



Occurrence of the rare and Endangered Ornate Eagle Ray, *Aetomylaeus vespertilio* (Bleeker, 1852) (Chondrichthyes, Myliobatidae), at a remote marine protected area in the Philippines

Gonzalo Araujo,¹ Sally J. Snow,¹ Andy Cornish,^{2,3} Ryan Murray,¹ Kymry Delijero,³ Alessandro Ponzo,¹ Marivel Dygico³

1 Large Marine Vertebrates Research Institute Philippines, Jagna, Bohol, 6308, Philippines. **2** WWF-International, 15/F, Manhattan Centre, 8 Kwai Cheong Road, Kwai Chung, Hong Kong. **3** WWF-Philippines, Cabang Road, San Pedro, Puerto Princesa City, Palawan, 5300, Philippines.

Corresponding author: Gonzalo Araujo, g.araujo@lamave.org

Abstract

We report the occurrence of the rare and Endangered *Aetomylaeus vespertilio* (Bleeker, 1852) at the remote archipelago of Cagayancillo, Palawan in the Sulu Sea, Philippines. Only 1 previous report of the species exists from the country, a juvenile specimen in the Pasil market, Cebu City in 2000. During an in-water shark and ray survey at Cagayancillo Island in April 2017, a female individual *A. vespertilio* with a disc width of approximately 200 cm, and a total length of approximately 400 cm was encountered along the reef's edge at a depth of 12 m. This species was confirmed by its characteristic dorsal pattern of narrow stripes anteriorly and reticulated spots posteriorly. We confirm the occurrence of this rare and poorly understood species in the Sulu Sea and extend the current known range farther west than previously known.

Keywords

Sulu Sea; archipelagic; elusive; conservation; live encounter; myliobatid

Academic editor: Zeehan Jaafar | Received 6 September 2017 | Accepted 7 December 2017 | Published 5 January 2018

Citation: Araujo G, Snow SJ, Cornish A, Murray R, Delijero K, Ponzo A, Dygico M (2018) Occurrence of the rare and Endangered Ornate Eagle Ray, *Aetomylaeus vespertilio* (Bleeker, 1852) (Chondrichthyes, Myliobatidae), at a remote marine protected area in the Philippines. Check List 14 (1): 1–5. <https://doi.org/10.15560/14.1.1>

Introduction

Aetomylaeus vespertilio (Bleeker, 1852) is a rare species of eagle ray belonging to the family Myliobatidae (White and Naylor 2016). The largest species in its genus, and a relatively large eagle ray, it grows to at least 300 cm maximum disc width (DW). It has a long whip-like tail, which extends the total length (TL) to 3 times the DW (Last et al. 2016). It has a long and rounded rostral lobe with a small mouth.

The currently known range of *A. vespertilio* is patchy, with reports from the Indo-West Pacific including Mozambique, the Red Sea, India, the Maldives, Indonesia, Philippines, China, Malaysia, Taiwan, and northern Australia (White and Kyne 2016). Its diet is unknown, but this fish likely preys on bottom-dwelling, hard-shelled invertebrates, as do other eagle rays (Schluessel et al. 2011). Its habitat use is also unknown but this is likely to include coastal habitats, such as coral reefs and muddy bays (Last et al. 2016). *Aetomylaeus vespertilio*

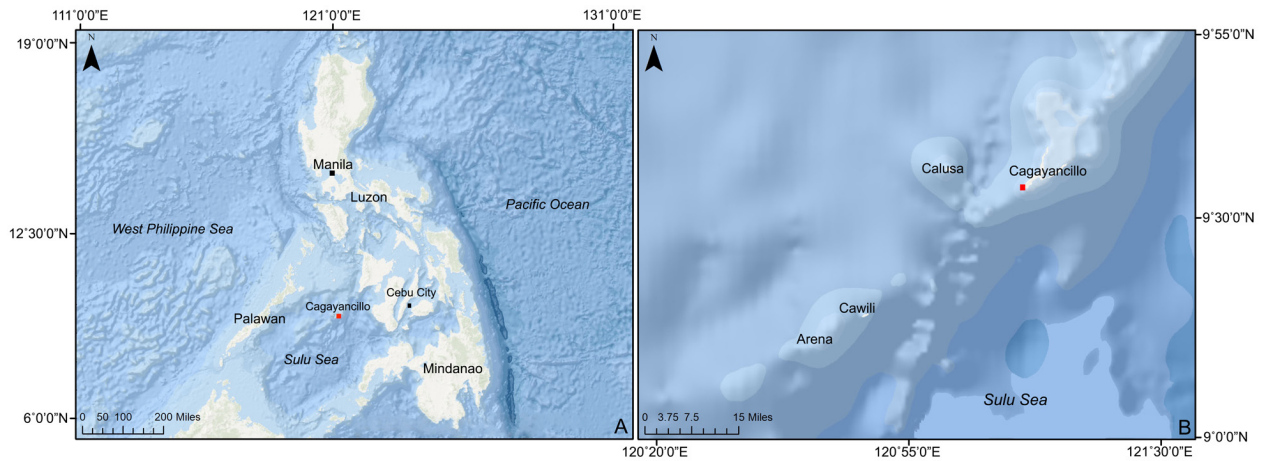


Figure 1. Map of the Philippines (A) and Cagayancillo Islands therein (B). The “airport strip” dive site is located in the southwest tip of the island, indicated by the red square.

is Endangered on the IUCN Red List due to suspected population declines of over 50% in the last 3 generations (45 years), and continued fishing pressure throughout its range (White and Kyne 2016).

At least one-quarter of all chondrichthyans are threatened with extinction, primarily due to targeted fisheries and incidental catches, although habitat loss, persecution, and climate change are threats (Dulvy et al. 2014). Eagle rays are highly susceptible to numerous fisheries (e.g. trawls, gillnets), and over 50% of myliobatid species are listed as Vulnerable or Endangered on the IUCN Red List (McClenachan et al. 2012). Eagle rays were landed in considerable numbers into the late 1990s in Malaysia and Thailand (Compagno and Last 1999) and likely extirpated from the Gulf of Thailand and possibly across a larger portion of their range (White 2006).

Large marine protected areas (MPAs) have the potential of mitigating some of the current threats to marine biodiversity, although the effectiveness of these areas for chondrichthyans is not yet fully understood (Davidson and Dulvy 2017). For example, the White-spotted Eagle Ray, *Aetobatus narinari* (Euphrasén, 1790), displays strong site affinity and localized movements (Ajemian and Powers 2014, Flowers et al. 2017), and therefore, spatially-focused management would protect this species during at least part of its life history. However, this would likely be incomplete, as it has been shown in other elasmobranch species, like the reef-associated Grey Reef Shark, *Carcharhinus amblyrhynchos* (Bleeker, 1856) (White et al. 2017). A multidisciplinary approach to chondrichthyan conservation might be optimal, by means of having spatial, temporal, size, and gear restrictions in artisanal and commercial fisheries (Dulvy 2013), depending on the level of engagement and implementation possible. Such features can complement the 5 key features of Edgar et al. (2014) for MPA effectiveness, namely that there be no take within the MPA, that this be well enforced, that the MPA is old (>10 years), that it is large (>100 km²), and that it is isolated by deep water or sand.

In the Philippines, there is a single record of *A. vespertilio* from the Pasil fish market in Cebu City landed on 12 April 2000; it is a juvenile male specimen measuring 53.2 cm DW and 153.7 cm TL (Joe Pres A. Gaudiano, JPAG, collection no. 324, Silliman University; Compagno et al. 2005, Alava et al. 2014). Here, we report the first live encounter of *A. vespertilio* in the Philippines at the remote archipelago of Cagayancillo in the Sulu Sea, and discuss the implications for the conservation and management of this species.

Methods

Study site. Cagayancillo is an archipelagic municipality in the northeastern Sulu Sea, approximately 270 km east of Puerto Princesa City, Palawan, Philippines (Fig. 1). The municipality comprises 31 islands and covers a land area of 26.4 km². On these islands live over 7000 people, whose main source of livelihood is fishing and seaweed farming (Dygico 2016). Sustainable practices have been encouraged, and ongoing work by WWF-Philippines is yielding benefits for the local communities (Dygico 2016). The main island of Cagayancillo extends about 12 km southwest to northeast with seagrass, mangrove, shallow and deep reef habitats extending around it. The island is near deep-water areas that exceed 4000 m and reach temperatures of <10 °C (Gordon et al. 2011). The municipality was recently declared the largest MPA in the Philippines, spanning 1 million ha. The MPA comprises various multiple-use zones, with strict no-take zones in place, whilst other areas are being studied for regulated resource use, such as gear restrictions to hook and line and closure during spawning season of certain species.

Haphazard scuba-based surveys were employed across the islands of Calusa, Arena, Cawili, and Cagayancillo (Fig. 1). Surveys were conducted within recreational scuba diving limits to 40 m to document species of sharks and rays present within the municipal waters of Cagayancillo. These surveys did not quantify abundance of individuals, and hence, the approach was haphazard.

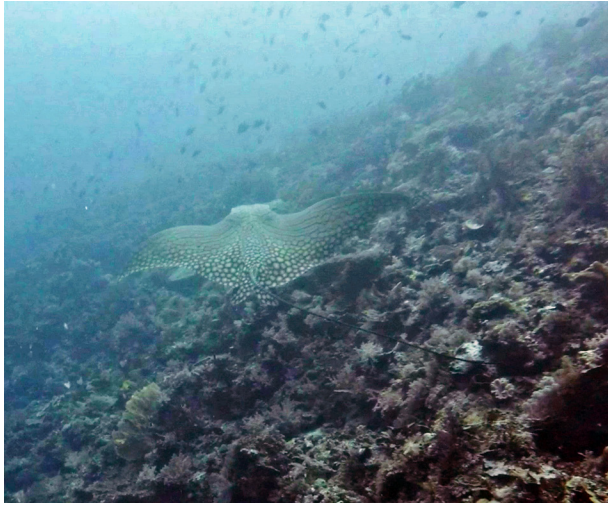


Figure 2. *Aetomylaeus vespertilio* free-swimming along the reef at 12 m.

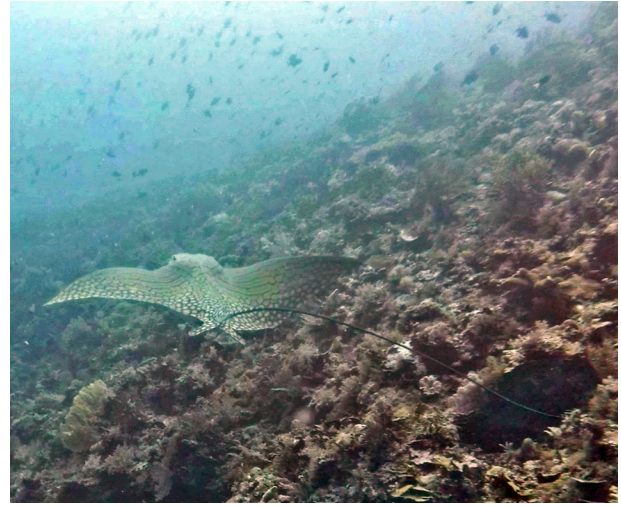


Figure 3. *Aetomylaeus vespertilio* can be identified through its unique dorsal pattern of thin stripes anteriorly, followed by reticulated spots posteriorly.

Video, photographic, and written notes were taken during surveys. We estimated the size of animals when possible. For our identifications of sharks and rays, we consulted the works of Ebert et al. (2013), Alava et al. (2014), and Last et al. (2016).

Results

New record. Whilst surveying the “airport strip” dive site on Cagayancillo Island (09°34'15" N, 121°10'47" E) on 25 April 2017, we encountered a female ornate eagle ray *A. vespertilio* individual, measuring an estimated 200 cm DW and 400 cm TL (Figs 2, 3; Supplementary Movie S1). The species was confirmed by its unique dorsal pattern of anterior dark stripes and posterior reticulated spots, and compared against Last et al. (2016) and Alava et al. (2014) (Fig. 2, 3). Its sex was confirmed by the absence of claspers on its pelvic fins. The ray was

observed slowly swimming along the reef’s edge at 12 m, approximately 1 m from the substrate. The ray was associated with 5 juvenile Golden Trevally, *Gnathanodon speciosus* (Forsskål, 1775), and 1 suckerfish, likely the Common Remora, *Remora remora* (Linnaeus, 1758) or the Live Sharksucker, *Echeneis naucrates* Linnaeus, 1758 (Fig. 4). The ray was observed defecating, possibly in response to diver proximity and strobe use, after which it quickly accelerated and dove out of sight (Fig. 4).

Discussion

Though brief, this represents the first report of a live encounter with *A. vespertilio* in the Philippines (Supplementary Movie S1). Online searches in social media platforms (i.e., Facebook, Twitter, Instagram, and Google) found no reported encounters with this elusive species. Only 1 previous record of this species exists



Figure 4. *Aetomylaeus vespertilio* defecates before fleeing, possibly in response to diver proximity and strobe use. Note the associated fauna of juvenile Golden Trevally and a suckerfish. Photo credit Jun V. Lao.

in the country (Compagno et al. 2005), which is from a fish market in the Visayas region of the Philippines, but it is uncertain where it was caught. We can confirm the presence of *A. vespertilio* in Cagayancillo, Sulu Sea, and extend the known range of this species westward in the Philippines. Although the size of this species at maturity is unknown (White 2006), this individual was near the maximum reported size for the species (240 cm DW; White 2006), and therefore, possibly mature. The associated fauna observed, namely the suckerfish and Golden Trevally, are also commonly associated with other marine megafauna (e.g. Whale Shark, *Rhincodon typus* A. Smith, 1828; Rowat and Brooks 2012). The occurrence of this rare myliobatid in a remote MPA is notable and highlights the need to further investigate the ecology and movement patterns of threatened, little-known species and the role of MPAs for their conservation.

Aetomylaeus vespertilio was encountered in what was recently declared (September 2016) the largest MPA in the Philippines, covering an estimated 1 million ha. Eagle rays are mostly reef-associated, coastal batoids, and therefore, restricting gillnets and trawlers throughout the range of these species could benefit their conservation (Compagno and Last 1999, McClenachan et al. 2012). During in-water surveys at Cagayancillo islands, spotted eagle rays (*Aetobatus* spp.) were encountered on every dive (GA, pers. obs.), which further highlights the occurrence of eagle rays in this area. Interestingly, the ray defecated before speeding up and diving, a response by animals to divers or snorkelers that has been previously reported in other elasmobranch species (e.g. Whale Sharks; Araujo et al. 2017); this warrants attention when developing sustainable tourism practices (e.g. Lawrence et al. 2016).

The municipality of Cagayancillo encompasses Tubbataha Reefs Natural Park (TRNP) approximately 150 km southwest of Cagayancillo Island. TRNP is possibly the best example of a well-managed MPA in the Philippines (Aquino et al. 2015, Dygico 2016). This MPA is a strictly no-take zone that covers roughly 100,000 ha and has year-round monitoring and on-site rangers. It hosts one of the highest densities in the world of reef-associated sharks reported to date (Authors, unpub. data). TRNP is an important habitat for elasmobranchs, and understanding its effectiveness for different species can help model other MPAs in the country, like Cagayancillo. Although sightings of *Aetobatus* spp. have been reported by citizen scientists (Tubbataha Management Office, unpub. data) using baited remote underwater video cameras and underwater visual surveys (Authors, unpub. data), no study has focused on their connectivity between TRNP and Cagayancillo, or their association to these remote islands and atolls. TRNP follows all 5 key MPA features suggested by Edgar et al. (2014), which is reflected in the abundance and biodiversity of shark species (Authors, unpub. data), and likely is instrumental in the conservation of myliobatid rays.

The effectiveness of spatially focused MPAs for conserving elasmobranchs is not yet fully understood, though some protection is evident. It appears that although it is important to create refuges for elasmobranchs as they are highly susceptible to fishing pressure (Dulvy et al. 2014), for their effective management, a combination of spatial restrictions with other conservation strategies such as restricted gear, catch quotas, and temporal limits might be necessary (Maxwell et al. 2015). Given the lack of understanding of the ecology and movement patterns of *A. vespertilio*, their Endangered status, and their susceptibility to trawls and gillnets (McClenachan et al. 2012), efforts to mitigate such threats, at least locally, should be pursued. Further research on *A. vespertilio* and the importance of Cagayancillo should be prioritized, particularly in light of possibly mature individuals there. This could lead to more efficient zoning and management of this newly established MPA and which may be critical for elasmobranch conservation as a whole.

Acknowledgments

The shark and ray expedition was made possible by WWF-Philippines and the crew of M/Y Navorca. We thank the municipal mayor and vice-mayor of Cagayancillo for accommodating us and welcoming our research. We also thank the Palawan Council for Sustainable Development for its support of shark and ray conservation in Palawan. This research did not receive any specific grants from public, commercial or not-for-profit funding agencies.

References

- Alava MNR, Gaudiano JPA, Utzurrum JA, Capuli EEC, Aquino MTR, Luchavez-Maypa MMA, Santos MD (2014) Pating Ka Ba? An Identification Guide to Sharks, Batoids and Chimaeras of the Philippines. Department of Agriculture, Bureau of Fisheries and Aquatic Resources, National Fisheries Research and Development Institute and Marine Wildlife Watch of the Philippines, Quezon City, 200pp.
- Ajemian MJ, Powers SP (2014) Towed-float satellite telemetry tracks large-scale movement and habitat connectivity of myliobatid sting-rays. *Environmental Biology of Fishes* 97 (9): 1067–1081. <https://doi.org/10.1007/s10641-014-0296-x>
- Aquino MTR, Songco AM, Alarcon RC (2015) Notes on the presence of *Manta alfredi* in the Tubbataha Reefs Natural Park, Cagayancillo, Palawan, Philippines. *The Palawan Scientist* 7: 1–11.
- Araujo G, Vivier F, Labaja JJ, Hartley D, Ponzo A (2017) Assessing the impacts of tourism on the world's largest fish *Rhincodon typus* at Panaon Island, southern Leyte, Philippines. *Aquatic Conservation: Marine and Freshwater Ecosystems* 27: 986–994. <https://doi.org/10.1002/aqc.2762>
- Compagno LJ, Last PR (1999) Myliobatidae. Eagle rays. In: Carpenter KE, Niem VH (Eds) *The Living Marine Resources of the Western Central Pacific*. FAO Species Identification Guide for Fishery purposes. Vol. 3. Rome, FAO, 1511–1519.
- Compagno LJ, Last PR, Stevens JD, Alava MNR (2005) Checklist of Philippine chondrichthyes. CSIRO Marine Laboratories Report 243: 1–103.
- Davidson LN, Dulvy NK (2017) Global marine protected areas to prevent extinctions. *Nature Ecology & Evolution* 1: 0040. <https://doi.org/10.1038/s41559-016-0040>

- Dulvy NK (2013) Super-sized MPAs and the marginalization of species conservation. *Aquatic Conservation: Marine and Freshwater Ecosystems* 23: 357–362. <https://doi.org/10.1002/aqc.2358>
- Dulvy NK, Fowler SL, Musick JA, Cavanagh RD, Kyne PM, Harrison LR, Carlson JK, Davidson LN, Fordham SV, Francis MP, Pollock CM (2014) Extinction risk and conservation of the world's sharks and rays. *Elife* 3: e00590. <https://doi.org/10.7554/eLife.00590>
- Dygico M (2016) Cagayancillo: Reaping the benefits of protecting Tubataha. WWF-Philippines, Quezon City, 29pp.
- Ebert DA, Fowler S, Compagno L (2013) *Sharks of the world: A fully illustrated guide*. Wild Nature Press, Plymouth, 528pp.
- Edgar GJ, Stuart-Smith RD, Willis TJ, Kininmonth S, Baker SC, Banks S, Barrett NS, Becerro MA, Bernard AT, Berkhout J, Buxton CD (2014) Global conservation outcomes depend on marine protected areas with five key features. *Nature* 506: 216–220. <https://doi.org/10.1038/nature13022>
- Flowers KI, Henderson AC, Lupton JL, Chapman DD (2017) Site affinity of Whitespotted Eagle Rays *Aetobatus narinari* assessed using photographic identification. *Journal of Fish Biology* 91: 1337–1349. <https://doi.org/10.1111/jfb.13452>
- Gordon AL, Sprintall J, Field A (2011) Regional oceanography of the Philippine Archipelago. *Oceanography* 24: 14–27. <https://doi.org/10.5670/oceanog.2011.01>
- Kyne PM, Dudgeon CL, Ishihara H, Dudley SFJ, White WT (2016) *Aetobatus ocellatus*. The IUCN Red List of Threatened Species 2016. <https://doi.org/10.2305/IUCN.UK.2016-1.RLTS.T42566169A42566212.en>
- Last PR, White WT, de Carvalho MR, Seret B, Stehmann MFW, Naylor GJP (2016) *Rays of the World*. Cornell University Press, Ithaca, New York, 800 pp.
- Lawrence AJ, Budziak A, Campbell I, Cornish A, Ender I, Jeffries B, Kanstinger P, Macdonald C, Marston J, Stevens G, Ward-Paige CA (2016) *Responsible Shark & Ray Tourism: A Guide to Best Practice*. WWF, Gland, Switzerland/Project AWARE, Rancho Santa Margarita, USA/Manta Trust, Dorset, UK, 87pp.
- Maxwell SM, Hazen EL, Lewison RL, Dunn DC, Bailey H, Bograd SJ, Briscoe DK, Fossette S, Hobday AJ, Bennett M, Benson S, Caldwell MR, Costa DP, Dewar H, Eguchi T, Hazen L, Kohin S, Sippel T, Crowder LB (2015) Dynamic ocean management: defining and conceptualizing real-time management of the ocean. *Marine Policy* 58: 42–50. <https://doi.org/10.1016/j.marpol.2015.03.014>
- McClenachan L, Cooper AB, Carpenter KE, Dulvy NK (2012) Extinction risk and bottlenecks in the conservation of charismatic marine species. *Conservation Letters* 5: 73–80. <https://doi.org/10.1111/j.1755-263X.2011.00206.x>
- Rowat D, Brooks KS (2012) A review of the biology, fisheries and conservation of the whale shark *Rhincodon typus*. *Journal of Fish Biology* 80: 1019–1056. <https://doi.org/10.1111/j.1095-8649.2012.03252.x>
- Schlüssel V, Bennett MB, Collin SP (2011) Diet and reproduction in the White-spotted Eagle Ray *Aetobatus narinari* from Queensland, Australia and the Penghu Islands, Taiwan. *Marine and Freshwater Research* 61: 1278–1289. <https://doi.org/10.1071/MF09261>
- White WT (2006) *Aetomylaeus maculatus*. The IUCN Red List of Threatened Species 2006. <https://doi.org/10.2305/IUCN.UK.2006.RLTS.T60120A12307534.en>
- White WT, Kyne PM (2016) *Aetomylaeus vespertilio*. The IUCN Red List of Threatened Species 2016. <https://doi.org/10.2305/IUCN.UK.2016-1.RLTS.T60121A68607665.en>
- White WT, Naylor GJP (2016) Resurrection of the family Aetobatidae (Myliobatiformes) for the pelagic eagle rays, genus *Aetobatus*. *Zootaxa* 4139: 435–438. <https://doi.org/10.11646/zootaxa.4139.3.10>
- White TD, Carlisle AB, Kroodsma DA, Block BA, Casagrandi R, De Leo GA, Gatto M, Micheli F, McCauley DJ (2017) Assessing the effectiveness of a large marine protected area for reef shark conservation. *Biological Conservation* 207: 64–71. <https://doi.org/10.1016/j.biocon.2017.01.009>

Supplementary Materials

Movie S1. Encounter with *Aetomylaeus vespertilio* at Cagayancillo Island, Sulu Sea, Philippines.