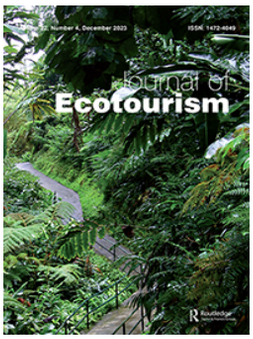

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Vincent Nijman

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Tourists, selfies and coastal monitoring during COVID-19

Vincent Nijman

School of Social Sciences, Oxford Brookes University, Oxford, UK

ABSTRACT

Citizen science in coastal ecosystems often involve (eco-)tourists that actively monitor reefs, species and pollution. Data collected by tourists, passively, was used to gain insight into landings of the largest fish, the whale shark (*Rhincodon typus*), in Pangandaran Bay, Indonesia. Monitoring of illegal fishing was halted due to COVID-19 travel restrictions and lockdowns. With two million, mainly Indonesian, tourists visiting Pangandaran Bay in 2020 (30% less than in 2019) enough tourists were present to record landings of whale sharks. Monitoring social media revealed reports of 10 whale shark landings between August 2020 and August 2022. Seven were in July–August of immatures 6–7 m in length. The information passively provided by tourists since COVID-19 have given insights into the biology of whale sharks, landing risks and how communities interact with sharks. Feeding back this information to tourists is challenging, yet vital, to cement a sense of belonging, purpose and attachment to their holiday location.

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Citizen science; Covid; ecotourism; Indonesia; whale sharks

Introduction

Citizen science involves members of the general public being included in monitoring projects and scientific research, collecting, sorting, cataloguing, and/or analysing scientific data. Citizen science projects in marine and coastal ecosystems worldwide often involve (eco-)tourists (both domestic and international visitors that typically stay for at least several days at a particular site) and includes monitoring reefs, recording the presence of vulnerable species and tallying marine debris (Bauer-Civiello et al., 2018; Cigliano et al., 2015; dos Santos & Bessa, 2019; Vianna et al., 2014). While passive data collection (e.g. by using data from mobile phones) in these projects is commonplace, scientists less often make use of information inadvertently and serendipitously collected by tourists that can be used to inform research. Citizen science in a coastal context can have an impact on marine conservation more broadly by influencing management and policy and by strengthening community capacity to address environmental problems (Garrod & Wilson, 2003). Importantly, from a tourism perspective it gives tourists a sense of

CONTACT Vincent Nijman vnijman@brookes.ac.uk School of Social Sciences, Oxford Brookes University, Oxford OX3 0BP, UK

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belonging, purpose and attachment to the site and its people. This is especially important for ecotourists as this is often one of the main motivations to visit a particular location in the first place. Coastal areas are also significant for monitoring underreported and illegal fishing and trade in marine wildlife other than fish. Many of these wildlife trade monitoring programmes involve foreign staff and requires travel between sites.

The whale shark (*Rhincodon typus*) is the largest fish. Adult females can reach lengths of ~15 m or more and even a 4-year-old juvenile reaches a length of ~4 m (Dove & Pierce, 2022). The species is listed as Endangered on the IUCN Red List, and especially the Indo-Pacific subpopulation has seen a drastic decline (Pierce & Norman, 2016). Seasonal gatherings of whale sharks attract considerable attention from tourists and tourism operators (Catlin & Jones, 2010; Wong et al., 2019; Ziegler et al., 2012), and much of what we know about the species comes from areas where tourists and whale sharks interact (Dove & Pierce, 2022). Occasionally, whale sharks get stranded or fishermen land them on beaches or in the shallows, although proper documentation of this is rare (Wosnick et al. (2022) recorded only 107 whale shark strandings globally, mostly from the period 1980–2021, including 45 in South Africa, 29 in Mexico and 2 in Indonesia). Given the size of whale sharks and with more and more tourists using social media, there is the potential of using data collected by tourists on gaining insight in the landings of whale sharks.

Encouraged by Sánchez et al. (2020) who used information from tourists and dive operators, amongst others, to gain insight in the killing of whale sharks in Venezuela, but unable to visit Indonesia due to COVID-19, the aim of this study was to use data posted by Indonesian tourists on social media, and as reported in the local media, to gain insight into the landings of whale sharks in Indonesia.

Materials and methods

The focus was on the greater Pangandaran Bay area on the south coast of the Indonesian island of Java (from Cikalong in the west to Kalipucang in the east). This region is off the beaten track of foreign tourists, especially so after the 2006 tsunami (Nijman, 2021) but it receives an increasing number of domestic tourists. Within the 40 km stretch of coastline there are several tourist spots, including Cukang Taneuh/Green Canyon (white-water rafting), Batu Keras (surfing), Karangnini (steep coastal cliffs), and most famously the Pangandaran peninsula (beaches, swimming). Ecotourists are attracted to the peninsula and some of the endemic animals (ebony langur *Trachypithecus auratus*; Javan deer *Rusa timorensis*; black-banded barbet *Psilopogon javensis*) that are easily observed on the peninsula (Nijman, 2022). In 2019, 3.23 million tourists visited the Pangandaran peninsula, only just over 32,000 (0.4%) being foreigners (Nijman, 2021). The total number is similar to the much better-known Eight Century Borobudur Temple, also in Java, visited by 3.92 million tourists, but here 242,000 (6.1%) were foreigners.[1] With less than 8000 permanent residents this means that on an average day at least two to three times as many tourists are present in Pangandaran than residents, and on weekends this increases to five times (Nijman, 2021).

Pangandaran Bay is known as a centre for wildlife trade and this has been intermittently studied mainly by conservationists or foreign research teams over the last 20 years (sharks: WCS, 2018; marine turtles: Hilterman & Goverse, 2005; ProFauna, 2005;

marine ornamental fish: Nuryanto et al., 2020; marine molluscs: Nijman et al., 2015). For much of 2020 and 2021, due to travel restrictions imposed by the COVID-19 pandemic, there was no monitoring of wildlife trade or fisheries in Pangandaran Bay. While compared to 2019, in 2020 there was a 30% drop in the number of tourists visiting the Pangandaran Bay area, probably even more for foreign tourists, that means that still 2.27 million tourists visited the area. Furthermore, from December 2020, the West Javan COVID-19 Information and Coordination Centre (PIKOBAR) started promoting Pangandaran as an alternative tourist destination (different from popular sites in Indonesia such as Bali or overseas travel), thus attracting more domestic tourists.

Whale sharks occur at low densities in most of the world's oceans. White and Cavanagh (2007) tried to gain insight into whale shark landings throughout Indonesia by conducting 270 surveys of 11 landing sites over a 4.5-year period (2001–2005), but only managed to record one single caudal fin for sale in southern Bali. Similar attempts by Nugraha et al. (2020) covering a six-year period (2012–2017) found evidence of 18 whale shark landings at eight landing sites. Pangandaran is not particularly known for its whale sharks, i.e. there are very few actual records, but in a modelling study Morales-Ramirez and Wang (2020) found the Indian Ocean south and southeast of Pangandaran Bay to be highly suitable for whale sharks.

In August 2021, February 2022 and November 2022 the Internet was searched for information on whale shark landings and trade using the search term *hiu naga or hiu naga bintang* or *béntang* (dragon shark or starred dragon shark), *hiu tutul* (spotted shark) or *hiu paus* (whale shark) in combination with Pangandaran going back to August 2020 the earliest. This included YouTube videos and Instagram (#HiuTutul). Once a report was located, the date and location were used to find additional reports, videos and photos. From this information (text, photos, videos) was extracted on its size, the context in which it landed and fate of the animal. All translations from Bahasa Indonesia (Indonesian, spoken throughout Indonesia) or Basa Sunda (Sundanese, spoken in western Java) were made by the author. In English landing would refer to a whale shark being actively moved onto the beach or into the shallows by fishermen using nets or lines for instance, whereas stranding would indicate the shark ends up on the beach in a passive manner, accidentally, by its own accord. While this difference is also apparent in Bahasa Indonesia (landing = *terjerat* or *digiring*; stranding = *terdampar*) and Basa Sunda (landing = *kajiret* or *giring*; stranding = *kapalidkeun*) in the online reports these terms were used interchangeably, and given it is not possible to retrospectively determine which is correct, here both are referred to as landings.

Results

For the period August 2020–November 2022, 10 landings of whale sharks in the greater Pangandaran Bay area were found (Table 1). One of the landings was in March, one in November, the other eight were between early July and late August, suggesting a temporal pattern in the landings of whale sharks. For six of the whale sharks the length was reported, mostly between five and seven metres in length, with one reported length of 10 m. Videos of the seventh whale shark, with people sitting on the shark, suggests a similar length. While these measurements may be inaccurate and difficult to verify, adult whale sharks measure between 9 and 18 m, strongly suggesting that these

Table 1. Reports of landings of whale sharks in Pangandaran, West Java, Indonesia recorded by tourists and holiday makers and posted on social media and reported in the local news.

No	Location (site, regency)	Date	Length; context; number of videos
1.	Cipatujuh, Tasikmalaya	3 August 2020	6 m; according to some report it was found when still alive; there were no attempts to drag it back into the sea as the current was unfavourable; reportedly by some as already dead when found by fishermen; videos show it to be alive with people walking on it; butchered in the shallows; no information on the fins; 10 videos posted online
2.	Pinggan, Pangandaran	23 August 2020	6.8 or 7 m; landed and buried; one video posted online
3.	Karangsari, Pangandaran	24 August 2020	n.a.; butchered; no videos.
4.	Cimanuk, Tasikmalaya	3 March 2021	6.5 m; stranded when tide was residing; discussions on whether local residents were allowed to butcher the animal; no information on fins; four videos posted online
5.	Batu Keras, Pangandaran	5 July 2021	n.a.; caught by fishing line; dragged back to sea as otherwise it would be butchered; three videos posted online.
6.	East beach, Pangandaran	13 August 2021	10 m; landed; dragged back to sea by fishermen; no videos.
7.	Batu Hiu, Pangandaran	27 August 2021	5 m; landed; dead; no video online
8.	Mandasari, Pangandaran	28 August 2021	n.a.; landed; dead; butchered; two videos online
9.	Pamugaran, Pangandaran	16 November 2021	n.a.; landed; dragged back to sea; no video online.
10.	East beach, Pangandaran	31 August 2022	6 m; the the shallows; dragged back to sea; two videos online

are immatures. Three of the whale sharks were butchered in the shallows or on the beach, and for two others this was discussed, suggesting that consumption of landed sharks may not be rare. Any landing of a whale shark is an impressive sight, and six of landings were covered extensively by the local media, by tourists posting photos and often several videos of the landing and the butchering were posted online (with posters often providing an on-the-spot commentary).

Discussion

I here show that even in the absence of on-site visits (in this case because of travel restriction, but this could equally be the case because of other logistical or financial constraints) it is possible to gain insights into the biology of the whale shark as well as some of the threats to their survival (cf. Sánchez et al., 2020; Theberge & Dearden, 2006). The continued presence of domestic tourists in Pangandaran Bay allowed for monitoring the landings of whale sharks. Given the size of the whale sharks (even immatures are several metres in length) relative to the size of the boats used by artisanal fishermen, it is difficult to keep any landing hidden from view. Landings of whale sharks evidently are spectacles, attracting any tourist that is present. Often within hours photographs or video footage appeared online on personal Facebook, Instagram or YouTube pages, and this was subsequently picked up by local media, or others reposting this information. Combined this allowed for more accurate recording, and cross-checking, of the numbers of landings and usage. Data from whale shark landings in Indonesia is sparse, as for instance, Wosnick et al. (2022) presented a global overview of 3150 shark strandings,

with only two, most likely referring to whale sharks, originating from Indonesia. Hitherto, much of the insights we have on whale sharks in Indonesian waters comes from six or seven sites in mainly eastern Indonesia where whale sharks are year-round present or appear seasonally and where ecotourism companies offer whale shark watching tours (Dove & Pierce, 2022).

Similar strategies to the one used here to gain insights into the biology of and threats to whale sharks have been deployed by Theberge and Dearden (2006) when studying whale sharks in the Andaman Sea and by Sánchez et al. (2020) assessing whale shark killings off the coast of Venezuela. Theberge and Dearden (2006) made use of data collected primarily by an ecotourist dive company. Although their observations concerned live whale sharks rather than landed ones, there was some differences in the estimated sizes of the animals recorded in Pangandaran, as almost 80% of the whale sharks in the Andama Sea were 5 m or less in length. In the Andaman Sea sightings peaked in February–May (Theberge & Dearden, 2006), whereas the landings in Pangandaran Bay peaked in July–September. For the northeastern coast of Venezuela, Sánchez et al. (2020) reported an average of about five whale shark deaths a year over a four-year period due to entanglement in nets, harpooning or other capture methods. This is a similar number to that recorded here for Pangandaran Bay, the difference is that in Pangandaran it occurred along a 40 km stretch of coast whereas in northeastern Venezuela it was reported from a 1200 km coastline.

The scenario presented here where researchers abroad search for information posted by tourists to remotely monitor (threats to) the environment can be expanded. For instance, in Java there is a small but very active group of songbird hobbyists that, as a leisure activity, travel to various parts of the country to visit bird markets to see what is on offer and what prices these birds command (the aim is not to buy birds). Several of these enthusiasts document their local travels on vlogs. Typically, these vlogs contain sections where just about every vendor is asked, in a systematic manner, what the local name is of each bird (in western Indonesia dozens of local languages are spoken and even within one language a bird can have regional names) and the asking price. With harvest and trade being the most significant threat to songbirds (Lees & Yuda, 2022), watching these vlogs allows for monitoring the songbird trade without ever having to travel to these markets.

Ecotourist wish to unite biodiversity conservation, communities, and sustainable travel, by increasing environmental awareness and respect, generating financial benefits for local people, and providing direct financial benefits for conservation (Becken et al., 2019; Ghilardi-Lopes, 2015; Wunder, 2000). As with any monitoring project that involves the general public or (eco)tourists in particular, to garner continued support it is vital that information collected by these volunteers gets fed back to them in a timely, meaningful and easy-digestible manner. This feedback creates an opportunity to cement a sense of belonging, purpose and attachment to their holiday location, and, hopefully, a desire to return.

Note

1. The operators of these sites pay close attention to nationalities as foreign tourists pay higher entrance fees; for instance, during the weekend entry to the nature reserve in Pangandaran is

US$ 1.46 for Indonesians but US$ 21.62 for foreigners, entry to the Borobudur is US$ 2.79 for Indonesians but US$ 24.41 for foreigners.

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