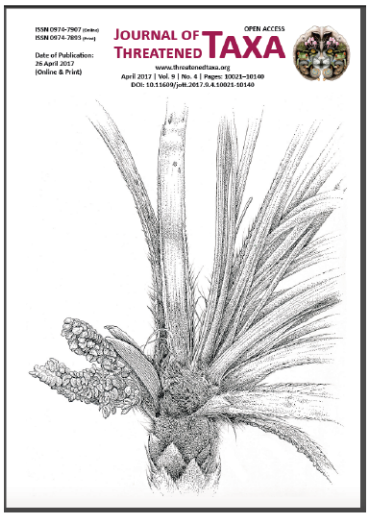

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Note

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The seasonal occurrence of the Whale Shark *Rhincodon typus* (Smith, 1828) (Orectolobiformes: Rhincodontidae) along the Odisha coast, India

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The Whale Shark *Rhincodon typus* Smith (1828) is the largest living species of fish reaching up to a length of 20m and weighing up to 20 tonnes (Norman 2005). The Whale Shark is a migratory species distributed in warm and temperate waters around the globe (Sequeira et al. 2014; Bailly 2008). It is a filter feeder, consumes planktonic organisms and occasionally small fishes. It has been hunted for its meat, oil and fin, which have commercial demand in some Asian markets. Due to rapid exploitation, it was listed as 'Vulnerable' in the IUCN Red list of Threatened Species in 2005 and presently categorized as 'Endangered' (Matwal et al. 2014; Pierce & Norman 2016). In India, the Whale Shark is listed in Schedule I (Part IIA) of the Indian Wildlife (Protection) Act, 1972, which is the highest protection status for the conservation of any living species in the country. It is included under the CITES Appendix II, which includes the species which are not yet threatened by extinction, but will become so if their trade, or any products made from them, are not subjected to strong regulations. Reports of Whale Shark sightings and its stranding from India were recorded from all the coastal states and union territories, with the maximum abundance along the Gujarat coast (Pravin 2010).

This article gives a description of the seasonal occurrence of the Whale Shark in the southern Odisha coast by taking into account current observation and the published literature. It also describes the ambient environment of the coastal waters where the shark was observed. The sighting of Whale Sharks in the present study was during offshore surveys on 13 March 2016 (09:50hr) and 15 March 2016 (08:05hr), 8km ($19^0$15'38"N & $85^0$01'32"E) and 4.5km ($19^0$15'69"N & $85^0$00'58"E) off the coast of Gopalpur Port, Odisha. The distance between the two sightings was nearly 3.5km. On 13 March during the offshore survey, a Whale Shark was observed approaching the survey trawler. Again on 15 March during the offshore survey, two Whale Sharks were spotted. One Whale Shark approached the trawler while the other remained at a distance. Comparing with the length of the trawler (14m), the length of the shark approaching the trawler was approximately fixed at 5–6m. The depths of the sites were recorded as 40m and 30m from the echo sounder (Garmin) available in the trawler. However, the shark was primarily observed on the surface on both the occasions (Image 1). Whale Sharks are filter feeders and plankton are the major part of their diet. In order to correlate the occurrence of Whale Shark with productivity, plankton samples were collected. The plankton samples were collected from both the sites using the plankton net, preserved in 5% formalin and

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Image 1. Photographs of the Whale Shark reported on 13 March 2016 and 15 March 2016 off Gopalpur coast

identified under the microscope up to group, genus or species level. Additionally, temperature and salinity of surface water was measured by using CTD present within Satlantic radiometer.

The surface water temperature and salinity was recorded as 28.24^{0}C and 33.76PSU on 15 March. Earlier studies in the Indian Ocean showed that around 65% of the Whale Shark sightings occurred between 27.5–29.0 ^{0}C and 90% occurred between 26.5–30.0 ^{0}C (Sequeira et al. 2012). The zooplankton samples were dominated with fish eggs, copepods (*Corycaeus* sp., *Centropages* sp., *Subeucalanus* sp.), pteropods (*Creseis* sp.), tintinnids (*Favella* sp.), copepod nauplii, chaetognaths, and radiolarians (Image 2). Among the phytoplankton, *Biddulphia* sp., *Ceratium furca*, *C. macroceros*, *Chaetoceros coarctatus*, *C. lorenzianus*, *Coscinodiscus* sp., *Nitzschia longissima*, *N. sigma*, *Planktoniella sol*, *Rhizosolenia hebetata*, *Rhizosolenia* sp. and *Thalassionema nitzschioides* were dominant (Image 3). The abundance of fish eggs in the sample ascertains that February and March are probably the spawning period for some fishes in coastal Odisha. The gut content analysis of Whale Shark in Taiwan and India revealed small fishes, shrimps, plankton and certain algae (Rao 1986; Chen et al. 1997).

Whale Shark occurrence is often associated with productive areas (Taylor & Pearce 1999). The southern part of the Odisha coast becomes more productive with periodic phytoplankton and ciliate blooms and these were mainly attributed to local coastal upwelling (Choudhury & Panigrahy 1989; Panigrahy & Gouda 1990; Sasamal et al. 2005; Mohanty et al. 2007; Sahu et al. 2016). Chlorophyll *a* and phytoplankton concentration have been used successfully to predict the seasonal occurrence of these Whale Sharks in the northern Gulf of Mexico (McKinney et al. 2012). During the present study fish eggs were found to be dominant in the plankton sample; however, it cannot be ascertained that the abundance of fish eggs might be the reason

Table 1. Sighting reports of *Rhincodon typus* along Odisha coast

	Month and year	Status	Off Coast	Source
1	November 1997	Live	Paradeep	Bar 1998
2	March 2004	Live	Gopalpur	Rao 2004
3	March 2008	Live	Rushikulya River mouth	John 2010
4	November 2008	Dead	Gopalpur	Anonymous 2009
5	February 2009	Dead	Gopalpur	Anonymous 2009
6	February 2009	Live	Rushikulya River mouth	John 2010
7	March 2016	Live	Gopalpur	Present report

Image 2. Dominant zooplankton species off Gopalpur
a - Fish egg; b - Fish larva; c - *Centropages* sp.; d - *Corycaeus* sp.; e - *Subeucalanus* sp.; f - Copepod nauplii; g - *Creseis* sp. ; h – Chaetognath; i - Radiolarian sp. 1; j - Radiolarian sp. 2; k - Echinopluteus larva ; l - *Favella* sp.

for the occurrence of the Whale Shark in the region during February–March. As the sighting was accidental and the study was done only once, it is difficult to draw any conclusion regarding the correlation between the productivity of the region and occurrence of the Whale Shark.

The Whale Shark is known as 'Baghua Timi' or 'Timiri Magar' in Odisha. Previous records of Whale Shark (both dead and live) along the Odisha coast are given in Table 1. Except one, all the Whale Shark sightings were reported either from the coastal waters off Rushikulya River mouth or Gopalpur during February–March (Bar

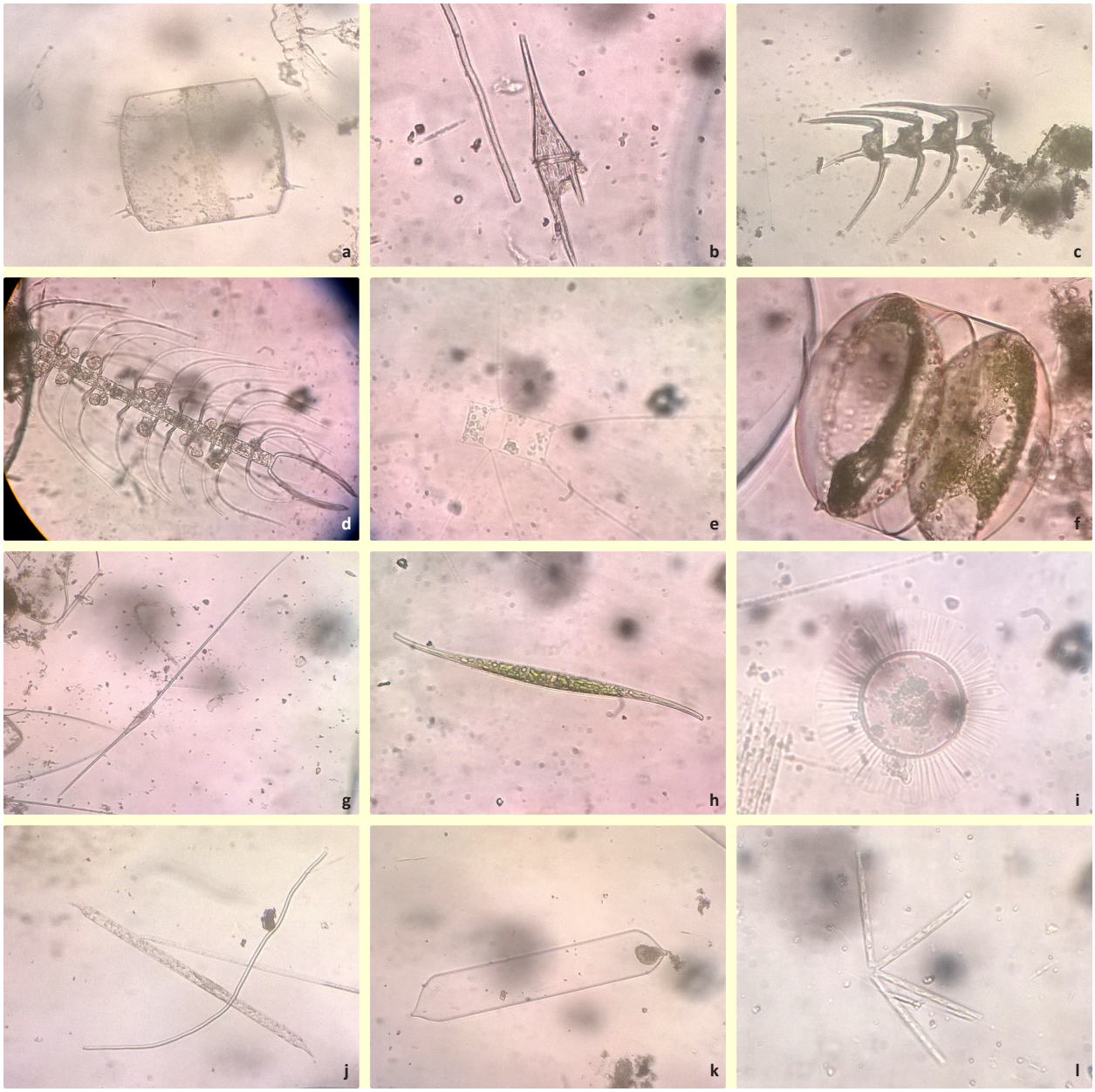

Image 3. Dominant phytoplankton species off Gopalpur
a - *Biddulphia* sp.; b - *Ceratium furca*; c - *Ceratium macroceros*; d - *Chaetoceros coarctatus*; e - *Chaetoceros lorenzianus*; f - *Coscinodiscus* sp.; g - *Nitzschia longissima*; h - *Nitzschia sigma*; i - *Planktoniella sol*; j - *Rhizosolenia hebetata*; k - *Rhizosolenia* sp.; l - *Thalassionema nitzschioides*

1998; Rao 2004; Anonymous 2009; John 2010). Also, there is a single Whale Shark sighting reported from Gopalpur during November in 2008. Whale Sharks are migratory in nature (Bailly 2008) and studies confirm that they are regularly recorded in specific locations near the shore where they occur seasonally (Sequeira et al. 2013; Matwal et al. 2014). Pravin (2000) reported that the peak landing of Whale Sharks in Gujarat was during March to June and the maximum is at Veraval, Saurashtra coast. Periodic records of the Whale Shark along the southern Odisha coast during February and March suggest the probability of seasonal migration of this giant fish during this period. Further investigation is however required to understand the behavior, habitat selection and their cause of the occurrence.

References

Anonymous (2009). Whale Shark washed ashore. The Hindu. Available from: http://www.thehindu.com/todays-paper/tp-national/tp-otherstates/whale-shark-washed-ashore/article345478.ece

(Online version dated 03 February 2009).

Bailly, N. (2008). *Rhincodon typus* Smith, 1828. In: Froese, R. & D. Pauly (eds.) (2017). FishBase. Accessed through: World Register of Marine Species at "http://www.marinespecies.org/aphia.php?p=taxdetails&id=105847 on 2017-04-12

Bar, S. (1998). On a Whale Shark landed at Paradeep, Orissa. *Marine Fisheries Information Service, Technical and Extension Series* 155: 20.

Chen, C.T., K.M. Liu & S.J. Joung (1997). Preliminary report on Taiwan's Whale Shark Fishery. *TRAFFIC Bulletin* 17(1): 53–57.

Choudhury, S.B. & R.C. Panigrahy (1989). Occurrence of bloom of diatom *Asterionellaglacialis* in near shore waters of Gopalpur, Bay of Bengal. *Indian Journal of Marine Sciences* 18: 204–206.

John, S. (2010). Observation of a Whale Shark *Rhincodontypus* (Orectolobiformes: Rhincodontidae) in the offshore waters of Rushikulya, Orissa, India. *Journal of Threatened Taxa* 2(5): 896–897; http://doi.org/10.11609/JoTT.o2245.896-7

Matwal, M., P. Jothi, D. Joshi, P. Kumar, F. Bloch, G. Sambath, M.V.M. Wafar, B.C. Choudhury & R. Kaul (2014). *Gujarat's Gentle Giant: Conservation of Whale Shark Rhincodon typus in Gujarat*. Wildlife Trust of India, Uttar Pradesh, India, 165pp.

McKinney, J.A., E.R. Hoffmayer, W. Wu, R. Fulford & J.M. Hendon (2012). Feeding habitat of the Whale Shark *Rhincodon typus* in the northern Gulf of Mexico determined using species distribution modeling. *Marine Ecological Progress Series* 458: 199–211; http://doi.org/10.3354/meps09777

Mohanty, A.K., K.K. Satpathy, G. Sahu, S.K. Sasmal, B.K. Sahu & R.C. Panigrahy (2007). Red tide of *Noctiluca scintillans* and its impact on the coastal water quality of the near-shore waters, off the Rushikulya River, Bay of Bengal. *Current Science* 93(5): 616–618.

Norman, B (2005). *The Whale Shark*. Ecocean consulting, Cottesloe, Australia, 5pp.

Panigrahy, R.C. & R. Gouda (1990). Occurrence of bloom of the diatom *Asterionella glacialis* (Castracane) in the Rushikulya estuary, East Coast of India. *Mahasagar - Bulletin of National Institute of Oceanography* 23: 179–182.

Pierce, S.J. & B. Norman (2016). *Rhincodon typus*. The IUCN Red List of Threatened Species 2016: Available from http://doi.org/10.2305/IUCN.UK.2016-1.RLTS.T19488A2365291.en

Pravin, P. (2010). Whale Shark in the Indian coast - need for conservation. *Current Science* 79(3): 310–315.

Rao, G.S. (1986). Note on the Occurrence of the Whale Shark off Veraval Coast, Cochin. *Marine Fisheries Information Service, Technical and Extension Series* 66: 30.

Rao, S.V.S. (2004). Landing of Whale Shark, *Rhincodontypus* at Gopalpur, Ganjam district, Orissa. *Marine Fisheries Information Service, Technical and Extension Series* 181: 14.

Sahu, B.K., R.C. Panigrahy, S.K. Baliarsingh, C. Parida, K.C. Sahu & A. Lotliker (2016). First report of red-tide of *Mesodinium rubrum* (Lohmann, 1908) in Indian waters. *Current Science* 110(6): 982–983.

Sasamal, S.K., R.C. Panigrahy & S. Misra (2005). Asterionella blooms in the northwestern Bay of Bengal during 2004, *International Journal of Remote Sensing* 26(17): 3853–3858; http://doi.org/10.1080/01431160500185391

Sequeira, A.M., C. Mellin, D. Rowat, M.K. Meekan & C.J.A. Bradshaw (2012). Ocean-scale prediction of Whale Shark distribution. *Diversity and Distribution* 18: 504–518; http://doi.org/10.1111/j.1472-4642.2011.00853.x

Sequeira A.M., C. Mellin, M.G. Meekan, D.W. Sims & C.J.A. Bradshaw (2013). Inferred global connectivity of Whale Shark *Rhincodon typus* populations. *Journal of Fish Biology* 82: 367–389; http://doi.wiley.com/10.1111/jfb.12017

Sequeira, A.M., C. Mellin, D.A. Fordham, M.G. Meekan & C.A. Bradshaw (2014). Predicting current and future global distributions of Whale Sharks. *Global Change Biology* 20: 778–789; http://doi.org/10.1111/gcb.12343

Taylor, J.G. & A.F. Pearce (1999). Ningaloo Reef currents: implications for coral spawn dispersal, zooplankton and Whale Shark abundance. *Journal of Royal Society of Western Australia* 82: 57–65.

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