

**Research Article**

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Notes on the Successful Restraining, Transport, and Release of Two Sub-Adult Whale Sharks (*Rhincodon Typus*) Stranded Inland on the Coast of Abu Dhabi

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On November 6th and November 12th, 2020, two sub-adult Whale Sharks (*Rhincodon typus*) Smith 1828, were successfully restrained and relocated in situ after being stranded for 4 and 2 weeks respectively, in manmade canals inland of Abu Dhabi, UAE. The first relocation operation took ~5 hours to complete a distance of 23.5 km and the second ~3.5 hours for 20km. Both individuals were in good condition after the transportation, with the second *R. typus* tagged with a SPOT 253 tracker (Wildlife computers).

Keywords: Whale Shark, Elasmobranch, Transport, Orectolobiforms, Tagging, Rescue, Abu Dhabi**Introduction**

The Whale Shark, *Rhincodon typus* [1] is the world's largest fish and as of 2016 has been classified as Endangered on the IUCN red list [2]. There is currently no action recovery plan in place for this species [3] and relatively little is known about the biology of the *R. typus* with the vast majority of published research on whale sharks to date being purely observational [4]. Tropical and warm temperate seas throughout are distributed with Whale Sharks [5]. This includes the Arabian Gulf, which is on the warmer scale of its range. During the boreal summer months (April-October), researchers find large aggregations of *R. typus* in the Arabian Gulf, especially off the coast of Qatar in the Al Shaheen fields. A study identified 340 whale sharks from this site since 2011, indicating that the area is a globally significant feeding area [6]. The same study also highlighted 43 whale shark encounters from UAE waters. Researchers reported twelve encounters from inside the Arabian Gulf side coast of the UAE. Additionally, marinas and ports reported all but three of these sharks [6].

On September 23, 2020, people observed a sub-adult male whale shark with an estimated total length of 4-5 m swimming in the manmade residential canals of the Al Raha creek, Abu Dhabi (Figure 1). The Environmental agency of Abu Dhabi (EAD) halted all boating and recreational activity within the area, and daily observation of the animal began. After several weeks of observation, it was clear that the whale shark had developed a consistent swimming pattern around the canals, and was clearly losing mass, which was the likely result of lack of food source within these shallow waters. Notably, the individual had become paler and has lost several remoras (*Remora remora*), which were present on first sighting (Highlighted in Plate 1).

After an unsuccessful attempt to guide the whale shark out of the canal using SCUBA divers to enable the shark to swim towards the larger waters, EAD decided a relocation attempt to deeper waters would help enable the shark to resume its natural migration and feeding behavior.



Plate 1: (a) Al raha creek Whale shark, 24/9/2020 – Photo: Amna Al Mansouri (EAD). (b) Al Raha creek whale shark, 4/11/2020 – Photo: Beatriz P. Maquieira



Figure 1: Al Raha creek residential canals, Abu Dhabi (Circled).

Coincidentally, on October 30, 2020, a slightly larger (~6m) male shark was observed inside another man-made port in the Al Bahia region of Abu Dhabi (Figure 2). The Al Bahia port that had a narrow entrance and very strong tidal pull during high tide had trapped a second larger Whale shark in it. In a similar manner to the first whale shark, SCUBA divers attempted a rescue mission to relieve the shark from the port. Although successful, the Whale shark returned two days later in the lagoon. This is likely due to the strong tidal pull during high tide.

Methods and Materials

Both *R. typus* sharks were trapped in relatively shallow water

(<5m). This enabled regular observational opportunities multiple times a day, which helped monitor their location and consistent swimming patterns. This in turn helped in monitoring their swimming patterns that they developed whilst in the manmade canals. The capture of both individuals was successful on first attempt. Teams of four SCUBA divers followed several meters behind the transport bag. When the Whale shark swam towards the transport bag the team of SCUBA divers, guided the shark directly into the bag, later swiftly securing it.

The transport bag shown in Figure 3 & 4 was custom designed for the rescue operation. For the fabrication of the main body of the

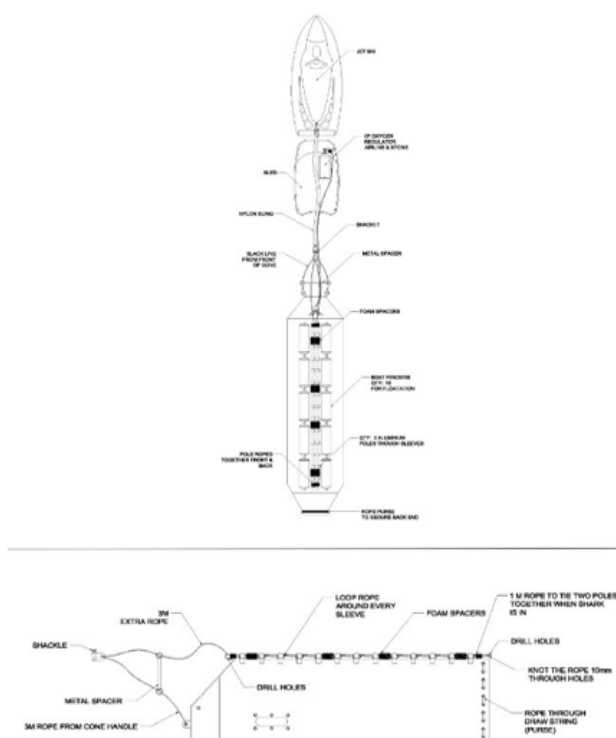


Figure 4: Annotated diagram of transport bag for the second transport (Alex Shepherd).

Once the *R. typus* individual was inside the bag, the pectoral fins were placed through gaps in the bag measuring 4700 mm x 1500 mm. 9mm marine grade nylon rope secures the poles and the bag. For the first transport, divers towed the transport bag via four 9mm nylon towlines attached to two Yamaha FX Cruiser 1800 Jet Skis. Each Jet Ski towed two lines, one attached directly to the poles and one from the nylon cone handle as shown in Figure 3. Each Jet Ski was equipped with a liquid shredder sled, which carried a 10-liter oxygen cylinder delivering medical grade oxygen via 4/6 mm airline tubing and a porous air stone, secured inside the cone of the bag, which was to assist the delivery of dissolved oxygen to the Whale shark during the transport.

For the transportation of the second *R. typus*, the divers made some adjustments and enhancements to the same transport bag (Figure 4). The key changes include the addition of foam spacers along the aluminum poles to help protect the dorsal fin as well as a rigid PVC pipe inside the cone to help strengthen the bag structure when not under tension. Finally, they consolidated four towlines to a master point consisting of stainless-steel carabiners and a stainless-steel shackle. From the shackle master point, they used a 3000mm x 750 mm nylon-lifting sling to tow the bag, using a single jet ski. This amended configuration also required a steel spacer bar on the cone head to ensure it did not collapse, reducing water flow. The single Jet Ski arrangement enhanced maneuverability in comparison to the original configuration as well as higher tensile strength with the addition of the lifting sling. During both

transportation journeys, divers stationed on the tow jet skis monitored the towlines and oxygen supply. Periodically, support jet skis deployed SCUBA divers ~100 m ahead of the moving transport bag in order to visually check the health of the animal and inspect the transportation set up. Support vessels remained close by during the entire operations, assisting where necessary. Upon the release of the second *R. typus*, they successfully anchored a SPOT 253 (wildlife computers) satellite transmitter to the individual using a handheld swobbit-tagging pole.

Discussion and Conclusion

Capturing and transportation of Elasmobranchs successfully has been widely demonstrated throughout various applications such as for captivity, scientific research or wildlife management. Aside from the *R. typus*, Elasmobranchs of the Orectolobiformes order (Carpenter sharks) such as the Atlantic nurse shark (*Ginglymostoma cirratum*), are routinely captured and released without too much impact as demonstrated by Aucoin et al, 2017. However, due to the sheer size and lack of captivity feasibility, there is little knowledge on the effects or methods of transporting *R. typus*. Dove et al, 2011 noted the acquisition of several *R. typus* for the Georgia aquarium, which demonstrated successful transport techniques for commercial flight operations. The process highlights the use of vinyl stretchers, a proven material for Elasmobranchs transports, but the situation itself is quite dissimilar to the *in situ* relocation process highlighted within this paper.

The ultimate aim of the relocation process for the two *R. typus* was to ensure the animals could return to the open Arabian Gulf and resume their natural migration patterns. This meant that the transportation of the whale sharks had to ensure they arrived in optimal health. The key concerns considered for the operations were to guarantee their safety and security for the entirety of the journey, and that they were receiving enough dissolved oxygen (DO). Fishes consume up to three times their normal oxygen requirement under transport conditions. Exhausted fishes may consume as much as 5-10 times their normal requirement [1,7,8]. The greater a commitment to aerobic respiration, the more important an unimpeded oxygen supply [1,7].

As highlighted in Figures 3 & 4, the transportation bag incorporates a nylon mesh front to allow the passage of new water during the towing of the bag. Simultaneously, this mesh also acted as a barrier for the turbulent and foamy water caused from the Jet Ski propulsion. During the first transport of the Al Raha creek individual, the oxygen supply line, secured only at the porous air stone, came undone from the force of the water drag. However, after continuous observations, the respiration rate of the whale shark did not drastically change, and the operation continued without the supplementation of DO. Other minor complications during the first

transport included the snapping of one of the towline. Because the transportation set up utilized two jet skis, it required both vehicles to accelerate equally, in order to achieve equal tension. Due to some minor turns and water currents, it was not always possible to have equal propulsion, which eventually led to the excess strain on the lines leading to ultimately breaking them. Retying the snapped towlines led to more unequal line lengths, thus further hindering the efficiency of the journey, with several stops needed to check and adjust the lines.

The upgrades shown in Figure 4 for the transport of the second *R. typus*, allowed for a much smoother journey, with the above-mentioned issues now becoming obsolete. DO was also delivered for a much longer period with the airline tubing secured in multiple stages along the lifting sling. The minor draw back from the amended configuration of the second transport was the need to change and refuel the single tow jet ski. However, this was not overly time consuming and allowed a thorough check of the condition of the *R. typus*. In total, the first transport operation that took place on November 6, 2020 lasted approximately 5 hours from acquisition to release, over a total distance of around 23.5km as highlighted in Figure 5. The whale shark dived immediately to the deeper water heading into the direction of the open Arabian Gulf.



Figure 5: Transportation of both Whale sharks from inland waters, Abu Dhabi on the 6/11/2020 and 12/11/2020.

Within 48 hours of the release of the first Whale Shark, it returned to the original location of the inland residential canals in Al Raha creek. They confirmed the same animal by comparison of its spot pattern. This is a very surprising piece of information.

Firstly, this observation confirmed the method of relocation of a sub adult whale shark was feasible for survivorship. Secondly, this circumstance may have some significance in understanding how *R. typus* migration and swimming patterns occur. The likelihood for

this animal to return over 23km back to such an undesirable and exact location in such a short time frame suggested its occurrence in the area was not purely accidental, but potentially influenced by external and/or environmental factors. After a further 48 hours, the individual disappeared again.

On November 12, 2020, the second transport from Al Bahia port was slightly shorter at ~20 km (Figure 5). Despite a similar distance travelled to reach an open approach to the Arabian Gulf,

the operation was more efficient due to the amendments of the transport hardware and configuration. After a total time of ~3.5 hours, the authorities released the whale shark. Prior to release, they successfully tagged the animal and received the first signal the next day. The whale shark swam in north and northeast direction to the location 190 km away from the release point within one week. Then the shark remained in the border waters among Qatar, UAE and Iran for more than three weeks. Over the first 30 days (13/12/2020), it travelled 601 km (Figure 6).

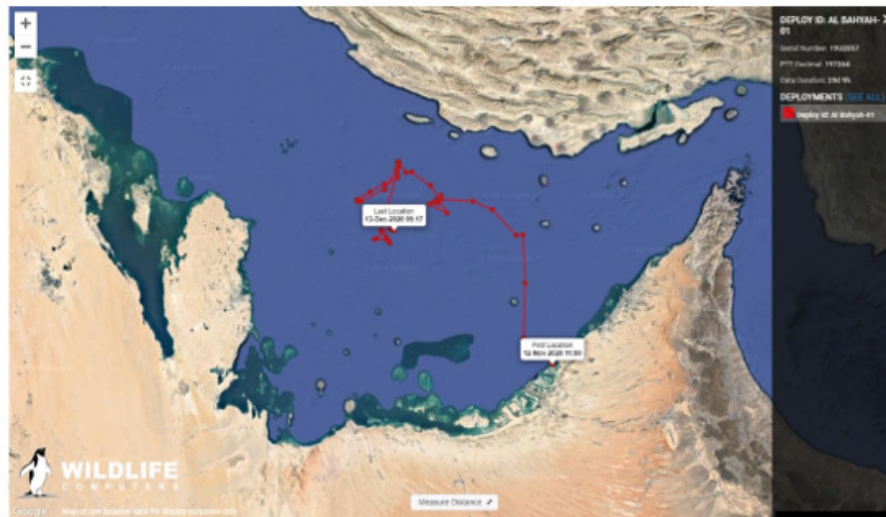


Figure 6: Tracking map for the Al Bahia Whale Shark from the 12/11/2020 – 13/12/2020.



Plate 2: (a) Al Bahia port shark heading out of the narrow entrance – Photo: Anas Allwama. (b) Al Bahia Whale shark being secured in transport bag. Photo: Anas Allwama (c) Al Bahia whale shark. Photo: Anas Allwama (d) Al Raha creek Whale Shark towed by two jetskis. Photo: Islam Yassin.

Looking at both transport operations of the two sub-adult Whale Sharks (*R. typus*), it can be noted with confidence that the methodology, strategy and materials used for the relocations resulted in successful transfers in terms of animal health post-release. The visual observation from the first *R. typus* showed

that the animal was in good physical condition aside from the loss of mass sustained prior the transport. The data received via the satellite transmission post release of the second whale shark, showed that the animal survived the transportation and returned to normal *R. typus* swimming and migration behavior within the

Arabian Gulf. The return of the first whale shark to its original location after the transport operation is extremely surprising, and unfortunate. However, it is noteworthy information, which may suggest that the influence of external factors on the migration of the *R. typus* towards its destination.

On a final note, the transportation materials used suited the slightly larger ~6m whale shark, which was more stable and secure during the operation. The up or down extrapolation of the dimensions of the highlighted materials is achieved depending on the animal in question, in the event of a similar situation.

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Conflict of Interest

None.

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