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Complementary redescription of *Anacanthobatis ori* (Wallace, 1967) and its assignment to *Indobatis* n. g. (Elasmobranchii, Anacanthobatidae), with comments on other legskates

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Abstract

Anacanthobatis ori is one of the least known species of the family Anacanthobatidae with only four juvenile specimens reported. The species remained assigned to the genus *Anacanthobatis sensu lato* due to the lack of an adult male as external and skeletal clasper characters are the essential diagnostic features for the differentiation of genera and subgenera within the family Anacanthobatidae. Since an adult male of *A. ori* became available, along with an adult female and six further juveniles, the authors reinvestigated the species and present its so far unknown diagnostic characters of clasper morphology and skeleton and scapulocoracoid. The clasper turned out to be the most complex one of all known anacanthobatids as the external components flag, slit, pseudosiphon-like cavity, pecten, and two sentinas are not known from any other anacanthobatid species. Furthermore, a dorsal terminal 1 cartilage is present but displaced proximally of the terminal clasper skeleton, the outer edge of dorsal terminal 2 is deeply serrated, the ventral terminal has a very long, curved, strap-like process, and the proximal part of accessory terminal 1 is embedded in the cavity of the baseball-glove-like head of accessory terminal 2. Due to the strong differences in external and internal clasper characters to all other known anacanthobatid species, *A. ori* is placed in its own, newly erected genus, *Indobatis*.

Key words: leg skates, western Indian Ocean, deep water, generic status, clasper features, *Crurirajidae*

Introduction

The family Anacanthobatidae (legskates) and its type genus *Anacanthobatis* were erected by von Bonde & Swart (1923) for *Leiobatis marmoratus* (type species, subsequently designated with lectotype by Hulley, 1973) and *L. dubius* n. spp. from South Africa. The family currently consists of two genera, *Anacanthobatis* von Bonde & Swart, 1923 and *Sinobatis* Hulley, 1973. *Sinobatis* was first described as a subgenus of *Anacanthobatis*, but was elevated to generic level by Last & Séret (2008) based on strong differences in clasper morphology. Two further subgenera, *Schroederobatis* and *Springeria*, were erected by Hulley (1973), also based on differences in their clasper morphology. As such differences are considered to be diagnostic of genera also in other rajoid groups, elevation of both latter subgenera to generic level was proposed by Last & Séret (2008).

The family Anacanthobatidae currently comprises 13 valid species. However, several authors consider three of these species, *Anacanthobatis donghaiensis* (Deng, Xiong & Zhan, 1983), *A. nanhaiensis* (Meng & Li, 1981), and *A. stenosoma* (Li & Hu, 1982), to be synonymous with formerly described species. The validity of *A. donghaiensis* is questioned by Séret (1986), the validity of *A. nanhaiensis* by Ishihara (1984) and Last & Compagno (1999), and the validity of *A. stenosoma* by Séret (1986) and Last & Compagno (1999). However, detailed interspecific comparisons are not possible based on their original descriptions, and only few specimens are known of each species (Séret 1986).

All known legskate species have restricted distributions on continental and insular slopes of the western Atlantic, the southeastern and southwestern Indian Ocean, and the western Pacific (Last & Séret 2008). The smallest species, *A.* (*Anacanthobatis*) *marmorata* (von Bonde & Swart, 1923), grows to about 290 mm total length

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Sinobatis cf. *melanosoma.* ZMH 25947 (94 mm TL, male postembryo).
Sinobatis cf. *melanosoma* (ex *borneensis*). MTUF 25005 (505 mm TL, subadult male).
Sinobatis sp. Vietnam. IOAN uncatalogued (331 mm TL, adult male).
Cruriraja hulleyi. ZMH 105118 (ex ISH 44-1967) (adult females: 503 mm TL; 532 mm TL), ZMH 122862 (ex ISH 30-1991) (juvenile males: 235 mm TL; 235 mm TL; juvenile females: 280 mm TL; 348 mm TL).

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References

Amante, C. & Eakins, B.W. (2009) *ETOPO1 1 Arc-Minute Global Relief Model: Procedures, Data Sources and Analysis*. NOAA Technical Memorandum NESDIS NGDC-24, 19 pp.

Aschliman, N.C., Ebert, D.A. & Compagno, L.J.V. (2010) A new legskate (Rajoidei: Genus *Cruriraja*) from Southern Africa. *Copeia*, 2010 (3), 364–372.
http://dx.doi.org/10.1643/ci-09-215

Aschliman, N.C., Nishida, M., Miya, M., Inoue, J.G., Rosana, K.M. & Naylor, G.J. (2012) Body plan convergence in the evolution of skates and rays (Chondrichthyes: Batoidea). *Molecular Phylogenetics and Evolution*, 63 (1), 28–42.
http://dx.doi.org/10.1016/j.ympev.2011.12.012

Bigelow, H.B. & Schroeder, W.C. (1948) New genera and species of batoid fishes. *Journal of Marine Research*, 7, 543–566.

Bigelow, H.B. & Schroeder, W.C. (1951) A new genus and species of anacanthobatid skate from the Gulf of Mexico. *Journal of the Washington Academy of Sciences*, 41(3), 110–113.

Bigelow, H.B. & Schroeder, W.C. (1953) Fishes of the Western North Atlantic. Part two. Sawfishes, Guitarfishes, Skates and Rays, Chimaeroids. *Memoirs Sears Foundation of Marine Research*, 1 (2), i–xv + 1–588.
http://dx.doi.org/10.2307/1440496

Bigelow, H.B. & Schroeder, W.C. (1958) Four New Rajids from the Gulf of Mexico. *Bulletin of the Museum of Comparative Zoology*, 119 (2), 201–233.

Bigelow, H.B. & Schroeder, W.C. (1962) New and little known batoid fishes from the western Atlantic. *Bulletin of the Museum of Comparative Zoology*, 128 (4), 159–244.

Carvalho, M.R. de., Gomes, U.L. & McEachran, J.D. (2006) First report and description of a legskate, genus *Cruriraja*, from the southwestern Atlantic Ocean (Chondrichthyes: Rajidae). *Cybium* 30 (4), 343–354.

Chan, W.L. (1965a) A New Anacanthobatid Skate of the Genus *Springeria* from the South China Sea. *Japanese Journal of Ichthyology*, 13, 40–45.

Chan, W.L. (1965b) *Anacanthobatis borneensis*, the second new anacanthobatid skate from the South China Sea. *Japanese Journal of Ichthyology*, 13, 46–51.

Clark, R.S. (1926) Rays and skates, a revision of the European species. *Fisheries, Scotland, Scientific Investigations*, 1, 1–66.

Compagno, L.J.V. (1999) Checklist of living elasmobranchs. *In*: Hamlett, W.C. (Ed.), *Sharks, skates, and rays: the biology of elasmobranch fishes*. The John Hopkins University Press, Baltimore and London, pp. 471–498.

Compagno, L.J.V., Stehmann, M. & Ebert, D.A. (1990) *Rhinochimaera africana*, a new longnose chimaera from southern Africa, with comments on the systematics and distribution of the genus *Rhinochimaera* Garman, 1901 (Chondrichthyes, Chimaeriformes, Rhinochimaeridae). *South African Journal of Marine Science*, 9 (1), 201–222. http://dx.doi.org/10.2989/025776190784378646

Deng, S., Xiong, G. & Zhan, H. (1983) Description of three new species of Elasmobranchiate fishes from the deep waters of the East China Sea. *Oceanologia et Limnologia Sinica*, 14 (1), 211–218. [in Chinese with English summary]

Eschmeyer, W.N. (2013) Catalog of Fishes. California Academy of Sciences. Available from: http://research.calacademy.org/research/ichthyology/catalog/fishcatmain.asp (accessed 10 January 2013)

Hubbs, C.L. & Ishiyama, R. (1968) Methods for the Taxonomic Study and Description of Skates (Rajidae). *Copeia*, 1968 (3), 483–491.

Hulley, P.A. (1970) An investigation of the Rajidae of the west and south coasts of southern Africa. *Annals of the South African Museum*, 55 (4), 151–220.

Hulley, P.A. (1972) The origin, interrelationships and distribution of southern African Rajidae (Chondrichthyes, Batoidei). *Annals of the South African Museum*, 60, 1–103.

Hulley, P.A. (1973) Interrelationships within the Anacanthobatidae (Chondrichthyes, Rajoidea), with a description of the lectotype of *Anacanthobatis marmoratus* von Bonde & Swart, 1923. *Annals of the South African Museum*, 62, 131–158.

Hulley, P.A. (1986) Rajidae. *In*: Smith, M.M. & Heemstra, P.C. (Eds.), *Smiths' Sea Fishes*. First edition. Springer-Verlag, Berlin, pp. 115–127.

Ishihara, H. (1984) Second record of the rare skate *Anacanthobatis borneensis* from the East China Sea. *Japanese Journal of Ichthyology*, 30 (4), 448–451.

Ishiyama, R. (1958) Studies on the rajid fishes (Rajidae) found in the waters around Japan. *Journal of the Shimonoseki College of Fisheries*, 7 (2/3), 193–394.

Krefft, G. (1968) Knorpelfische (Chondrichthyes) aus dem tropischen Ostatlantik. *Atlantide Report*, No. 10, 33–76.

Last, P.R. & Compagno, L.J.V. (1999) Anacanthobatidae, legskates. *In*: Carpenter, K.E. & Niem, V.H. (Eds.) *FAO species Identification Guide for Fishery Purposes. The living marine resources of the Western Central Pacific. Vol. 3. Batoid fishes, chimaeras and bony fishes part 1 (Elopidae to Linophrynidae)*. FAO, Rome, 1466 pp.

Last, P.R. & Séret, B. (2008) Three new legskates of the genus *Sinobatis* (Rajoidei: Anacanthobatidae) from the Indo-West Pacific. *Zootaxa*, 1671, 33–58.

Li, S. & Hu, A. (1982) *Springeria stenosoma* sp. nov. pp. 306–308, 310–311 in Zhu, Y., Meng,Q., Hu, A. & Li, S. (authors) Five new species of Elasmobranchiate fishes from the deep waters of South China Sea. *Oceanologia et Limnologia Sinica*, 14 (4), 301–311. [in Chinese with English summary]

Lloyd, R.E. (1909) A description of the deep-sea fish caught by the R.I.M.S. ship "Investigator" since the year 1900, with supposed evidence of mutation in *Malthopsis*. *Memoirs of the Indian Museum*, 2 (3), 139–180.

McEachran, J.D. & Compagno, L.J.V. (1979) A further description of *Gurgesiella furvescens* with comments on the interrelationships of Gurgesiellidae and Pseudorajidae (Pisces, Rajoidei). *Bulletin of Marine Science*, 29 (4), 530–553.

McEachran, J.D. & de Carvalho, M.R. (2002) Batoid Fishes. *In*: Carpenter, K.E. (Ed.), *The living marine resources of the Western Central Atlantic. Vol. 1. Introduction, molluscs, crustaceans, hagfishes, sharks, batoid fishes and chimaeras*. FAO Species Identification Guide for Fishery Purposes and American Society of Ichthyologists and Herpetologists Special Publication No. 5, FAO, Rome, pp. 507–589.

Meng, Q. & Li, S. (1981) *Springeria nanhaiensis* sp. nov. pp. 105–108, 115 in Zhu, Y., Meng,Q., Hu, A. & Li, S. (authors) Description of four new species, a new genus and a new family of Elasmobranchiate fishes from the deep sea of the South China Sea. *Oceanologia et Limnologia Sinica*, 12 (2), 103–116. [in Chinese with English summary]

Naylor, G.J.P., Caira, J.N., Jensen, K., Rosana, K.A.M., Straube, N. & Lakner, C. (2012a) Elasmobranch Phylogeny: A Mitochondrial Estimate Based on 595 Species. *In*: Carrier, J.C., Musick, J.A. & Heithaus, M.R. (Eds.), *The Biology of Sharks and Their Relatives*. CRC Press, Boca Raton, pp. 31–56.

Naylor, G.J.P., Caira, J.N., Jensen, K., Rosana, K.A.M., White, W.T. & Last, P.R. (2012b) A DNA Sequence-Based Approach to the Identification of Shark and Ray Species and its Implications for Global Elasmobranch Diversity and Parasitology. *Bulletin of the American Museum of Natural History*, 367, 1–262. doi: http://dx.doi.org/10.1206/754.1

Sabaj Pérez, M.H. (Ed.) (2012) Standard symbolic codes for institutional resource collections in herpetology and ichthyology: an Online Reference. Version 3.0 (23 February 2012). Available from: http://www.asih.org/ (accessed 27 March 2012)

Séret, B. (1986) Deep water skates of Madagascar. Part I. Anacanthobatidae (Pisces, Chondrichthyes, Batoidea), second record of the skate *Anacanthobatis ori* (Wallace, 1967) from off Madagascar. *Cybium*, 10, 307–326.

Springer, V.G. & Garrick, J.A.F. (1964) A survey of vertebral numbers in sharks. *Proceedings of the United States National Museum*, 116 (3496), 73–96. http://dx.doi.org/10.5479/si.00963801.116-3496.73

Stehmann, M. (1970) Vergleichend morphologische und anatomische Untersuchungen zur Neuordnung der Systematik der nordostatlantischen Rajidae (Chondrichthyes, Batoidei). *Archiv für Fischereiwissenschaft*, 21 (2), 73–164.

Stehmann, M. (1976) Revision der Rajoiden-Arten des nördlichen Indischen Ozean und Indopazifik (Elasmobranchii, Batoidea, Rajiformes). *Beaufortia*, 24 (315), 133–175.

Stehmann, M. (1985) Ergebnisse der Forschungsreisen des FFS "Walther Herwig" nach Südamerika. LXIV. *Bathyraja papilionifera* sp. n. (Pisces, Batoidea, Rajidae), eine weitere neue Rochenart aus dem Südwestatlantik vom nordargentinischen Kontinentalabhang. *Archiv für Fischereiwissenschaft*, 36 (1/2), 195–211.

Stehmann, M.F.W., Séret, B., Costa, M.E. & Baro, J. (2008) *Neoraja iberica* n. sp., a new species of pygmy skate (Elasmobranchii, Rajidae) from the southern upper slope of the Iberian Peninsula (Eastern North Atlantic). *Cybium*, 32 (1), 51–71.

von Bonde, C. & Swart, D.B. (1923) The Platosomia (Skates and Rays) collected by the S.S. "Pickle". *Reports of the Fisheries and Marine Biological Survey of the Union of South Africa*, 3, 1–22.

Wallace, J.H. (1967) The Batoid Fishes of the East Coast of Southern Africa. Part III: Skates and Electric Rays. *Investigational Report of the Oceanographic Research Institute*, 17, 1–62.

Weigmann, S., Stehmann, M.F.W. & Thiel, R. (2013) *Planonasus parini* n. g. and n. sp., a new genus and species of false cat sharks (Carchariniformes, Pseudotriakidae) from the deep northwestern Indian Ocean off Socotra Islands. *Zootaxa*, 3609 (2), 163–181.
http://dx.doi.org/10.11646/zootaxa.3609.2.3