

**PSEUDO-EGGS OF BROWN *SULA LEUCOGASTER* AND  
BLUE-FOOTED *S. NEBOUXII* BOOBIES IN THE GULF OF CALIFORNIA, MEXICO**

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Pseudo-eggs, foreign round objects, notably eggs of other species or pebbles, are common in some ground-nesting species, and have been reported especially in larids (Sugden 1947, Twomey 1948, Coulter 1980, Conover 1985). As many as 10% of Ring-billed Gull *Larus delawarensis* nests in Washington, USA included pseudo-eggs (Conover 1985). The nests of some larids that usually lay three eggs sometimes have a pebble and two eggs. Pebbles could be an important stimulus for incubation in gulls and terns (Coulter 1980). However, there is other evidence to suggest that pseudo-eggs are adopted because they are mistaken for real eggs (Conover 1985). Pseudo-eggs seem not to have been previously reported from sulids (Nelson 1978, and a literature search through *Zoological Review*). Here, I report on seven nests containing such objects in the Gulf of California, Mexico.

Between 8 January and 8 March 2001 I discovered six Brown Booby *Sula leucogaster* nests containing pseudo-eggs, on a flat area of Isla San Jorge (31°01'N, 113°15'W), in the northern Gulf of California, Mexico (Table 1). Three nests contained two rounded rocks each; the others contained a large rounded rock, an irregular piece of rock, and an irregular piece of guano, respectively. Except for the nest with the piece of guano, which also had one egg, these nests did not contain eggs. On Isla Isabel, in the southern Gulf of California, in addition to rocks in nests, B. Contreras (pers. comm.) witnessed a Brown Booby repeatedly pulling an escaping hermit crab into the nest.

One 1 March 2001 I examined 111 Brown Booby nests on Isla San Jorge. Nest contents were as follows: one egg, 63 nests; two eggs, 28; three eggs, 1; one chick, 7; one chick and one egg, 7; one egg and one pseudo-egg, 1; one pseudo-egg, 1; two pseudo-eggs, 3. I measured 50 real eggs: length was 52.6–70.0 mm (mean 59.82±3.1 mm, s.d.) and width 38.0–43.0 mm (mean 41.1±1.36 mm). Seven of the nine pseudo-eggs were longer than the mean of real eggs and wider than the widest real egg measured; five were longer than the longest egg measured (Table 1). By 1 May all nests with pseudo-eggs had been abandoned.

The only nest with pseudo-eggs found on 8 January was tended by both a male and a female. The male was still tending the nest on 8 March (both adults were marked). Four of the nests with rocks were placed near the edge of the above mentioned flat, and the other one below it, where pebbles were abundant. The nest containing the piece of guano was situated away from the edge.

On Farallón de San Ignacio (25°26'N, 109°23'W), in the southern Gulf of California, I examined 10 Brown Booby nests on 6 March 2001. They contained only real eggs. On this island I also examined 61 nests of Blue-footed Boobies *S. nebouxii*. One of those contained a single rock that was being 'incubated' by a male. The length of eleven Blue-footed Booby eggs in this colony was 56.3–69.0 mm (mean 62.69±4.22 mm, n = 11), and the width was 40.6–44.4 (mean 42.51±1.22 mm). The pseudo-egg was thus almost

**TABLE 1**

**Pseudo-eggs of Brown Boobies *Sula leucogaster* on Isla San Jorge and Blue-footed Boobies *S. nebouxii* on Farallón de San Ignacio, Gulf of California, Mexico, 2001**

Nest	Species	Size of objects (mm)	Overall shape, material, eggs	8 January	1 March	6 March	8 March
1	Brown Booby	77.0 × 49.5 × 23.2 78.8 × 55.7 × 29.0	Rounded pebbles, no eggs	Active	Active		Active
2	Brown Booby	76.0 × 55.7 × 55.5 61.6 × 45.5 × 32.5	Rounded pebbles, no eggs		Active		Active
3	Brown Booby	77.5 × 48.5 × 38.6 61.3 × 56.6 × 52.2	Rounded pebbles, no eggs		Active		Active
4	Brown Booby	49.4 × 40.9 × 21.3	Very irregular rock, no eggs		Active		Deserted
5	Brown Booby	49.7 × 27.0 × 25.9	Irregular piece of guano, one egg		Active		Not checked
6	Brown Booby	83.9 × 51.1 × 37.1	Long pebble, no eggs				Active
7	Blue-footed Booby	136.8 × 48.1 × 41.9	Very irregular rock, no eggs			Active	

twice the length of the longest egg measured, but only slightly wider than the widest egg (Table 1).

In no case was there any evidence or suspicion that the rocks had been put in the nest by anyone but the parent boobies. Few visitors landed on Isla San Jorge during the 2000/01 breeding season: local tourists to observe California Sea Lions *Zalophus californicus* and the breeding seabirds, and sport fishermen for brief sanitary stops. Farallón de San Ignacio is visited occasionally by fishermen, but they rarely reach the area where the Blue-footed Boobies nest. The only known visitors to the colony during the 2000/01 booby breeding season were a group of biologists, who did not place the rock in the Blue-footed Booby nest (M.A. González-Bernal pers. comm.).

Unlike pseudo-eggs in Ring-billed and California *L. californicus* Gulls that are similar in size and shape to real eggs (Conover 1985), most of those documented here were larger than eggs. Unlike gulls, boobies adopted not only rounded rocks, but also irregular objects. Rocks of the type used as pseudo-eggs were within reach of birds sitting on the nest (less than 15–20 cm) in the areas where pseudo-eggs were found on both islands. On Isla San Jorge, areas away from the plateau edge had fewer loose rocks. The nest containing the piece of guano had no rocks nearby, but pieces of guano were within reach of the sitting bird.

Pseudo-egg adoption in these species seems rare: 2.7% and 1.6% for Brown and Blue-footed Boobies, respectively, in my samples. Moreover, one Brown Booby nest with two pseudo-eggs was incubated for over 60 days, and was long 'overdue', as normal incubation lasts about 42 days (Tershy & Breese 2000). Not ceasing to incubate within the normal period could cause an over-representation of pseudo-eggs in the sample.

As in gulls (Conover 1985), it seems likely pseudo-egg adoption by boobies results from behaviour intended to recover eggs rolled

out of the nest. However, contrary to what has been observed for gulls, all but one booby nest with pseudo-eggs contained no real eggs. Hence, the adoption of pseudo-eggs may have caused a loss in reproductive output for the pairs involved. The benefits of such retrieval behaviour must balance the gain in fitness through the recovery of displaced eggs against the potential loss of fitness brought about by incubating infertile objects.

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