

Christmas Island Frigatebird Weight Logger

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A weight logger has been designed to record seasonal changes in average weights of perching Christmas Island Frigatebirds. The logger records the weight of individual birds as an indicator of foraging success and bird condition which may be related to breeding effort or other demographic parameters.

Project objectives

This project seeks to obtain the weights of Christmas Island Frigatebirds (*Fregata andrewsi*) by making use of existing bamboo poles used as fishing infrastructure in Indonesia. These poles have varying dimensions, and so the system requires dimensional flexibility to allow for sturdy installation regardless of selected pole. The system will be used to provide insight into relative seasonal foraging success over a number of years, to determine if there is any correlation with breeding performance.

System overview

- The Frigatebird weight loggers consist of a small waterproof weight logger, measuring bird mass up to 3 kg. The entire system weighs less than 3kg and is designed to attach to fit over bamboo poles (*Figure 1*).
- In current operation mode (data sampling performed every 10 seconds until a bird lands on a perch) and battery pack configuration, the system can operate in the field continuously for up to three months. This enables continuous data collection prior to battery changeovers.
- The system is designed to withstand harsh marine environments (e.g. wind, water ingress, foreign particles), without affecting logger reliability and performance. Multiple stages of assembly protects key components.
- Sufficient weight range allows for a rolling change in zero-balance mass. This is achieved by logging the average weight of the system when no bird is perched.



Figure 2: (Left) Various electronic components during manufacture and assembly. (Middle) Section view of assembled unit. (Right) Complete Frigatebird weight Logger and various subsystem assemblies shown on right.

System specifications

Table 1: System specifications of Frigatebird Weight Logger prototypes

SPECIFICATION	VALUE
Maximum load cell capacity	2800 g
Sampling Rate (scanning)	0.1 Hz
Sampling Rate (loaded)	5 Hz for 5 seconds; 0.1 Hz thereafter
Data Download/ Storage	microSD card
Battery Capacity	10 Ah @ 6V
Dimensions	φ100 × 600 mm
Weight	2.3 kg

Future developments

- Three species of Frigatebird are known to reside in the study region. Species identification is currently performed based on weight (*Table 2*), with supplemental photographs taken by researchers and operators whilst in the region. Weight overlap between species complicates analysis. Future modification of the system could include automated photography, triggered by communication from the logger to a hidden camera.
- Data logs are manually downloaded from a microSD card when changing batteries. To minimise the risk of water exposure to electronics, alternative download methods will be explored, such that all maintenance procedures can be performed by only opening the battery canister plug.

Table 2: Weight estimate for adult Frigatebird species

SPECIES	GENDER	MASS (G)
Christmas Island Frigatebird	Female	1550 g ¹
	Male	1400 g ¹
Great Frigatebird	Female	1403.6 ± 50.4 ²
	Male	1075.8 ± 46.9 ²
Lesser Frigatebird	Female	899.0 ± 13.1 ²
	Male	778.8 ± 17.4 ²



Figure 1: (Top left) Christmas Island Frigatebird perched on bamboo fishing poles. (Top right) Top level assembly technical drawing. (Bottom) Frigatebirds occupying poles at potential field site in Indonesia.

FOR FURTHER INFORMATION

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REFERENCES

- Orta, J; Garcia, EFJ; Kirwan, GM; Boesman, P. *Christmas Frigatebird (Fregata andrewsi)*. In *del Hoyo, J; Elliott, A; Sargatal, J; Christie, DA; de Juana, E. Handbook of the Birds of the World Alive*. Barcelona: Lynx Edicions.
- Mott, R., A. Herrad and R. H. Clarke (2017). *Resource partitioning between species and sexes in Great Frigatebirds and Lesser Frigatebirds*. The Auk. 134: 153-167.

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