

# THREATS TO THE CRITICALLY ENDANGERED CHRISTMAS ISLAND FRIGATEBIRD *FREGATA ANDREWSI* IN JAKARTA BAY, INDONESIA, AND IMPLICATIONS FOR RECONSIDERING CONSERVATION PRIORITIES

FRANSISCA N. TIRTANINGTYAS<sup>1</sup> & JANOS C. HENNICKE<sup>2,3</sup>

<sup>1</sup>*Burung Laut Indonesia, Depok, East Java, 16421, Indonesia (fransisca\_noni@yahoo.com)*

<sup>2</sup>*Dept. of Ecology and Conservation, University of Hamburg, 20146 Hamburg, Germany*

<sup>3</sup>*CEBC-CNRS, 79360 Villiers-en-Bois, France*

*Received 4 November 2014, accepted 26 February 2015*

## SUMMARY

TIRTANINGTYAS, F.N. & HENNICKE, J.C. 2015. Threats to the critically endangered Christmas Island Frigatebird *Fregata andrewsi* in Jakarta Bay, Indonesia, and implications for reconsidering conservation priorities. *Marine Ornithology* 43: 137–140.

The Christmas Island Frigatebird *Fregata andrewsi* is one of the most endangered seabirds in the world. The reasons for its population decline are unknown, but recommended protection measures and management actions focus on the species' breeding site. Threats to the species away from Christmas Island have received little consideration. Here, we report on several previously undescribed anthropogenic threats to Christmas Island Frigatebirds based on observations in Jakarta Bay, Indonesia: accidental entanglement in fishing gear, as well as capture, poisoning and shooting. Based on these findings, we suggest that it is imperative to reconsider the present management strategies and conservation priorities for the species and to urgently include protection measures away from Christmas Island.

Keywords: Christmas Island Frigatebird, *Fregata andrewsi*, conservation, mortality, anthropogenic threats, Jakarta Bay, Southeast Asia

## INTRODUCTION

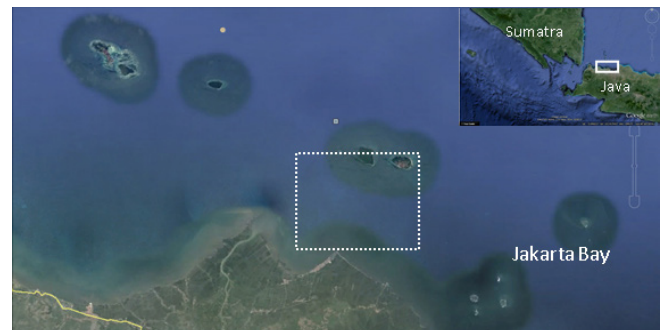
The Christmas Island Frigatebird *Fregata andrewsi* is one of the most threatened seabirds in the world. It is endemic to Christmas Island (10°25'S, 105°40'E), a small oceanic island governed by Australia in the eastern Indian Ocean, about 360 km south of Java, Indonesia. The species is listed as Critically Endangered by the IUCN (IUCN 2013). The most recent population census estimates a population of 2400–4800 adult individuals (James 2003), and the population is assumed to have experienced a severe decline (i.e., of 66% over three generations) (Birdlife International 2014). While many threats have been suggested as causes of the population decline (e.g., invasive Yellow Crazy Ants *Anoplolepis gracilipes*, introduced weeds affecting breeding habitat, entanglement in fishing gear, avian diseases), no cause has been definitely proven (e.g., Hill & Dunn 2004, Garnett *et al.* 2011, Quillfeldt *et al.* 2011, Merino *et al.* 2012, Birdlife International 2014, James & MacAllan 2014).

So far, threats to the birds away from their breeding site have been considered of relatively little importance to the conservation of the species, as there has been no specific information on such threats. Consequently, management strategies and recommendations for conservation actions have focused on Christmas Island (Hill & Dunn 2004, Garnett *et al.* 2011, BirdLife International 2014). However, so far no major threat has been identified to account for the population decline (James 2003, Garnett *et al.* 2011, Birdlife International 2014). In addition, the species is known to forage while breeding in waters off Indonesia, Malaysia, Singapore, Thailand and Brunei (e.g., Orta 1992, Wells 1999, BirdLife International 2001, Phillipps & Phillipps 2009, Jensen & Tan 2010, Tirtaningtyas *et al.* 2012). Thus, it is possible that Christmas Island Frigatebirds face major threats away from the island, either at sea or at their roosting sites. The objective of the present study was to determine whether

Christmas Island Frigatebirds are exposed to threats in Southeast Asian waters, namely in Jakarta Bay, Indonesia, that might contribute to the unexplained population decline of the species. This information is crucial to developing new conservation measures as well as to prioritising existing measures for the highly threatened species.

## METHODS

The study was conducted in the western part of Jakarta Bay, Indonesia (5°59'S, 106°41'E; Fig. 1), about 15 km northwest of downtown Jakarta, from July 2011 until July 2013. In the bay, Christmas Island Frigatebirds of all age classes (juveniles, sub-adults and adults) are present in relatively high numbers (monthly mean 79.4, SD 49.91) during all months of the year. The majority of the birds usually perch on *seros*, traditional fishing traps made of up to 100 bamboo poles of up to 100 m in length (Tirtaningtyas *et al.* 2012).



**Fig. 1:** Jakarta Bay and survey area (white dashed square) in western Jakarta Bay, Indonesia, 2011–2013.

Information about interactions between people and Christmas Island Frigatebirds was gathered by observations during monthly boat surveys in Jakarta Bay covering an area of about 30 km<sup>2</sup> (Fig.1; Tirtaningtyas *et al.* 2012) and by communicating with local inhabitants of the study area. Christmas Island Frigatebirds were identified, aged and sexed following James (2004). Local inhabitants and fishermen were interviewed as well as being asked to report any observed interaction between the frigatebirds and people. When information about any interaction was obtained, it was confirmed that Christmas Island Frigatebirds were identified correctly.

## RESULTS

Over the study period, four different types of interactions between people and frigatebirds were identified.

### *Entanglement in fishing gear*

In April 2013, a recently dead juvenile Christmas Island Frigatebird was found in a tree on Pulau Rambut Island, a small islet in Jakarta Bay. It was entangled in fishing line, with the hook piercing through its bill (Fig. 2). In December 2013, two were found dead entangled in fishing lines (sex and age could not be determined).

### *Capture and attachment of string to leg*

During the study period, four Christmas Island Frigatebirds were recorded with strings attached to their legs (Fig. 3; juvenile in September 2011; fourth year female in October 2011; female of unknown age in March 2012; and adult female in April 2013). The strings were estimated to be up to 70 cm long. In theory, the strings could have originated from accidental entanglement in fishing gear, but fishermen reported that they caught frigatebirds and attached strings to the birds' legs.

### *Poisoning/Sedating*

In March 2013, local people observed a fisherman throwing fish overboard from his fishing boat, specifically aimed at Christmas Island Frigatebirds, which readily took the bait from the water surface. Apparently, the bait was poisoned or contained a sedative,

as the three frigatebirds (sex and age unknown) that had swallowed the bait fell to the surface of the sea shortly afterward and were taken by the fishermen, who then left the area.

### *Shooting*

In November 2013, the local police arrested four hunters who had shot two juvenile Christmas Island Frigatebirds and several Little Cormorants *Microcarbo niger*.

## DISCUSSION

Entanglement in fishing gear is known to be a huge source of seabird mortality, and bycatch mortality has been identified as a major seabird conservation issue (e.g., Lewison *et al.* 2004, Anderson *et al.* 2011). Frigatebirds take prey from or close to the water surface and sometimes also prey on baited fishing hooks (e.g., Diamond & Schreiber 2002, Metz & Schreiber 2002). Thus, they are likely to be susceptible to entanglement in fishing gear, but information about this threat to Christmas Island Frigatebirds has been scarce. The frigatebirds that were found entangled in fishing gear clearly show that fishing gear is a cause of mortality in this species. Given the intensive fishing activities in Southeast Asian waters, in particular the artisanal and small-scale subsistence fisheries, it is likely that accidental entanglement in fishing gear represents a significant threat to Christmas Island Frigatebirds.

During the study period, several Christmas Island Frigatebirds with strings attached to their legs were observed. Fishermen confirmed that they intentionally catch Christmas Island Frigatebirds and attach strings like the observed ones to the birds' legs before release. While the mere capture of frigatebirds by fishermen is not deadly, it raises the question of why birds are being caught and strings being attached to their legs. The fishermen did not give any reasons for catching the birds, for attaching the strings, or for releasing the birds after attaching the strings. The birds may have been caught for food, as fishermen have admitted repeatedly to eating Christmas Island Frigatebirds. As interviews had to be made in the presence of Indonesian government officials and harvest of Christmas Island Frigatebirds (and other seabirds) is illegal, the answers of the fishermen are likely to be incomplete and biased. However, even if the birds were not caught to be eaten, the attached string might



**Fig. 2:** Juvenile Christmas Island Frigatebird entangled in fishing gear found dead in Jakarta Bay, Indonesia, in April 2013. The arrow points to the hook in the bird's bill (photo F.N. Tirtaningtyas).



**Fig. 3:** Female Christmas Island Frigatebird with string on her leg, attached by fishermen, observed in Jakarta Bay, Indonesia (photo F. N. Tirtaningtyas).

still cause death if it became caught in a roosting tree, for example. Christmas Island Frigatebirds with strings attached to their legs have never been seen during investigations on Christmas Island from 2005 until present (JCH pers. obs.). Thus, birds must either lose the attached string or die due to string entanglement before returning to their breeding site. Both explanations are possible, but since the strings are most often made of durable plastic, the latter appears more likely.

Intentional poisoning/sedating of frigatebirds has, to the authors' knowledge, not been described previously. As the fisherman could not be interrogated, it is only possible to speculate about his reasons. Frigatebirds may be regarded as competitors for fish. Actual or perceived competition for marine resources is a known reason why fishermen often want to reduce numbers of other marine upper trophic level predators (e.g., Yodzis 2001). On the other hand, it is also possible that the birds were sedated to be captured easily for use as food. Both possibilities — killing to reduce potential competition or hunting for food — could also explain the observed shooting of the birds.

Although the motivation for catching, poisoning/sedating, and shooting are unknown, the most likely explanation seems to be that the birds were to be eaten. Even today, seabirds are being caught and eaten all over the world (Steadman & Olson 1985, Skira *et al.* 1986, A. Anderson 1996, R.C. Anderson 1996, Lyver *et al.* 1999, Denlinger & Wohl 2001). Fishermen in Jakarta Bay have stated that they eat Christmas Island Frigatebirds, and some specimens in the Bogor Zoological Museum, Bogor, Indonesia, had been acquired when found for sale in fish markets. While in some seabird species the impact of harvest on the population might be insignificant, the small and declining Christmas Island Frigatebird population is unlikely to be able to sustain this mortality. In addition, similar threats probably exist in other parts of the wide range of Christmas Island Frigatebirds in Southeast Asia, as lifestyles and economic situations of the people living within their range are similar. As those countries have rapidly growing populations (United Nations 2013), the hunting pressure may increase. While Jakarta Bay was designated a protected Wildlife Refuge through a Jakarta Governor Decree in 2011, hunting still continues. Thus, it appears that the implementation of effective wildlife conservation even in this protected area is insufficient.

The present study is the first to clearly identify a number of threats to which Christmas Island Frigatebirds are exposed away from their breeding island and which are likely to affect the species at the population level, thus contributing to the species' rapid decline. As the current recommendations and proposed management actions for the protection of this species focus mainly on its breeding site (Hill & Dunn 2004, Garnett *et al.* 2011, BirdLife International 2014), it seems imperative to reconsider the existing management priorities and to urgently include effective protection measures in the roosting and foraging areas away from the breeding colony.

#### ACKNOWLEDGEMENTS

We thank the people of the Jakarta Bay area for their support and interest. We are thankful to the staff of Jakarta Nature Conservation Agency, Jakarta, Indonesia, the staff of the Bogor Zoological Museum, Bogor, Indonesia, the team of Burung Laut Indonesia (I. Febrianto, K.H. Nanang, K. Yordan, F. Surahmat, F. Bakhtiar, P. Wardhani and A. Kaban), as well as N. Brickley, D.J. James, and P.

O'Neill for their kind help and support. Sponsorship was received from the Conservation Leadership Program, the Oriental Birding Club and the Australian Government.

The frigatebirds that were recovered dead as a result of entanglement in fishing gear and shooting were given to the Bogor Zoological Museum, Bogor, Indonesia.

#### REFERENCES

- ANDERSON, A. 1996. Origins of Procellariidae hunting in the Southwest Pacific. *International Journal of Osteoarchaeology* 6: 403–410.
- ANDERSON, O.R.J., SMALL, C.J., CROXALL, J.P., DUNN, E.K., SULLIVAN, B.J., YATES, O. & BLACK, A. 2011. Global seabird bycatch in longline fisheries. *Endangered Species Research* 14: 91–106.
- ANDERSON, R.C. 1996. Seabirds and the Maldivian tuna fishery. *Rasain Newsletter* 16: 134–147.
- BIRDLIFE INTERNATIONAL. 2001. *Threatened birds of Asia: the BirdLife International red data book*. Cambridge, UK: BirdLife International.
- BIRDLIFE INTERNATIONAL. 2014. Species factsheet: *Fregata andrewsi*. [Available online from: <http://www.birdlife.org/datazone/speciesfactsheet.php?id=3847>; accessed 10 October 2014].
- DENLINGER, L.M. & WOHL, K.D. 2001. Harvest of seabirds in Alaska. In: Denlinger, L.M. & Wohl, K.D. (Eds.) *Seabird harvest regimes in the circumpolar nations. Conservation of Arctic Flora and Fauna Technical Report 9*. pp. 3–10.
- DIAMOND, A.W. & SCHREIBER, E.A. 2002. Magnificent Frigatebird *Fregata magnificens*. In: Poole, A. & Gill, F. (Eds.) *The birds of North America*, No. 601. Philadelphia, PA: The Birds of North America Inc.
- GARNETT, S.T., SZABO, J.K. & DUTSON, G. 2011. *The Action Plan for Australian Birds 2010*. Collingwood, Australia: CSIRO Publishing.
- HILL, R. & DUNN, A. 2004. *National Recovery Plan for the Christmas Island Frigatebird Fregata andrewsi*. Canberra, Australia: Commonwealth of Australia.
- INTERNATIONAL UNION FOR CONSERVATION OF NATURE AND NATURAL RESOURCES (IUCN). 2013. *Red List of Threatened Species*. Gland, Switzerland and Cambridge, UK: Species Survival Commission, IUCN.
- JAMES, D.J. 2003. *A survey of Christmas Island Frigatebird nests in 2003*. Christmas Island, Australia: Parks Australia North.
- JAMES, D.J. 2004. Identification of Christmas Island, Great and Lesser Frigatebirds. *Birding Asia* 1: 22–38.
- JAMES, D.J. & McALLAN, I.A.W. 2014. The birds of Christmas Island, Indian Ocean: a review. *Australian Field Ornithology* 31 (Supplement).
- JENSEN, A.E. & TAN, J.M.L. 2010. First observation and subsequent records of Christmas Island Frigatebird *Fregata andrewsi* in the Philippines with notes on its occurrence and distribution. *Birding Asia* 13: 68–70.
- LEWISON, R.L., CROWDER, L.B., READ, A.J. & FREEMAN, S.A. 2004. Understanding impacts of fisheries bycatch on marine megafauna. *Trends in Ecology and Evolution* 19: 598–604.
- LYVER, P.O., MOLLER, H. & THOMPSON, C. 1999. Changes in sooty shearwater *Puffinus griseus* chick production and harvest precede ENSO events. *Marine Ecology Progress Series* 188: 237–248.

- METZ, V.G. & SCHREIBER, E.A. 2002. Great Frigatebird *Fregata minor*. In: Poole, A. & Gill, F. (Eds.) *The birds of North America*, No. 681. Philadelphia, PA: The Birds of North America Inc.
- MERINO, S., HENNICKE, J.C., MARTÍNEZ, J., LUDYNIA, K., TORRES, R., WORK, T.M., MASELLO, J.F. & QUILLFELDT, P. 2012. Infection by *Haemoproteus* parasites in four species of frigatebirds and the description of a new species of *Haemoproteus* (Haemosporida: Haemoproteidae). *Journal of Parasitology* 98: 388–397.
- ORTA, J. 1992. Family Fregatidae. In: del Hoya J., Elliot, A. & Sargatal, J. (Eds.) *Handbook of the birds of the world*, Vol. 1. Barcelona, Spain: Lynx Edicions. pp. 362–374.
- PHILLIPPS, Q. & PHILLIPPS, K. 2009. *Phillipps' Field Guide to the Birds of Borneo: Sabah, Sarawak, Brunei and Kalimantan*. Oxford, UK: Beaufoy Books.
- QUILLFELDT, P., MARTÍNEZ, J., HENNICKE J.C., LUDYNIA, K., GLADBACH, A., MASELLO, J.F., RIOU, S. & MERINO, S. 2011. Hemosporidian blood parasites in seabirds—a comparative genetic study of species from Antarctic to tropical habitats. *Naturwissenschaften* 97: 809–817.
- SKIRA, I.J., WAPSTRA, J. E., TOWNEY, G.N. & NAARDING, J.A. 1986. Conservation of the short-tailed shearwater *Puffinus tenuirostris* in Tasmania, Australia. *Biological Conservation* 37: 225–236.
- STEADMAN, D.W. & OLSON, S.L. 1985. Bird remains from an archaeological site on Henderson Island, South Pacific: man-caused extinctions on an “uninhabited” island. *Proceedings of the National Academy of Science USA* 82: 6191–6195.
- TIRTANINGTYAS, F.N., Febrianto, I., Hadi, N.K., Wardhani, P. & Yordan, K. 2012. *Conservation of Christmas Island Frigatebird (Fregata andrewsi) in West Java, Indonesia*. Final report. Bogor, Indonesia: Burung Laut Indonesia.
- UNITED NATIONS. 2013. *World population prospects: the 2012 revision*, vol. II: Demographic profiles. ST/ESA/SER.A/345. New York, US: UN Department of Economic and Social Affairs, Population Division.
- WELLS, D.R. 1999. *The birds of the Thai-Malay peninsula, non-passerines*, Vol. 1. London: Academic Press.
- YODZIS, P. 2001. Must top predators be culled for the sake of fisheries? *Trends in Ecology and Evolution* 16: 78–84.
-