NEW LIFE-SPAN RECORDS OF THE BROWN BOOBY *SULA LEUCOGASTER*

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Seabirds are exposed to a highly variable marine environment in which prey availability is unpredictable, patchy and ephemeral (Ashmole 1971, Hunt & Schneider 1987, Shealer 2002). Consequently, seabirds have evolved a number of distinct life history traits to cope with those conditions, such as low fecundity, deferred maturity and high adult survival (e.g. Furness & Monaghan 1987, Weimerskirch 2002). An important life history trait of seabirds is their longevity. Seabirds can reach extremely old ages and are able to reproduce during this long life span, increasing their chances to project their genes into future generations under the challenging conditions of their marine habitat.

Despite the general acknowledgement of seabird longevity and its evolutionary importance, the life spans of many seabird species are unknown. As age determination in birds is difficult, following banded birds over time is the most common method used to age them. However, seabirds' life spans often exceed the duration of particular research programs, and hence maximum longevity often remains unknown. However, knowledge of life span is crucial for modelling and predicting processes concerning demography and population dynamics as well as for conservation.

The Brown Booby (*Sula leucogaster*) is an abundant, medium-sized member of the Sulidae. It breeds in large numbers in the tropical and sub-tropical waters worldwide (Nelson 1978, Carboneras 1992). Until now, the life span of this species has been unknown and was only roughly estimated based on the life span of other, better studied members of the sulid family (Marchant & Higgins 1990, Carboneras 1992, Nelson 2005). Here, we report on several band resightings that provide new and direct information on the life span of this species.

METHODS AND RESULTS

Three re-sightings of banded adult Brown Boobies were made at two locations:

(1) A female Brown Booby banded as a fully fledged young at Raine Island, Coral Sea (11.6°S, 144.0°E) on December 02, 1986, was re-sighted at the same place on November 30, 2010, 23 years, 11 months and 28 days after banding. The bird had also been re-encountered at this location several times previously.

(2) An adult Brown Booby (sex unknown) banded as a nestling at Raine Island on December 21, 1984, was resighted on December 6, 2009, 24 years, 11 months and 15 days after banding. This is the oldest age known for this species in Australia and, to the authors' knowledge based on literature surveys, worldwide.

(3) On May 10, 2009, a dead bird with a leg ring was found in the Brown Booby colony at the "Dales", Christmas Island, Indian Ocean (10.5°S, 105.6°E). The bird was already decomposed to bones and feathers, but the carcass was complete, and the bones were still largely held together by ligaments. It had been banded at approximately the same location on August 16, 1985. Time and cause of death are unknown but, given the condition of the carcass, it seems likely that the bird died of a natural cause several weeks before the finding. The time from banding to recovery was 23 years, 8 months and 24 days. Making the most conservative assumption, i.e. the bird was banded as a chick and died at the start of the rainy season at the beginning of November 2008, the minimum life span of this individual was ca. 23 years and 3 months.

Our findings show that Brown Boobies can reach old ages and longer life spans than previously assumed. Information on the longevity of booby species is sparse, which is generally the case in the long-living seabirds. The life span of the Red-footed Booby (*S. sula*) was determined to be 22 years (Carboneras 1992, Nelson 2005). The life spans of Abbott's Boobies (*Papasula abbotti*) and Masked Boobies (*S. dactylatra*) are estimated to be 30–35 years (Nelson 2005) and over 23 years (Carboneras 1992), respectively. For the other booby species, including the Brown Booby, no data are available. The life span of Brown Boobies determined in this study (almost 25 years) matches well with the life spans of Red-footed and Masked Boobies. Animals with similar life histories, body sizes and habitats, generally have similar life spans (cf. Roff 1992, Stearns 1992).The substantially longer life span of Abbott's Booby can most likely be attributed to the different life-history of this species compared to all other boobies (Nelson 1978).

In all three cases, the birds we report here were re-encountered at approximately the same location where they were banded as young birds. This suggests that they spent their entire (reproductive) life close to the location where they hatched and had a life-long fidelity to their natal colony, behaviour often observed in seabirds. Upon reaching maturity, brown boobies return to their natal colony for breeding and do not change colonies anymore as high site fidelity from one reproductive season to the next has been observed in adult birds (Nelson 1978, Carboneras 1992).

Although numerous censuses were conducted at both islands, only one of the birds was re-sighted repeatedly while the other two were not. That may be because Brown Boobies do not always breed seasonally (i.e. they can have breeding cycles shorter than 12 months and hence "escape" seasonal yearly counts), because adults might skip reproduction when conditions are unfavourable and/or because adults

that do not breed spend extended periods away from their breeding site (Nelson 1978, Marchant & Higgins 1990, Carboneras 1992).

Both birds of Raine Island were still alive and might be re-sighted again. In addition, other individuals banded on Raine and Christmas Island in the late 1980s and early 1990s might be re-encountered in future censuses and increase sample size as well as perhaps setting new records of longevity for this species.

In conclusion, our findings provide information on the life span of brown boobies that should allow more accurate modelling of population dynamics and demography. Our findings also emphasize the importance of long-term studies in seabird research and of national bird banding schemes as long-term data collection, storage and access are crucial to providing information on longevity for many seabird species.

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