

Morphology and DNA Barcoding highlights the presence of a cryptic skate species in the South-west Atlantic Ocean

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The yellownose skate, *Zearaja chilensis*, is a large skate that has been reported from the coasts of Chile in the Southeastern Pacific to Southern Brazil in the Southwestern Atlantic. Due to its geographical range, biological traits, and levels of exploitation, this species was listed as vulnerable by the IUCN. Recent molecular studies have called into question the conspecificity between specimens from these opposite coasts of South America, which can have implications for the conservation status of the species. The aim of this study is to verify the identity of specimens identified as *Z. chilensis* in Argentina with respect to specimens from Chile. A total of 50 specimens from Argentinean waters (AW) and 22 from Chilean waters (CHW) were examined in order to compare their external morphology, spinulation pattern, clasper, and egg capsules. Tissue samples (AW=12, CHW=2) were obtained and sequence data for the Cytochrome Oxidase Subunit I (COI) gene were generated. Additionally, public sequences were obtained from BOLD (AW=25, CHW=8). Despite its external similarity, several traits were consistently different between specimens from both regions. Adults from AW presented longer preorbital length and shorter distance between first gill openings than those from CHW. AW specimens

presented 3-5 rows of caudal thorns, whereas most specimens from CHW had only one row. Dermal denticles were restricted to the rostral area in AW skates, whereas in CHW skates most of the dorsal surface of the disc was covered with denticles, with a smooth area in the centre of pectoral fins. Major differences in clasper morphology were also found. For instance: in AW specimens, terminal bridge (tb) is straight towards tip of dorsal terminal 2 cartilage (dt2) and sentinel (st) does not reach tb, whereas in CHW specimens tb is curved towards tip of dt2 and st reach tb; ventral terminal cartilage of CHW has a longer apophysis and the outer edge is wider than those from AW. Egg capsules of AW skates had wider lateral keels than these of their Chilean counterparts. Molecular analysis revealed two well defined cohesive clusters, corresponding to AW and CHW specimens, respectively. Average K2P distance between groups was 3.4%, a value substantially higher than expected for intraspecific differences. Indeed, BINs analysis (algorithm that clusters barcode sequences into OTUs) assigned the sequences to different BINs. These integrative results strongly support that specimens from Argentinean waters known as *Z. chilensis* correspond to a different nominal species than those from Chilean waters.

Keywords: Rajiformes, longnose skates, hidden diversity, genetics, morphological features.