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Integrative Taxonomic Delimitation of Stonefishes (Perciformes: Synanceiidae) from the Kerala Coast, India

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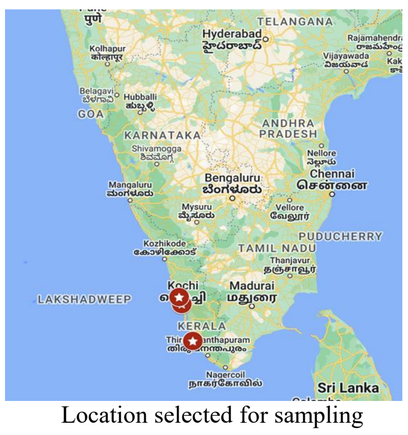
INTRODUCTION & AIM

Stonefishes (Synanceiidae) are highly venomous, cryptic, benthic fishes that are often misidentified due to their strong camouflage and overlapping morphological characters. Combining morphometric and meristic analysis with COI-based DNA barcoding provides accurate species-level identification and resolves long-standing taxonomic ambiguities.

- Identify the species of the family Synanceiidae using morphometric and meristic characters
- To analyze the genetic divergence within and between species to resolve taxonomic ambiguity.



Location selected for sampling

Kingdom : Animalia

Phylum : Chordata

Class : Actinopterygii

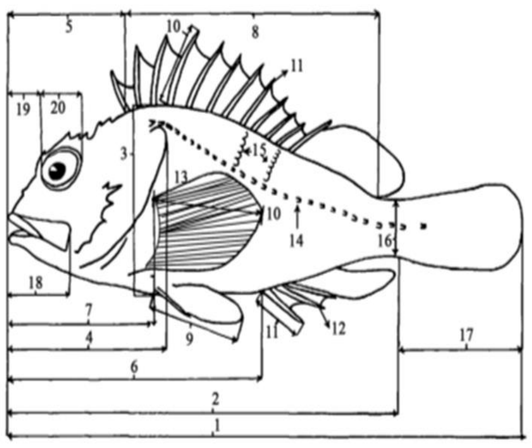
Order : Perciformes

Suborder : Scorpaenoidei

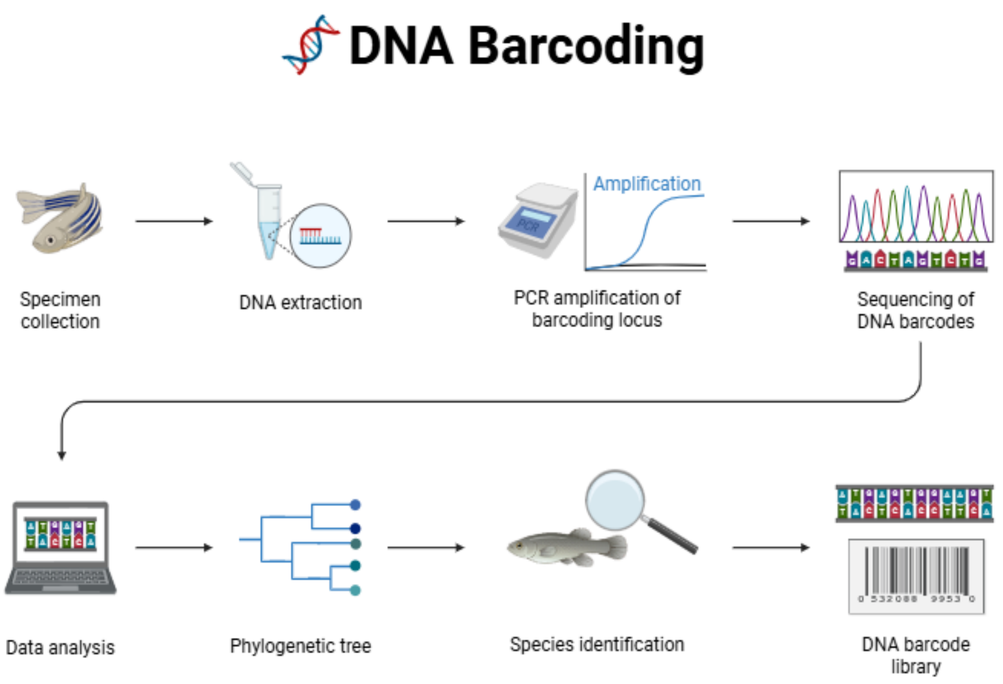
Family : Synanceiidae

METHOD

- Stonefish specimens were collected from Munambam, Kalamukku and Sakthikulangara landing centres.
- Samples were obtained from deep-sea trawl bycatch, photographed fresh, and preserved in 3–5% formalin for analysis.



1. Total length
2. Standard length
3. Body depth
4. Head length
5. Pre dorsal length
6. Preanal-fin length
7. Pre pectoral fin length
8. Length of dorsal base
9. Pelvic-fin length
10. Pectoral-fin length
11. Height of dorsal and anal spines
12. Dorsal and anal fin soft ray length
13. Pectoral rays
14. Lateral line pored scales
15. Vertical scale rows
16. Least depth of caudal peduncle
17. Caudal length
18. Upper jaw length
19. Snout length
20. Eye diameter



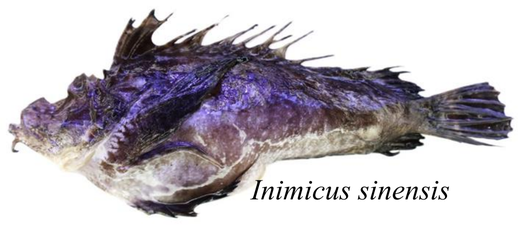
RESULTS & DISCUSSION

- 8 species of stonefishes identified from Kerala coast.

Choridactylus multibarbus, Apistus carinatus, Inimicus didactylus, Inimicus sinensis, Minous monodactylus, Minous inermis, Minous trachycephalus &Minous dempsterae.

Choridactylus multibarbus

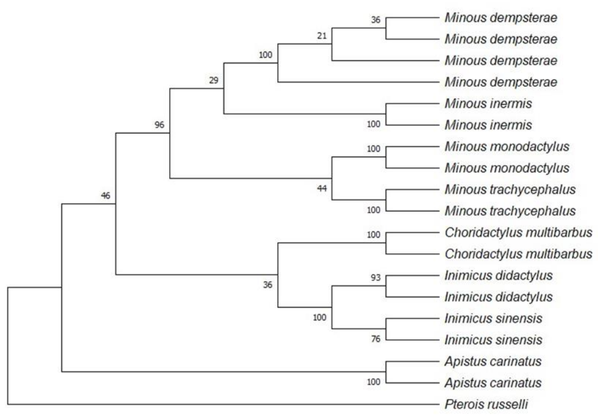
Apistus carinatus



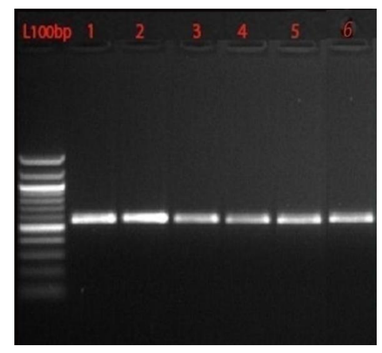
Inimicus sinensis

Minous dempsterae

- COI gene amplification was successful for every specimen, and ML phylogeny produced eight well-supported clades matching morphological identifications.
- Genetic divergence (4.1%–24.6%) confirmed strong interspecific separation.

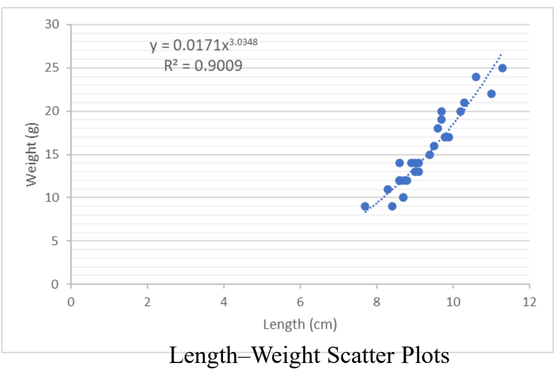


Maximum likelihood tree from COI sequence data



mtDNA profile of Stonefishes with COI primer

- COI gene (~650 bp) was successfully amplified for all collected stonefish specimens.
- Gel electrophoresis showed sharp, single bands, confirming high-quality DNA extraction.
- Tree topology showed high interspecific divergence, supporting the presence of diverse stonefishes along Kerala coast.
- Length–weight analysis showed positive allometric growth in Minous dempsterae and negative allometric growth in M. inermis.



Length–Weight Scatter Plots

CONCLUSION

- Eight stonefish species belonging to four genera were documented from the Kerala coast.
- COI gene proved effective for species delineation, producing eight well-supported clades.
- This work establishes a baseline reference for Synanceiidae diversity in Kerala.

FUTURE WORK / REFERENCES

- Expand sampling to deeper and offshore habitats along southwest India..
- Develop a public DNA barcode database for venomous fishes of India.
- Conduct ecological and venom protein studies for biomedical applications.

Eschmeyer et al., 2017. Catalog of Fishes.Ward et al., 2005. DNA Barcoding of Fish.Inaba & Motomura, 2018. FishBase.Nelson et al., 2016. Fishes of the World.