Flag Expedition Report

Explorers Club Flag #84

Whale sharks of Cendrawasih Bay and the Coral Triangle

by

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Introduction and Location

Observations of whale sharks in Cendrawasih Bay, West Papua (formerly Irian Jaya; Figure 1), Indonesia, have increased during the past several years correlative with the local establishment of lift net (i.e., bagan) fisheries which target small schooling fishes (Figure 1). Whale sharks are apparently attracted to these nets by the concentration of small fishes in holding nets, and perhaps the scent of those fishes as they become injured during capture and processing (Figure 2). The bagan fishermen also feed these fishes to the whale sharks, believing that the whale sharks attract other larger fishes and are good luck, which results in the sharks lingering near the bagans for several hours. Consequently, whale sharks can be easily observed and closely approached at these sites (e.g., Maldives Whale Shark Research Programme 2010, Jones and Shimlock 2011, Stewart 2011, Topp 2010).

The abundance of whale sharks in Cendrawasih Bay and Bird’s Head, the age and sex composition and seasonal dynamics of the aggregation there, and the relevance and relationship of this aggregation to aggregations of whale sharks elsewhere in the Pacific and Indian oceans are unknown. Important basic questions that need to be addressed are: 1) are whale sharks present year round in this area? 2) If they leave the area for any period of time, where do they range? 3) What are the important foraging areas (geographic and vertical) for whale sharks in the area? 4) What are the local and
regional issues that may threaten the vitality of whale sharks that appear in the Cendrawasih area? 4) What are the potential direct and indirect impacts of the bagan fisheries and the emerging whale shark ecotourism activities on the behaviors and health of the local and regional whale shark assemblage?

As an initial step in exploring a framework for local whale shark based ecotourism in the Cendrawasih Bay National Park and to assess its potential long term benefits and consequences, I led a workshop in Nabire, Papua in May 2011 which was sponsored by the Cendrawasih Bay National Park, the Indonesian Ministry of Fisheries, the World Wildlife Fund, and attended by various national and local stakeholders (Stewart 2011). Following the workshop I attached a pop-up archival satellite-linked radio transmitter (PAT) to one whale shark in Cendrawasih Bay (Figure 3) to demonstrate the method to stakeholders as a preliminary step for development of plans by the Indonesian government and WWF for a science-based ecotourism industry for whale sharks in the Cendrawasih Bay National Park. The tag detached or was removed (accidentally or perhaps intentionally) about 13 days after it was attached. The ambient light level data that the tag measured, stored, and then transmitted to the Argos Data Collection and Location Service (DCLS) indicated that the shark (Guillermo) started travelling north on 6 May, continued north until around 11 May (about 190 nm north of the tagging site) where he remained until he started moving south on 15 May into the southern reach of central Cenderawasih Bay and then back to where he was tagged by 18 May (Figure 4). During the 13 days while the tag was attached, Guillermo was highly mobile and travelled a minimum geographic distance of around 690 nm (Figure 4).
**Purposes of the Expedition**

The objectives of this study are to: 1) document the movements and use of marine habitats (geographic and vertical) of whale sharks in the Coral Triangle; 2) develop a predictive model of whale shark distribution based on movements of sharks documented from this and prior studies versus data from an independent suite of biotic and abiotic explanatory variables; 3) discover the whereabouts of females and adult males and the areas where whale sharks mate and give birth, unknown for this species, using these descriptive studies and the derived predictive model; and 4) document the types and extent of direct and indirect interactions of whale sharks with human populations and their activities at and near coral reef ecosystems to aid in the development and implementation of whale shark and coral reef ecosystem conservation and management plans.

The goal of the expedition was to tag five whale sharks in Cendrawasih Bay, West Papua, Indonesia, with pop-up archival satellite linked transmitters to document their movements and diving patterns for six months to one year.

**Accomplishments**

To follow up the pilot study conducted in May 2011, I participated in a joint expedition in November 2011 with Conservation International and its sponsors and the World Wildlife Fund, facilitated by the Ministry of Forestry and Cendrawasih Bay National Park, to extend that study with additional tagging. I tagged two whale sharks on 16 November and three more sharks on 17 November (Figure 6; Table 1) with pop-up archival satellite-linked radio transmitters (PATs) near the same location where
Guillermo was tagged in May 2011. Sex of each shark was determined by the presence or absence of claspers (male sexual organs between the ventral anal fins; Figure 5) and length was simply estimated directly (Table 1). Four of the tags (89372, 89374, 89382, 89385) are programmed to release from the sharks about 200 days after they were tagged whereas the fifth tag (80183) is programmed to detach in about 12 months. While these tags remain attached to the sharks, they will record and store measurements of ambient light, water depth, and water temperature. After the tags detach they will rise to the sea-surface and then begin transmitting the stored measurements to earth–orbiting satellites in the Argos DCLS system until the transmitter batteries expire (about 7-10 days after detachment). The remotely recovered data on daylight will be used to reconstruct the geographic movements of the sharks from estimates of day-length (to derive latitude) and local apparent noon (to derive longitude). The measurements of depth will be used to reconstruct diving patterns and use of vertical habitats with the water temperature data providing some proxy of oceanographic environmental conditions.

**Sponsorship**

This expedition to conduct research on whale sharks off West Papua, Indonesia was supported by:

- Conservation International (and its sponsors)
- World Wildlife Fund-Indonesia
- Cendrawasih Bay National Park
- Indonesian Ministry of Forestry
- Hubbs-SeaWorld Research Institute
Members of the Expedition

The project members were:


Acknowledgments

The expedition was supported by Conservation International and its patrons, the World Wildlife Fund, the Cendrawasih Bay National Park, the Indonesian Ministry of Forestry and Hubbs-SeaWorld Research Institute. P. Yeung, D. de Jesus, and E. Tan sponsored four of the pop-up satellite tags. I thank the owners and crews of the CV-9 and Tiger Blue for their tremendous support, generosity, and hospitality, and Djati Witjaksono (Director of Cendrawasih Bay National Park) for supporting the research. I also thank M. Brooks, L. Conway, M. Erdmann, L. Hershfield, W. v.d. Houten, D. de Jesus, J. Keill, P. Levy, A. Levy, R. Mast, A. Nicholas, R. Perdue, C. Realini, J. Steinberg, L. Tumminaro, P. Yeung, and J. Williamson for their support and sharing observations, discussions, and companionship throughout the expedition and the staff of WWF-Indonesia (C. Hitipeuw, A. Wijonarno, B. Ahadian Noor, K. Cenderakasih Sumolang, C. Tania, S. Irani) for their support in organizing and executing the research project.

Participants in the Cendrawasih Bay Whale Shark Expedition, November 2011, with Explorers Club Flag #84

Figure 1. Cenderwasih Bay in West Papua, Indonesia.
Figure 2. Lift-net (*bagan*) fishing platform in southern waters of Cendrawasih Bay (top), resident *bagan* fisherman feeding 2 whale sharks (left), fish targeted by *bagan* fisheries (top right), and whale shark approaching holding net at *bagan* loaded with fish (bottom right).
Figure 3. An adolescent male whale shark (*Guillermo*) tagged with a pop-up archival satellite-linked radio transmitter in Cendrawasih Bay in May 2011 (Stewart 2011).

Figure 4. Movement of *Guillermo* between 5 and 18 May 2011 (Stewart 2011).
Figure 5. Presence and location of sexual organs (i.e., claspers) on male (right) whale sharks for determination of sex.
Figure 6. Whale sharks tagged with pop-up archival satellite-linked transmitters in Cendrawasih Bay on 16 and 17 November 2011.

- **Cumulus** (89374)
- **Javas** (89382)
- **Stimpy** (89372)
- **Rachel** (80183)
References


Sleeman, J.C., M. G. Meekan, B. S. Stewart, S. G. Wilson, J. J. Polovina, J. D. Stevens, G.


Table 1. Whale sharks tagged with pop-up archival satellite-linked tags in Cendrawasih Bay in November 2011.

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