

A nursery for the Giant Shovel-nosed Ray (*Glaucostegus typus*) in the northern Great Barrier Reef

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Abstract

The Giant Shovel-nosed Ray (*Glaucostegus typus*) is a large member of the Galucostegidae family of rays, for which there is still much to learn of their biology in northern Australia. Here I document the observation of a previously unknown nursery site for this species on Milman Island reef on the northern Great Barrier Reef, far north Queensland.

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The Giant Shovel-nosed Ray, *Glaucostegus typus* (Bennett, 1830) is a large member (attaining at least 2.7 m total length) of the Galucostegidae family of shovel-nosed rays which occurs throughout the coastal Indo-Pacific as far south as northern Australia (Last & Stevens 2009). There have been studies recording life history parameters (Simpendorfer *et. al.* 2014) as well as interactions with fisheries (Zhou & Griffiths 2008; White *et. al.* 2013) for this species, however there are few documented observations of the behaviour of these rays in the wild. Below is an observation of what I believe is a nursery site for the Giant Shovel-nosed Rays in an isolated area of the northern section of the Great Barrier Reef, Australia.

Milman Island is an uninhabited, densely wooded sand cay located about 112 km south-east from Thursday Island (Torres Strait) and about 45 km east-north-east from Orford Ness on Cape York Peninsula, Queensland. The island is approximately 2400 m in circumference. A large reef flat (area = 560 ha) fringed with a rubble reef crest extends around most of the island and dries during low tide, restricting human access to the island at that time to the northernmost tip. This reef flat connects to a small coral rubble island called Aplin

Islet, located 3 km south-east of Milman Island. The island is considered to be internationally important as a nesting rookery for the endangered Hawksbill Turtle, *Eretmochelys imbricata* (Linnaeus, 1766), and is visited regularly by researchers as part of an ongoing monitoring program for this species.

Over the course of five trips to Milman Island between 2015 and 2019, I observed pup-sized Giant Shovel-nosed Rays on the sandy edge of the large reef flat at the southern end of the Island (Fig. 1). These rays were in the very shallowest of water to the point that, at times, dorsal fins would be exposed as a result of wave action. Their behaviour seemed to vary from burying themselves in sand to moving parallel with the shoreline for many metres, often in groups of two or three individuals. Movement away from shore was only undertaken with reluctance; for example, when they took flight from the perceived threat presented by me approaching too closely.

No observations of this species were made at any other site around the edge of the island although similar-sized Giant Shovel-nosed Rays were observed on a regular basis on the broader reef flat when it was still inundated during low tide.



Figure 1. Juvenile Giant Shovel-nosed Ray, Milman Island February 2019.

Both photos are by Alistair Freeman.

In addition, a large adult (approximately 2.5m in length) was observed adjacent to Douglas Island approximately six kilometres SSW of Milman while snorkelling in water 1.2 m deep in 2018.

Giant Shovel-nosed Rays are born at 38–40 cm in size (Last & Stevens 2009) and between 2015 and 2019 all those observed at this presumed nursery site appeared to be of that size. To confirm this, in 2019 the pups of Giant Shovel-nosed Rays were compared to a submerged builders tape laid across the benthos and all size estimates were between 35 to 45 cm ($n = 15$).

In this paper I have categorised what was observed as a nursery based on criteria developed by Heupel *et. al.* (2007). In particular that newborn sized shovel-nosed rays are more commonly encountered at this site than at other sites in the area and that this site appears to be repeatably used across years.

To ascertain the number of shovel-nosed ray pups that were present in 2019, counts ($n = 22$) were carried out on a regular basis along the southern end of Milman Island. This transect covered 450 m

of reef flat edge (Fig. 2). I walked slowly along the beach at the water's edge counting individuals as they were encountered during a 10-min period. Individuals to the front and side of the recorder were counted taking care not to double-count individuals. Counting was performed by day and at night as other work commitments allowed, with night counts undertaken using a headlamp for illumination. No more than two counts were ever carried out in any 24-hour period and at least two hours separated any two counts. Immediately following each count, the height of the tide was noted using the Navionics™ navigation app. This gave a relative measure of tide height at Milman Island as the nearest tide gauge was on Cairnscross Island 20 km to the west of Milman Island.

Numbers of Giant Shovel-nosed Ray pups varied between zero and 61 (total $n = 487$) with the highest estimates coinciding with the highest tides when the lagoon contained water 1.5 m–3 m deep. The lowest estimates occurred when the water level was merely sufficient to cover the body of each ray (~10 cm). The average number of rays counted when tide height was less than 2 m as



Figure 2. Example of shallows where juvenile Giant Shovel-nosed Rays were observed.
Individuals were particularly common on the shore edge in water as shallow as 10cm depth.

measured at Cairnscross (n = 6) averaged 7.6 individuals while higher than 2 m the mean number of rays was 28 individuals (n = 16 passes).

The movement of juvenile Giant Shovel-nosed Rays with the rise and fall of the tide has been associated with predator avoidance behaviour (Davy *et al.* 2015). Similarly, for recently pupped Giant Shovel-nosed Rays on the Milman Island reef flat the best place to be at high tide is on the very edge of the shore in water as shallow as 10 cm. Small to medium-sized (1.2m to 2.5m) Estuarine Crocodiles (*Crocodylus porosus*) have been observed in the lagoon at Milman Island on occasions and White-tipped Reef Sharks (*Triaenodon obesus*) and Black-tipped Reef Sharks (*Carcharhinus melanopterus*) have been recorded around Milman Island (A.B. Freeman, unpublished data). In February 2019 on two occasions, adult Black-tipped Reef Sharks were observed swimming in the shallows along the transect.

The litter size of wild Giant Shovel-nosed Rays is unknown (Last & Stevens 2009). However, a captive female in an aquarium in North American, gave birth to a litter of 11 stillborn pups (Timm *et al.* 2014). Another Australian species, the Eastern

Shovel-nosed Ray (*Aptychotrema rostrate*), has been recorded as having a mean litter size of eight in Morton Bay (Kyne & Bennett 2002). In view of this information, it is likely that the largest estimate of individuals recorded at a single time (61 individuals) in the current study equated to litters from multiple mothers.

It has been suggested that guitarfish (the family of rays that includes the Giant Shovel-nosed Ray) as a whole are a group of rays that have ecological attributes that are likely to place them at high conservation risk now and into the future (Moore 2017). Currently the Giant Shovel-nosed Ray is listed by the IUCN as Vulnerable and is to be uplisted to Critically Endangered in the near future (C. Simpfendorfer personal communication). In contrast the conservation status of the Australian population is generally thought of as Least Concern (White & McAuley 2016; Simpfendorfer *et al.* 2019). However, like many rays of the northern tropics of Australia, there is still much to learn of their ecology and behaviour in the wild. What can be said is that the likely presence of a Giant Shovel-nosed Ray nursery at, or close to, this site adds to the already high conservation value of Milman Island and its associated reef flat.

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