
(9)	Place of posting	Zoological Survey of India, Kolkata.
(10)	Nature of work: a) Managerial (Lower/Middle/Senior*) b) Supervisory c) Operative d) If none of the above, please indicate nature of work (*Strike off whichever is not applicable)	Senior Research Associateship (Pool Scientist Scheme)
(11)	Remarks, if any	N/A

It is certified that above facts and figures are true and based on records available in our Organization/ Department/ Ministry.

This is issued with the approval of the Director, ZSI.

Yours faithfully,



(Dr. Jasmine P.)
Scientist-E & Addl. Officer-in-Charge,
प्रौद्योगिकी विभाग / Technical Section
Officer-in-Charge
तकनीकी अनुभाग / Technical Section
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भारत प्राणि सर्वेक्षण

Zoological Survey of India

प्राणि विज्ञान भवन

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फा.सं./No. F.229-12(LG)/2017-Tech./ 17588

दिनांक/Dated: 16 December, 2019

EXPERIENCE CERTIFICATE

This is to certify that **Dr. Shantanu Kundu** has worked as Research Associate in the Project entitled 'Conservation of Threatened Vertebrate Fauna in Indian Himalayan Region through Long-term monitoring and Capacity Building' under the funding support of National Mission on Himalayan Studies, Ministry of Environment, Forest and Climate Change, Government of India, New Delhi, executed by the Zoological Survey of India.

(1)	Name of post held	NMHS Research Associate
(2)	From dd/mm/yy	04/05/2018
(3)	To dd/mm/yy	31/07/2019
(4)	Total period dd/mm/yy	27 days, 02 months, 01 year,
(5)	Nature of Appointment-Permanent, Regular, Temporary, Part-time, Contract, Guest, Honorary etc.	Fellowship
(6)	Department/Specially/Field of experience	Centre for DNA Taxonomy, Zoological Survey of India, Kolkata
(7)	Monthly remuneration (total)	Rs.44,640/- per month as per MoEF&CC norms, Govt. of India
(8)	Duties performed/experience gained in brief in each post (please give details, if need be, in attached sheet) (in case of Medical posts, please mention field of specialization)	Molecular Biology experiments, NGS data analysis, Complete mitochondrial genome analysis and Bioinformatics studies on the threatened Vertebrate fauna of Indian Himalayan Region
(9)	Place of posting	Zoological Survey of India, Kolkata.
(10)	Nature of work: a) Managerial (Lower/Middle/Senior*) b) Supervisory c) Operative d) If none of the above, please indicate nature of work (*Strike off whichever is not applicable)	Research Associateship
(11)	Remarks, if any	NA

It is certified that above facts and figures are true and based on records available in our organization/Department/Ministry.

This is issued with the approval of the Director, ZSI.



Yours faithfully

 (Dr. Santosh Kumar)
 Scientist-D & Addl. Officer-in-Charge,
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 अधिकारी-अधीनस्थ / Officer-in-Charge
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MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE



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F.No. 223-81/2016-Tech/11019

Dated 22 July 2019

EXPERIENCE CERTIFICATE


This is to certify that **Dr. Shantanu Kundu** worked as Research Associate in the Project entitled '*Combined taxonomy, biogeography, and next-generation sequencing (NGS) based reassessment of Testudines in Eastern Himalaya and Indo-Burma Biodiversity hotspots with special reference to archival specimens at National Zoological Collections*' under the funding support of Science & Engineering Research Board (SERB), Department of Science & Technology, Government of India, New Delhi, executed by the Zoological Survey of India.

(1)	Name of post held	DST-SERB National Postdoctoral Fellow
(2)	From dd/mm/yy	09/06/2016
(3)	To dd/mm/yy	03/05/2018
(4)	Total period dd/mm/yy	24 days, 10 months, 01 years
(5)	Nature of Appointment-Permanent, Regular, Temporary, Part-time, Contract, Guest, Honorary etc.	Fellowship
(6)	Department/ Specialty/Field of experience	Centre for DNA Taxonomy, Zoological Survey of India, Kolkata
(7)	Monthly remuneration (total)	Rs.55,000/- per month as per DST-SERB norms, Govt. of India
(8)	Duties performed/experience gained in brief in each post(please give details, if need be, in attached sheet)(in case of Medical posts, please mention field of specialization)	Taxonomy, biogeography, and next-generation sequencing (NGS) based reassessment of Testudines in Eastern Himalaya and Indo-Burma Biodiversity hotspots.
(9)	Place of posting	Zoological Survey of India, Kolkata.
(10)	Nature of work: a) Managerial (Lower/Middle/Senior*) b) Supervisory c) Operative d) If none of the above, please indicate nature of work (*Strike off whichever is not applicable)	Post-Doctoral Research
(11)	Remarks, if any	Successfully completed the project.

It is certified that above facts and figures are true and based on records available in our organization/ Department/ Ministry.

This is issued with the approval of the Director, ZSI.




(Dr. Basudev Tripathy)
Scientist-D & Officer-in-Charge,
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F.No. 223-54/2013-TechJ /1020

Dated 22 July 2019

EXPERIENCE CERTIFICATE

This is to certify that Dr. Shantanu Kundu worked as Research Associate in the Project entitled 'Molecular identification of archival Chelonians (Turtles and Tortoises) by using contemporary genome technologies' under the funding support of Department of Biotechnology, Government of India, New Delhi, executed by the Zoological Survey of India.

(1)	Name of post held	DBT-Research Associate
(2)	From dd/mm/yy	01/01/2014
(3)	To dd/mm/yy	08/06/2016
(4)	Total period dd/mm/yy	07 days, 05 months, 02 years
(5)	Nature of Appointment-Permanent, Regular, Temporary, Part-time, Contract, Guest, Honorary etc.	under Fellowship
(6)	Department/ Specialty/Field of experience	Centre for DNA Taxonomy, Zoological Survey of India, Kolkata.
(7)	Monthly remuneration (total)	Rs.52,000/- per month as per DBT norms, Govt. of India
(8)	Duties performed/experience gained in brief in each post (please give details, if need be, in attached sheet) (in case of Medical posts, please mention field of specialization)	Molecular Biology experiments (DNA isolation from different biological sources, PCR, Gel-electrophoresis, and Sequencing) on Chelonians, present in NZC of ZSI.
(9)	Place of posting	Zoological Survey of India, Kolkata.
(10)	Nature of work: a) Managerial (Lower/Middle/Senior*) b) Supervisory c) Operative d) If none of the above, please indicate nature of work (*Strike off whichever is not applicable)	Post-Doctoral Research
(11)	Remarks, if any	Successfully completed the project.

It is certified that above facts and figures are true and based on records available in our organization/ Department/ Ministry.

This is issued with the approval of the Director, ZSI.



(Dr. Basudev Tripathy)
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Technical Section
Officer-in-Charge
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Zoological Survey of India
Calcutta

Assam University : Silchar



SILCHAR : ASSAM : INDIA

(A Central University Constituted By an Act of Parliament)

DOCTOR OF PHILOSOPHY

This is to certify that

SHANTANU KUNDU

bearing University Registration No 74400129 of 2008-2009
was admitted to the Degree of Doctor of Philosophy in
Biotechnology under Hargobind Ksiurana School
of Life Sciences having qualified for
the same on 03.06.2014.

The Degree is conferred in the 14th Convocation of the University
held on 15th November, 2014.

Given under the seal of Assam University this 15th day of November,
2014.

Silchar, Assam (India)


(Vice Chancellor)

- The Degree is awarded in accordance with the UGC Regulations-2009 for Ph.D / M.Phil



அறிவியல் புலம்
FACULTY OF SCIENCE

பெரியார் பல்கலைக்கழக ஆட்சிக்குழு 2008 ஆம் ஆண்டு ஏப்ரல் மாதம்
நடந்த பயன்பாட்டு நுண்ணுயிரியியல் தேர்வில்
சந்தனு குண்டு என்பவர்
முதல் வகுப்பில் தேர்ச்சி பெற்றார் என்று தக்க
தேர்வாளர்கள் சான்றளித்தபடி அறிவியல் நிறைஞர்
என்னும் பட்டத்தை அவருக்குப் பல்கலைக்கழக இலச்சினையுடன்
வழங்குகிறது.

*The Syndicate of the Periyar University hereby makes known
that SHANTANU KUNDU has been
admitted to the DEGREE OF MASTER OF SCIENCE in
APPLIED MICROBIOLOGY
he/she having been certified by duly appointed Examiners to be qualified to
receive the same and was placed in the FIRST CLASS
at the Examination held in APR-2008*



Given under the seal of this university

பதிவாளர்
Registrar

துணைவேந்தர்
Vice-Chancellor



November 12, 2020

TO WHOM IT MAY CONCERN

It gives me immense pleasure to write about **Dr. Shantanu Kundu**, who is presently working as a CSIR- Pool Scientist in Zoological Survey of India (ZSI), Kolkata. I know Dr. Kundu since 2014 when he joined in ZSI for his postdoctoral research. His inquisitiveness and avid interest in the Zoological research made him skillful in various theoretical and practical domains through consecutive postdoctoral schemes (DBT-RA, DST-SERB-NPDF, MoEF&CC-NMHS-RA). I know him as a meticulous researcher who has gained expertise in survey and exploration, vouchering and cataloguing, taxonomic identification, knowledge on threatened and endemic Indian fauna, as well as molecular systematics and wildlife forensics identification and advisory services to the enforcement agencies.

Given the opportunity, Dr. Kundu will be able to produce the desired research outcome, which will significantly fill the gap of knowledge of Indian Fauna. He has discovered four new species of Spider and described new record of three spider species and two turtle species from India. So far, he has published 58 high-quality research articles with cumulative impact factor 69.16 in several reputed peer-reviewed journals, four books, two book chapters, three proceeding articles, and 11 national/international abstracts on different vertebrates and invertebrates fauna of India. I am confident that with his immense potency and expertise in cutting-edge approaches, he would be able to expand his thoughts and ideas in Indian biodiversity research. He is proficient to train many academicians and forest personals on Indian biogeography, faunal diversity and DNA barcoding. He is a member of IUCN/SSC Tortoise and Freshwater Turtle Specialist Group (TFTSG) and acted as a potential reviewer of international journals.

Moreover, I feel Dr. Kundu is an enthusiastic and diligent fellow with strong moral character. I am very pleased to recommend the candidature of Dr. Shantanu Kundu for any scientific position in India for his future academic and research endeavors.


Dr Kailash Chandra



RESEARCH ARTICLE

The complete mitochondrial genome of the endangered Assam Roofed Turtle, *Pangshura sylhetensis* (Testudines: Geoemydidae): Genomic features and phylogeny

Shantanu Kundu, Vikas Kumar*, Kaomud Tyagi, Kailash Chandra

Molecular Systematics Division, Centre for DNA Taxonomy, Zoological Survey of India, Kolkata, India

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Abstract

The Assam Roofed Turtle, *Pangshura sylhetensis* is an endangered and least studied species endemic to India and Bangladesh. The present study decodes the first complete mitochondrial genome of *P. sylhetensis* (16,568 bp) by using next-generation sequencing. The assembly encodes 13 protein-coding genes (PCGs), 22 transfer RNAs (tRNAs), two ribosomal RNAs (rRNAs), and one control region (CR). Most of the genes were encoded on the majority strand, except NADH dehydrogenase subunit 6 (*nad6*) and eight tRNAs. All PCGs start with an ATG initiation codon, except for Cytochrome oxidase subunit 1 (*cox1*) and NADH dehydrogenase subunit 5 (*nad5*), which both start with GTG codon. The study also found the typical cloverleaf secondary structures in most of the predicted tRNA structures, except for serine (*trnS1*) which lacks of conventional DHU arm and loop. Both Bayesian and maximum-likelihood phylogenetic inference using 13 concatenated PCGs demonstrated strong support for the monophyly of all 52 Testudines species within their respective families and revealed *Batagur trivittata* as the nearest neighbor of *P. sylhetensis*. The mitogenomic phylogeny with other amniotes is congruent with previous research, supporting the sister relationship of Testudines and Archosaurians (birds and crocodilians). Additionally, the mitochondrial Gene Order (GO) analysis indicated plesiomorphy with the typical vertebrate GO in most of the Testudines species.

OPEN ACCESS

Citation: Kundu S, Kumar V, Tyagi K, Chandra K (2020) The complete mitochondrial genome of the endangered Assam Roofed Turtle, *Pangshura sylhetensis* (Testudines: Geoemydidae): Genomic features and phylogeny. PLoS ONE 15(4): e0225233. <https://doi.org/10.1371/journal.pone.0225233>

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Data Availability Statement: The following information was supplied regarding the accessibility of DNA sequences: The complete mitogenome of *Pangshura sylhetensis* is deposited in GenBank of NCBI under accession number MK580979.

Funding: This research was funded by the Ministry of Environment, Forest and Climate Change (MoEF&CC); Zoological Survey of India (ZSI), Kolkata in-house project, 'National Faunal Genome

Introduction

The evolution of living organisms is a continuous process over generations and difficult to understand by measuring with a distinct speciation hypothesis [1]. Several biological as well as environmental factors play an important role in the mutations of a gene from one generation to the next, leading to an altered gene in a new species from an ancestral population. Apart from natural selection, the genetic traits of a population are often altered randomly, forced by several biotic/abiotic factors, gradually leading to the evolutionary dynamics of a species. It is evidenced that, the adequate gene sequences have been largely employed to elucidated the

OPEN

Identification of Indian Spiders through DNA barcoding: Cryptic species and species complex

Kaomud Tyagi¹, Vikas Kumar¹, Shantanu Kundu¹, Avas Pakrashi, Priya Prasad, John T. D. Caleb & Kailash Chandra¹

Received: 22 January 2019

Accepted: 22 August 2019

Published online: 01 October 2019

Spiders are mega diverse arthropods and play an important role in the ecosystem. Identification of this group is challenging due to their cryptic behavior, sexual dimorphism, and unavailability of taxonomic keys for juveniles. To overcome these obstacles, DNA barcoding plays a pivotal role in spider identification throughout the globe. This study is the first large scale attempt on DNA barcoding of spiders from India with 101 morphospecies of 72 genera under 21 families, including five endemic species and holotypes of three species. A total of 489 barcodes was generated and analyzed, among them 85 novel barcodes of 22 morphospecies were contributed to the global database. The estimated delimitation threshold of the Indian spiders was 2.6% to 3.7% K2P corrected pairwise distance. The multiple species delimitation methods (BIN, ABGD, GMYC and PTP) revealed a total of 107 molecular operational taxonomic units (MOTUs) for 101 morphospecies. We detected more than one MOTU in 11 morphospecies with discrepancies in genetic distances and tree topologies. Cryptic diversity was detected in *Pardosa pusiola*, *Cyclosa spirifera*, and *Heteropoda venatoria*. The intraspecies distances which were as large as our proposed delimitation threshold were observed in *Pardosa sumatrana*, *Thiania bhamoensis*, and *Cheiracanthium triviale*. Further, shallow genetic distances were detected in *Cyrtophora cicatrosa*, *Hersilia savignyi*, *Argiope versicolor*, *Phintella vittata*, and *Oxyopes birmanicus*. Two morphologically distinguished species (*Plexippus paykulli* and *Plexippus petersi*) showed intra-individual variation within their DNA barcode data. Additionally, we reinstate the original combination for *Linyphia sikkimensis* based on both morphology and DNA barcoding. These data show that DNA barcoding is a valuable tool for specimen identification and species discovery of Indian spiders.

Spiders are an ancient group of arthropods with their fossil records dating back to the Devonian period (~400 million years ago)^{1–3}. They are one of the most diverse groups with 48,248 extant species and can be found everywhere except Antarctica^{4,5}. Due to their high abundance and rich diversity, spiders have been studied as model organisms for ecological⁶, developmental⁷, evolutionary^{8,9}, and behavioral¹⁰ studies. They are natural predators and play an important role in Integrated Pest Management (IPM) in agriculture and horticulture ecosystems^{11,12}. Spiders have been used as bio-control agents for various diseases causing mosquitoes¹³ and act as indicator species for environmental monitoring¹⁴. The silk produced by spiders has potential applications in biomedical, and defense avenues¹⁵. As compared with the global diversity, approximately 3.72% (1,799 species) are currently known from India⁴. Taxonomic research on spiders is rapidly progressing with many new species being described every year (on an average ~813 new species have been described each year from 2010 to 2018). However, a recent study predicted that the species richness of spider could be at least 120,000 worldwide³; hence, a large proportion of spider diversity remains yet to be discovered or described.

The morphological identification of this group is time consuming and challenging due to (i) sexual dimorphism (ii) polymorphism, and (iii) lack of identification keys for juveniles^{16,17}. Considering these obstacles, it is important to use additional tools, which, may help in rapid species identification and resolving the taxonomic ambiguities. DNA barcoding has been widely used in the last decade in biodiversity research for accurate species identification¹⁸, resolving taxonomic questions¹⁹, detection of cryptic species and species complexes²⁰, population estimation²¹, food adulteration²², wildlife forensics²³, and invasive species detection²⁴. The DNA barcode data can

Centre for DNA Taxonomy, Molecular Systematics Division, Zoological Survey of India, M- Block, New Alipore, Kolkata, 700 053, West Bengal, India. Correspondence and requests for materials should be addressed to V.K. (email: vikaszsi77@gmail.com)

SCIENTIFIC REPORTS

OPEN

Complete mitochondrial genome of Black Soft-shell Turtle (*Nilssononia nigricans*) and comparative analysis with other Trionychidae

Shantanu Kundu¹, Vikas Kumar¹, Kaomud Tyagi, Rajasree Chakraborty, Devkant Singha, Iftikar Rahaman, Avas Pakrashi & Kailash Chandra¹

The characterization of mitochondrial genome has been evidenced as an efficient field of study for phylogenetic and evolutionary analysis in vertebrates including turtles. The aim of this study was to distinguish the structure and variability of the Trionychidae species mitogenomes through comparative analysis. The complete mitogenome (16796 bp) of an endangered freshwater turtle, *Nilssononia nigricans* was sequenced and annotated. The mitogenome encoded for 37 genes and a major non-coding control region (CR). The mitogenome was A + T biased (62.16%) and included six overlapping and 19 intergenic spacer regions. The Relative synonymous codon usage (RSCU) value was consistent among all the Trionychidae species; with the exception of significant reduction of Serine (TCG) frequency in *N. nigricans*, *N. formosa*, and *R. swinhoei*. In *N. nigricans*, most of the transfer RNAs (tRNAs) were folded into classic clover-leaf secondary structures with Watson-Crick base pairing except for *trnS1* (GCT). The comparative analysis revealed that most of the tRNAs were structurally different, except for *trnE* (TTC), *trnQ* (TTG), and *trnM* (CAT). The structural features of tRNAs resulted ≥ 10 mismatched or wobble base pairings in 12 tRNAs, which reflects the nucleotide composition in both H- and L-strands. The mitogenome of *N. nigricans* also revealed two unique tandem repeats (ATTAT)₈ and (TATTA)₂₀ in the CR. Further, the conserved motif 5'-GACATA-3' and stable stem-loop structure was detected in the CRs of all Trionychidae species, which play an significant role in regulating transcription and replication in the mitochondrial genome. Further, the comparative analysis of Ka/Ks indicated negative selection in most of the protein coding genes (PCGs). The constructed Maximum Likelihood (ML) phylogeny using all PCGs showed clustering of *N. nigricans* with *N. formosa*. The resulting phylogeny illustrated the similar topology as described previously and consistent with the taxonomic classification. However, more sampling from different taxonomic groups of Testudines and studies on their mitogenomics are desirable for better understanding of the phylogenetic and evolutionary relationships.

The genus *Nilssononia* (Testudines: Trionychidae) was originally described from Myanmar based on *N. formosa* as its type¹. Further, four species of *Aspideretes* were synonymized under *Nilssononia*^{2–4}. At present, the genus *Nilssononia* is known by the five extant species (*N. formosa*, *N. gangetica*, *N. hurum*, *N. leithii*, and *N. nigricans*), which are distributed in India and adjacent countries, from Pakistan, Nepal, Bangladesh, and up to Myanmar. Among them, *N. leithii* is endemic to peninsular India, while *N. formosa* is restricted to Myanmar^{5,6}. Nevertheless, the identification of *Nilssononia* congeners has been elusive due to similar conspicuous morphological characters in their different life stages^{7,8}. Since the original description, about 150–300 individuals of *N. nigricans* were thought to be living in the shrine pond of Chittagong, Bangladesh that is regarded as type locality^{9–11}. Further, due to the countless anecdotal reports on its identification and distribution, *N. nigricans* was categorized as 'Critically Endangered' (1996–2000) and later on shifted to 'Extinct in the wild' (2002–2018) in the International Union for Conservation of Nature (IUCN, Version-2017-3) Red data list¹². Further, in 2011 the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group (TFTSG) drafted the list and categorized the species as Critically Endangered⁸.

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The first complete mitochondrial genome of marigold pest thrips, *Neohydatothrips samayunkur* (Sericothripinae) and comparative analysis

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Complete mitogenomes from the order Thysanoptera are limited to representatives of the subfamily Thripinae. Therefore, in the present study, we sequenced the mitochondrial genome of *Neohydatothrips samayunkur* (15,295 bp), a member of subfamily Sericothripinae. The genome possesses the canonical 13 protein-coding genes (PCGs), 22 transfer RNA genes (tRNAs), and two ribosomal RNA genes (rRNAs) as well as two putative control regions (CRs). The majority strand was 77.42% A + T content, and 22.58% G + C with weakly positive AT skew (0.04) and negative GC skew (−0.03). The majority of PCGs start with ATN codons as observed in other insect mitochondrial genomes. The GCG codon (Alanine) was not used in *N. samayunkur*. Most tRNAs have the typical cloverleaf secondary structure, however the DHU stem and loop were absent in *trnV* and *trnS1*, while the TΨC loop was absent in *trnR* and *trnT*. The two putative control regions (CR1 and CR2) show 99% sequence similarity indicated a possible duplication, and shared 57 bp repeats were identified. *N. samayunkur* showed extensive gene rearrangements, with 11 PCGs, 22 tRNAs, and two rRNAs translocated when compared to the ancestral insect. The gene *trnL2* was separated from the '*trnL2-cox2*' gene block, which is a conserved, ancestral gene order found in all previously sequenced thrips mitogenomes. Both maximum likelihood (ML) and Bayesian inference (BI) phylogenetic trees resulted in similar topologies. The phylogenetic position of *N. samayunkur* indicates that subfamily Sericothripinae is sister to subfamily Thripinae. More molecular data from different taxonomic groups is needed to understand thrips phylogeny and evolution.

The order Thysanoptera (thrips) includes nine families in two suborders, the Terebrantia and Tubulifera. The family Thripidae is the largest of the Terebrantia and is further subdivided into four subfamilies; Dendrothripinae, Panchaethripinae, Sericothripinae, and Thripinae¹. The members of Sericothripinae have a worldwide distribution and are usually associated with flowers^{2,3}. This subfamily currently includes 168 species in three genera, *Neohydatothrips*, *Hydatothrips*, and *Sericothrips*. The marigold thrips, *Neohydatothrips samayunkur* is a pest of marigold (*Tagetes* spp.) with a worldwide distribution^{4–6}. Recently, *N. samayunkur* has also been suspected as a vector for tospoviruses⁷. Integration of molecular data with morphology is required for fast and accurate species identification and to understand phylogenetic relationships². The mitochondrial genes *cox1* and 16S rRNA have been found to be useful in the identification of thrips species and to infer phylogenetic relationships^{8–10}, however, phylogenetic relationships below the family level in thrips are still unclear and require more molecular data^{2–4}.

Insects typically have a single circular mitochondrial genome, 14–19 kb in size, with 37 genes, including 13 protein-coding genes (PCGs), large and small ribosomal RNA genes (rRNAs), 22 transfer RNA genes (tRNAs) and variable number of A + T rich control regions (CRs). The characteristic features of the animal mitochondrial genomes are (i) conserved gene content, (ii) conserved genome size and organization, (iii) lack of extensive

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Taxonomic quest: validating two mahseer fishes (Actinopterygii: Cyprinidae) through molecular and morphological data from biodiversity hotspots in India

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Abstract Mahseers, the members of the fish genus *Tor*, are economically important as sport and food fishes, but their population is declining in South and Southeast Asia. Taxonomic discrepancies exist in discussions surrounding a few species of mahseer in India. In this study, we hypothesize that *Tor mosal* is wrongly synonymized with *T. putitora*, and *T. barakae* with *T. tor*. To test this, we collected samples from the type localities, and from known distribution areas. We observed a clear morphological distinctiveness among these four species using Principal Component Analysis. The most prominent distinctive parameters among the four species were body depth and head length. Phylogenetic analysis using Bayesian Inference and Maximum Likelihood for both partial mtCOI and mtCytb datasets revealed monophyletic origin,

and supported distinctive species level delimitation which was consensus with morphological identity. Moreover, the automatic species delimitation methods (ABGD and PTP) also quantify the four species. The mean K2P distance was 1.57% between *T. putitora* and *T. tor*, 2.60% between *T. mosal* and *T. putitora*, 3.27% between *T. mosal* and *T. tor*, and 2.63% between *T. barakae* and *T. tor*. Based on this study, we validate *T. mosal* and *T. barakae*, and provide taxonomic keys to the species.

Keywords Mahseer · *Tor* · Northeast India · Brahmaputra · Barak · Eastern Himalaya · Indo-Burma · DNA barcoding · Conservation

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Introduction

Fishes of the genus *Tor* Gray (1834) are large-growing freshwater barbs in South and Southeast Asia, commonly referred to as Mahseers (Laskar et al., 2013). Mahseers are important as the top consumers in the hill-stream ecosystems, a source of food, and a source of recreation for common people and hobbyist anglers (Thomas, 1897; McDonald, 1948; Nautiyal, 2006). Mahseers have recently attracted the attention of conservationists due to their manifold importance, and the declining trend of their populations (<http://mahseertrust.org/research-conservation/>). The IUCN-Red List of threatened species has categorized a