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Baseline

Ingestion of microplastics by *Hypanus guttatus* stingrays in the Western Atlantic Ocean (Brazilian Amazon Coast)Tamyris Pegado^{a,*}, Lucio Brabo^a, Kurt Schmid^{a,b}, Francesco Sarti^c, Thaís T. Gava^d, Jorge Nunes^d, David Chelazzi^c, Alessandra Cincinelli^c, Tommaso Giarrizzo^a^a Núcleo de Ecologia Aquática e Pesca da Amazônia (NEAP), Universidade Federal do Pará, Belém, Brazil^b Department of Fish Ecology and Evolution, EAWAG Swiss Federal Institute of Aquatic Science and Technology, Kastanienbaum, Switzerland^c Department of Chemistry "Ugo Schiff" and CSGI, University of Florence, Florence, Italy^d Laboratório de Organismos Aquáticos, Departamento de Oceanografia e Limnologia, Universidade Federal do Maranhão, São Luís, Brazil

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ABSTRACT

The present study documents, for the first time, the ingestion of microplastics (MPs) by Longnose stingrays in the Western Atlantic Ocean. We examined 23 specimens of *Hypanus guttatus* from the Brazilian Amazon coast and found microplastic particles in the stomach contents of almost a third of the individuals. Fibers were the most frequent item (82%), blue was the most frequent color (47%) and Polyethylene Terephthalate (PET) was the most frequent polymer recorded (35%), as identified by 2D imaging - Fourier Transform Infrared (FTIR). The ingestion of microplastics by Longnose stingray has not been previously recorded. The findings of the present study thus provide an important baseline for future studies of microplastic ingestion by dasyatid rays and other batoid species in the Atlantic Ocean, and contribute to the broader understanding of the spatial and temporal dimensions of the growing problem of plastic pollution in aquatic ecosystems and organisms.

Microplastics (MPs) are now widely distributed in the environment, reaching even the remotest areas of the oceans, and infiltrating food webs worldwide (Germanov et al., 2019). These particles are potential carriers of persistent organic pollutants (POPs) and metals (Yu et al., 2019). Microplastics are normally defined as plastic particles with a maximum dimension of less than 5 mm (Arthur et al., 2009). These particles can be classified according to their origin as either primary or secondary MPs. Primary MPs are produced intentionally as micro-sized particles for use in cosmetics and a range of other industrial applications (Ogata et al., 2009), while secondary MPs are produced by the physical or chemical degradation of larger plastic waste by the environment (Cole et al., 2011; Godoy et al., 2019). Given their small size and abundance, MPs can be actively ingested by a wide range of organisms (Eriksen et al., 2014; Herrera et al., 2019), when the MPs are mistaken for prey, or passively, through the unintentional ingestion of the particles during normal feeding activities (Campbell et al., 2017; Desforges et al., 2015).

Despite the large number of studies that have focused on the ingestion of MPs by marine teleost fishes (e.g. Markic et al., 2018; Murphy et al., 2017; Pegado et al., 2018), few data are available on

elasmobranchs, and most of which refer to sharks or pelagic rays (Alomar and Deudero, 2017; Anastasopoulou et al., 2013; Germanov et al., 2019; Valente et al., 2019). Up to now, only two reports have apparently been published on the ingestion of MPs by benthonic rays in marine environments; Neves et al. (2015) recorded MPs in specimens of *Raja asterias*, off the coast of Portugal and Pegado et al. (2018) that found MPs in an individual of *Narcine brasiliensis* from Amazon river estuary. However, both studies analyzed less than 10 individuals, which Markic et al. (2020) considered to be a suboptimal sample size for a reliable estimate of plastic ingestion rates.

Elasmobranchs are commercially important fishes, being consumed widely by some Latin American populations, from the Caribbean coast to northeastern Brazil (Feitosa et al., 2018; Rodrigues et al., 2020; Schmid et al., 2019). This suggests that the ingestion of microplastics by stingrays and sharks may eventually also affect human food safety and health (Van Cauwenberghe and Janssen, 2014). The Longnose stingray, *Hypanus guttatus* (Bloch and Schneider, 1801), a species of the family Dasyatidae, is an opportunistic, benthonic predator (Gianeti et al., 2019; Last et al., 2016), distributed from the southern Gulf of Mexico to southeastern Brazil (Bigelow and Schroeder, 1953; Rosa and Furtado,

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