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BRIEF REPORT

Birth of Common Shovelnose Rays (*Glaucostegus typus*) Under Captive Conditions

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The common shovelnose ray (*Glaucostegus typus*) is a poorly studied species of the Rhinobatidae family that occurs throughout the Indo-West Pacific. Although common in aquariums throughout the United States, there are currently no records of captive birth events. In 2013, a female common shovelnose ray housed at the Downtown Aquarium in Houston, Texas, USA gave birth to eleven pups. Although all pups were stillborn, this event demonstrates that it is possible to breed common shovelnose rays in a controlled environment. The single female and two male common shovelnose rays at the aquarium are of sexually mature size (between 206 and 240 cm total length, TL), demonstrate mating behaviors, and provide an excellent opportunity to investigate the reproductive biology of this species. Captive environmental conditions of the birth enclosure may be useful in replicating the birthing event in order to develop a breeding program that could potentially relieve collection pressures on wild populations of guitarfish given their vulnerable status. Zoo Biol. 33:357–359, 2014.

Keywords: breeding program; stillborn; environmental conditions; aquarium

INTRODUCTION

Common shovelnose rays (*Glaucostegus typus*) are found in the Indo-West Pacific, ranging from Thailand to New Guinea and the Solomon Islands south of Australia [White and McAuley, 2003; Vaudo and Heithaus, 2011; White et al., 2013a]. This species is listed as vulnerable in the International Union for Conservation of Nature (IUCN) Red List due to significant population declines [Cavanagh et al., 2003; White and Kyne, 2010; White et al., 2013b,c]. Common shovelnose rays are one of the most valuable commercial guitarfish in the western Central Pacific where they are targeted for the high demand of fins [Holmes et al., 2009] and are also caught as bycatch in demersal fishing nets [White and McAuley, 2003; White et al., 2013b]. In addition to overfishing, habitat destruction (e.g., mangroves) in southeast Asia is eliminating juvenile nursery areas which consequently affects the recovery rate for the population [Cavanagh et al., 2003].

Many species of elasmobranchs have successfully reproduced in captivity [Henningsen et al., 2004]. Documentation of reproductive behaviors in captive elasmobranchs provides invaluable data on a behavior rarely observed in wild conspecifics [Henningsen et al., 2004]. Captive breeding may also reduce collecting pressure on wild populations that are threatened. Although reproductive behaviors have been observed in bowmouth guitarfish (*Rhino ancyclostoma*), ringstraked guitarfish (*Rhinobatos hynnicephalus*), Atlantic guitarfish (*Rhinobatos lentiginosus*), and shovelnose guitarfish (*Rhinobatos productus*), there are no recorded captive births of common shovelnose rays [Henningsen et al., 2004]. Common shovelnose rays are one of the most common guitarfish in aquariums throughout the United States, yet little is known about the reproductive biology. In addition, there are no data on the age of maturity and longevity of this species in the wild [White and McAuley, 2003]. A successful breeding program for common shovelnose rays would provide invaluable data on the reproductive biology of this

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species, including hormonal fluctuations and female physiology.

MATERIALS AND METHODS

History of Common Shovelnose Rays at Downtown Aquarium in Houston, Texas

In 2003, the Downtown Aquarium in Houston, Texas acquired a wild caught female common shovelnose ray from Cairns Marine in Queensland, Australia. In 2009, two wild caught males were obtained from the same supplier. All three individuals were approximately 122 cm total length (TL) at the time of capture. Reproductive maturity was unknown at the time of capture; however, other specimens examined from Shark Bay in Western Australia showed that females and males mature between 155 and 175 cm TL [White and McAuley, 2003].

Housing Conditions

All three common shovelnose rays at the Downtown Aquarium in Houston, Texas are housed in constant conditions in a 165,745 gallon (627,413 L) tank and monitored daily. Water temperature remains constant at approximately 25°C with an average pH of 7.98 and a salinity of 29.81 ppt, and each of the three parameters are tested daily. Ammonia levels are monitored twice a week and maintained at 0.04 ppm while nitrate levels are checked monthly and kept at 56.05 ppm. All basic water parameter measurements are within the suggested parameter limits for elasmobranch exhibits [Mohan and Aiken, 2004] and are in accordance with the Association of Zoos and Aquariums (AZA) standards. The lighting system is set to 16–18 hr of light per day with metal halide lighting.

RESULTS

On October 21, 2013 at 4:45pm, a female common shovelnose ray gave birth to at least 11 pups consisting of four females, six males, and one severely underdeveloped pup (Fig. 1A,B). It is probable that more than 11 pups were born, however only 11 were found and retrieved within 30 min of the birth and did not survive the night. It was not apparent the female was pregnant prior to the birth and no mating behaviors were observed. At the time of the birth, the female was approximately 240 cm TL and the two males were 226 and 206 cm TL. All three were of sexually mature size according to previous studies [White and McAuley, 2003]. Upon initial observation of the pups, respiration was not observed and all offspring were presumed stillborn at the time of birth. The pups ranged in length from 27 to 39 cm TL and weighed 50–220 g (Table 1). In wild populations, common shovelnose ray pups are born between 38 and 43 cm TL [White and McAuley, 2003]. Only two pups appeared to be nearly fully developed and a significant internal yolk sac was still present for all 11 pups recovered (Fig. 1C).

DISCUSSION

This paper is the first to report a captive birth event of the common shovelnose ray and describes the environmental conditions in which the birth occurred. Due to the high demand for fins, common shovelnose rays are a valuable elasmobranch target and bycatch species [White and McAuley, 2003; White et al., 2013b]. With little known about their reproductive biology and their conservation status, it is necessary to elucidate the reproductive characteristics and suitable captive breeding conditions in order to develop successful breeding programs. Although only two of the 11 retrieved pups born at the Downtown Aquarium in Houston, Texas were nearly fully developed, the event still demonstrates the possibility of a successful breeding program. In the wild, common shovelnose ray pups are born at approximately 38–43 cm TL [White and McAuley, 2003]. Whereas, in this captive birth, only one male was born at 38.2 cm TL and one female at 39 cm TL, barely within the range found in wild born pups. Despite the underdeveloped and stillborn births reported here and the unknown accompanying causes, the environmental parameters in which the common shovelnose rays are held appear to be reasonable conditions for breeding. In addition to environmental conditions, the three adult common shovelnose rays at the aquarium are of sexually mature size, demonstrate breeding behaviors, and therefore provide an

Fig. 1. **A**: Common shovelnose ray pups and size variation among the brood. **B**: Severely underdeveloped common shovelnose ray pup; measurements not applicable. **C**: Body cavity showcasing internal viscera of a common shovelnose pup with large yolk-sac still present.

TABLE 1. Ten of the eleven pup lengths and weights at time of birth

Sex	Length (cm TL)	Weight (g)
Female	27	50
Female	35.5	165
Female	36.5	180
Female	39.0	220
Male	30.7	80
Male	33.7	145
Male	34.4	135
Male	36.3	170
Male	37.8	205
Male	38.2	200

One pup was severely underdeveloped and was not measured.

excellent opportunity to further investigate the reproductive biology of this species in a controlled environment. To monitor future pregnancies, the Downtown Aquarium will be performing periodic ultrasounds on the female and documenting any mating behaviors observed throughout the day. In addition, the aquarium will be performing pedigree analyses on all three adults through DNA profiling. Pedigree analyses are the foundation for captive breeding programs and help to ensure stable captive populations [Lacy, 1995; Sonesson et al., 2002; Ivy et al., 2009]. Use of reproductive data obtained from this trio of guitarfish would contribute to the creation of a successful breeding program that would provide invaluable data on the reproductive biology of the common shovelnose rays (e.g., hormonal fluctuations, maternal-brood relationships, and female physiology) and could relieve collecting pressures on wild populations [Henningsen et al., 2004].

CONCLUSION

A female common shovelnose ray gave birth at the Downtown Aquarium in Houston, Texas. Although all 11 pups retrieved were stillborn, this event demonstrates that it is possible to breed common shovelnose rays in a controlled environment.

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