



## Morphological abnormality in a Longnose Stingray *Hypanus guttatus* (Bloch & Schneider, 1801) (Myliobatiformes: Dasyatidae)

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SCHMID, K., ANDRADE, M., MACHADO, F., ARAUJO, J., CORRÊA, E., GIARRIZZO, T. **Morphological abnormality in a Longnose Stingray *Hypanus guttatus* (Bloch & Schneider, 1801) (Myliobatiformes: Dasyatidae)**. *Biota Neotropica*. 19(4): e20190792. <http://dx.doi.org/10.1590/1676-0611-BN-2019-0792>

**Abstract:** A Longnose stingray *Hypanus guttatus* (Bloch & Schneider, 1801) embryo with a major asymmetrical morphological abnormality to its pectoral fin was obtained from commercial shrimp fisher's bycatch, off the coast of the Amazon River Mouth in northern Brazil. The specimen and the deformity, which would presumably have impeded its long-term survival, are described and documented in detail. We herein provide the first report of an abnormal individual of this species for the Brazilian coast.

**Keywords:** Fish, Elasmobranchs, Atlantic, Teratology, Deformity.

## Anormalidade morfológica em uma Arraia-bicuda *Hypanus guttatus* (Bloch & Schneider, 1801) (Myliobatiformes: Dasyatidae)

**Resumo:** Um embrião de Arraia-bicuda *Hypanus guttatus* (Bloch & Schneider, 1801) com uma anomalia morfológica assimétrica grave na nadadeira peitoral foi obtido como captura-acidental de um barco de pesca de camarão da costa da foz do rio Amazonas, no norte do Brasil. O indivíduo e sua deformação, que provavelmente teria impedido sua sobrevivência ao longo prazo, são descritos e documentados em detalhe. Apresentamos com esse estudo o primeiro registro de um indivíduo anormal dessa espécie para a costa do Brasil.

**Palavras-chave:** Peixes, Elasmobrânquios, Atlântico, Teratologia, Deformação.

### Introduction

The longnose stingray *Hypanus guttatus* (Bloch & Schneider, 1801), Dasyatidae, is widespread throughout the tropical waters of the western Atlantic Ocean from the southern Gulf of Mexico to the southern coast of São Paulo in Brazil. This aplacental viviparous stingray inhabits shallow water areas to at least 36 m in depth, has been found primarily on sandy bottoms and feeds predominantly on mobile invertebrates (Anderson et al. 2015, Froese & Pauly 2018). *Hypanus guttatus* is a commercially important species in certain regions, such as the Caribbean coast of Colombia, Venezuela and Northeastern Brazil, where it is primarily targeted by artisanal fisheries (Cervigón & Alcalá 1999, Ramírez-Hernandez et al. 2011).

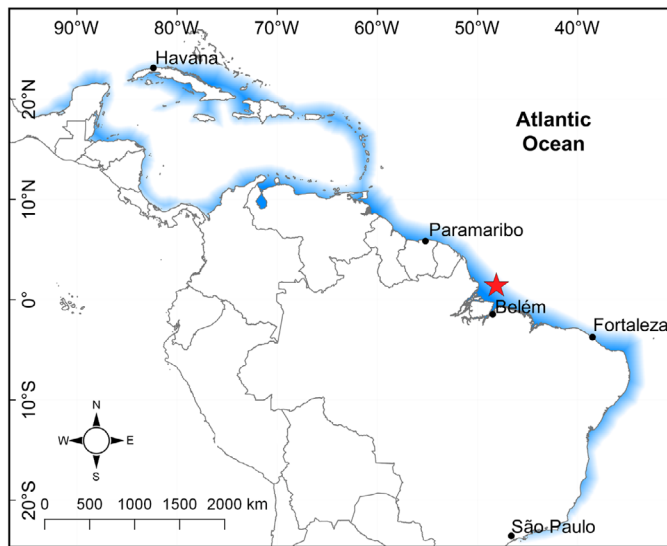
There have been several reports of morphological abnormality in specimens of the genera *Dasyatis* and *Hypanus*, from both the Atlantic and Pacific Oceans. The vast majority of the deformities have been found in the head, rostrum and pectoral fin (Gomes et al. 1991, Lamilla et al. 1995, Escobar-Sánchez et al. 2009, Blanco-Parra & Niño-Torres 2011), while there have been fewer reports of abnormality in other parts, such as gonads, internal organs, tail and teeth (Ribeiro-Prado

et al. 2008, Ramírez-Hernandez et al. 2011). Here we describe in detail the morphological abnormalities of a *H. guttatus* embryo, captured off the Brazilian Amazon Coast, as the first record for this taxon from this region.

### Material and Methods

The *H. guttatus* embryo with its yolk sac still present was collected approximately 200-km off the coast of the Amazon River mouth (1°23'54.4" N 48°07'37.2" W) in February 2017, as bycatch during a bottom trawl for the southern brown shrimp *Farfantepenaeus subtilis* (Pérez-Farfante, 1967), in approximately 43 m depth (Figure 1). The embryo was identified based on Carpenter and Niem (1999), measured, weighed, fixed in 10% formalin, and deposited in the fish collection of the Grupo de Ecologia Aquática (GEA 3677). No other individuals (e.g. more embryos or a pregnant female) of *H. guttatus* were captured during this trawl. A morphological description of the embryo and measurements were conducted based on Gomes et al. (2000) (Table 1). Additionally, measurements were taken for: (1) preorbital length (snout tip along sagittal axis of body to the eye level), (2) snout to aperture

end of the pectoral fin, a linear measurement from the snout tip through the sagittal axis to the aperture end of the pectoral fin level, and (3) anterior margin of cranium to aperture end of the pectoral fin, measured as in the previous item (Figure 2). The internal anatomy was visualized by radiography performed on a Phillips Aquilla Plus 300 device at 45 kVolts and 50 mA for 2.5mAs at the Universidade Federal Rural da Amazônia (UFRA).



**Figure 1.** Distribution of *Hypanus guttatus* (Bloch & Schneider, 1801) (blue shading) according to Rosa and Furtado (2004), and the collection site (red star) at ~200 km offshore Amazon River mouth, Brazil.

## Results

The *H. guttatus* embryo had a morphological abnormality that formed an aperture from the anterior margin of the snout around the left margin of the disc to the fourth gill slit (Figure 2, Table 1). In addition to the clearly separated pectoral fin, the left branchial arches (on the deformed side) appeared to be more widely interspaced, albeit more regularly formed than on the right side (Figure 3). The pectoral fins presented convex anterior margins and slightly straightened posterior margins. The embryo's disc length was slightly shorter than its width and its eye diameter was smaller than the spiracle length. Although the x-ray imaging (Figure 3) does not provide full evidence, the cranium and jaw musculature do not seem to present an evident abnormality. Moreover, other morphological features of the specimen are consistent with other accounts of the species, such as that by Bigelow & Schroeder (1953) and Last et al. (2016).

## Discussion

The cause of the pectoral fin separation found in the *H. guttatus* embryo remains unknown. Pectoral fin separation from the head has been described as a common feature in the early stages of batoid embryonic development, with possible causes including parasitic infection, natural developmental mutation as well as injury- and environmental stressor-induced (e.g. long-term exposure to chemical pollution) teratogenic responses (Mancini et al. 2006, Ramírez-Hernandez et al. 2011).

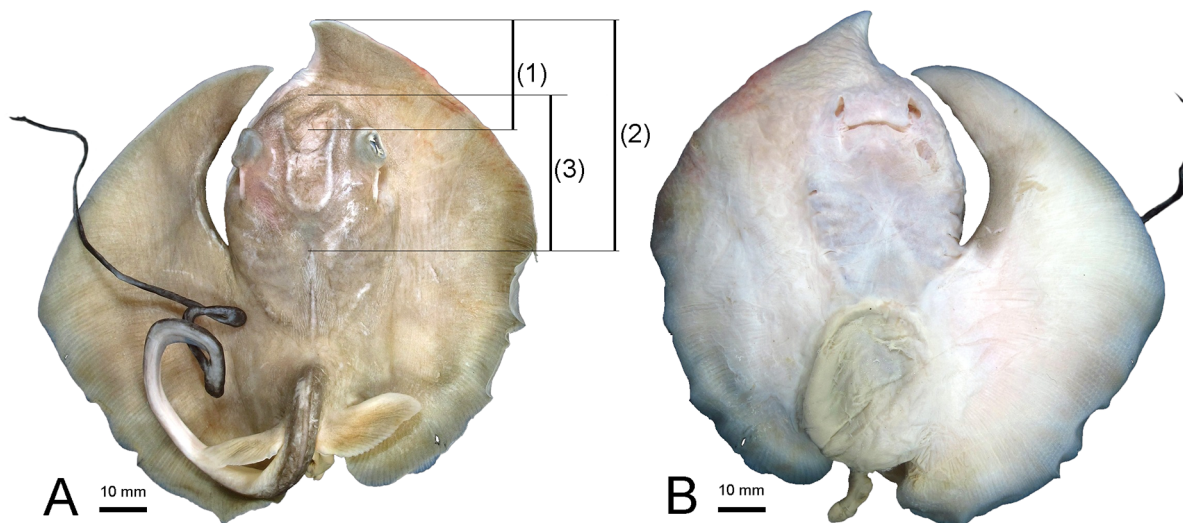
**Table 1.** Measurements of the *Hypanus guttatus* (Bloch & Schneider, 1801) specimen (GEA 3677).

Measurement	(mm)
Disc width	95.9
Disc length	96.6
Total length	271.6
Disc length to axil of pectoral fin	44.4
Preoral length	27.2
Preorbital length	27.6
Snout to cloaca	89.9
Snout to aperture end	50.4
Cloaca to sting base	39.8
Tail length	199.2
Tail height	4.9
Height of dorsal finfold	0.5
Eye diameter	7.2
Spiracle length	8.8
Cranial interorbital	15.6
Cranium anterior margin to aperture end	30.9
Interspiracular	24.7
Internarial	6.4
Mouth width	5.4
Distance between first pair of gill slits	12.3
Distance between first and fifth gill slits	9.0
Pelvic fin anterior margin	4.1
Pelvic fin posterior margin	10.2

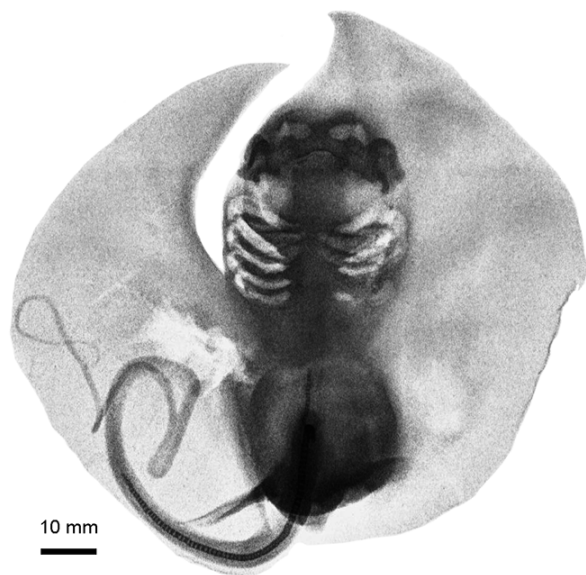
Morphological abnormalities of the fins could directly impact a fish's mobility, affecting both its ability to forage and/or avoid predators, thereby reducing its likelihood of survival (Mancini et al. 2006). Although the morphological abnormality found in the embryo from this study could have presumably impeded its long-term survival, a similar malformation was recorded in a mature male *H. guttatus* captured in the Colombian Caribbean (Ramírez-Hernandez et al. 2011). This mature male had a disc width of 520 mm; however, the abnormality was symmetrical and divided the snout equally, which presumably had a reduced impact on the swimming kinematics of the individual, thus allowing it to reach adult size. The abnormality of the *H. guttatus* embryo was asymmetrical and would presumably have had a negative impact on the swimming capacity of the individual, post-embryonically. That being said, Ribeiro-Prado et al. (2008) reported a female *Pteroplatytrygon violacea* (Bonaparte, 1832) (Dasyatidae) specimen which reached maturity, carrying an embryo, regardless of exhibiting very similar asymmetrical anomaly—a one-sided deeply unfused pectoral fin.

Scientific records of abnormalities for elasmobranchs are generally much rarer than for teleost fishes. The present report is only the second for an abnormal *H. guttatus* specimen, and the first from the Brazilian coast and for an embryo of this species thus providing an important biogeographic insight on abnormalities for this genus and species, given that existing and future reports contribute to the detection of

## Malformation in a Longnose stingray



**Figure 2.** Embryo *Hypanus guttatus* (Bloch & Schneider, 1801), collected off the Brazilian Amazon Coast (GEA 3677), disc width = 95.9 mm, (a) dorsal view, (b) ventral view. New measurements depicted by (1) preorbital length, (2) snout to aperture end of the pectoral fin, and (3) anterior margin of cranium to aperture end of the pectoral fin; see material and methods for more details.



**Figure 3.** Radiograph of the embryo *Hypanus guttatus* (Bloch & Schneider, 1801) (GEA 3677), disc width = 95.9 mm.

potential spatial and/or species-related patterns and, eventually, may help uncovering possible causes.

### Acknowledgements

The specimen was obtained during the “Shrimp NEN” research project (#445766/2015-8) from the Center for Research and Management of Fishing Resources of Brazil’s North Coast of the Brazilian Ministry of the Environment in partnership with the Federal

University of Pará. Thanks to M. Figueiredo (UFRA) for radiograph preparation and to D. McLennan for proofreading the manuscript. This study was financed in part by the Coordenação de Aperfeiçoamento do Pessoal de Nível Superior - Brasil (CAPES) – Finance Code 001 (KS, FSM). MCA receives a National Postdoctoral Fellowship Program (PNPD/CAPES # 2017-6), JSA is funded by the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPQ) and TG receives a productivity grant (CNPq # 310299/2016-0).

### Author Contributions

Kurt Schmid is the main (first) author of the manuscript and made substantial contribution in the concept and design of the study.

Marcelo Andrade made contribution to data collection, data analysis and interpretation and manuscript preparation.

Fabiola Machado made contribution to data collection, data analysis and interpretation.

Juliana Araujo made contribution to data collection, data analysis and interpretation.

Eglê Corrêa made contribution to data collection.

Tommaso Giarrizzo made substantial contribution in the concept and design of the study, to critical revision, adding intellectual content.

### Conflicts of interest

The author(s) declare(s) that they have no conflict of interest related to the publication of this manuscript.

### Data availability

All data used and analyzed in this study are included in the main text of the manuscript.

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Received: 11/05/2019

Revised: 01/07/2019

Accepted: 02/07/2019

Published online: 29/07/2019