

The high incidence and origin of two-egg clutches in a Damara Tern colony in southwestern Namibia

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ABSTRACT

Damara Terns *Sterna balaenarum* laid two-egg clutches in less than 0.9% of over 500 nests reported in coastal Namibia since 1975. In 1991, during renewed efforts to completely survey Damara Tern population throughout Namibia, a colony was re-discovered at Hottentot Bay in southwestern Namibia. Of 12 nests with eggs, at least 4 (33%) had two eggs. We argue that this unexpectedly high incidence probably arises from enhanced food resources in the Lüderitz area rather than release from predator-influenced clutch limitation. Further study in this area would greatly assist in our understanding of the evolution of single-egg clutches in Damara Terns.

INTRODUCTION

The Damara Tern *Sterna balaenarum* is one of only five terns that regularly lays a single egg clutch (Frost & Shaugnessy 1976, Cramp & Simmons 1985) and in this respect it differs from its presumed closest relative the same-sized Little Tern *Sterna albifrons*, which lays two eggs. Laying two eggs appears unrelated to body mass (see Fig. 1) as both large and small species lay more than one egg per clutch (Cramp & Simmons 1985). Instead it has been suggested the trait may be related to the Damara Tern's noncolonial habits and vulnerability to predation (Frost & Shaugnessy 1976, Clinning 1978). Alternatively it may arise from an inability to rear more than two young due to ephemeral or limited food resources (cf. Nisbet 1977, Monaghan *et al.* 1989). One way of testing these ideas is to seek areas in which Damara Terns lay two eggs and compare ecological factors there with areas in which they lay single eggs. Here we report on a small colony with an unusually high incidence of two-egg clutches in southwestern Namibia.

RESULTS

During regular monitoring of this globally vulnerable and near-endemic breeding seabird, Namibian nature conservation officials have recorded over 500 Damara Tern nests between 1975 and 1988. These nest records, deposited with the Ministry of Environment & Tourism in Windhoek, indicate that two-egg clutches occurred in just five of 511 nests. Since then, a further 66 nests, all single eggs, have been recorded from two areas: the West Coast Recreation Area (S. Rohm and R. Norris-Jones) and from a coastal survey of terns from the Cunene River to Sandwich Harbour (Simmons 1993). In total, just 5 of 577 Damara Tern nests recorded in Namibia to date, had two-egg clutches, a frequency of 0.87%.

During renewed efforts to census terns throughout Namibia, the coastal area north of Lüderitz was surveyed in December 1991. On 18 December, 12 nests were located on a large isolated salt pan which runs 24 km south from

Hottentot Bay, some 40 km north of Lüderitz. Centred on 26°15'S, 15°00'E, the elongated pan is c. 6 km at its widest point and varies from 0 to c. 3 km from a coast which comprises a series of small sandy and rocky bays. In the east it is bordered by the Namib sand sea. The dry brown pan is topographically flat but is criss-crossed in some areas with large salt ridges where the salt crust has buckled. Birds were found nesting in these raised areas, and were first reported here in 1977 (Siegfried & Johnson 1977).

Eleven tern nests all with eggs, were checked in a small colony which may have comprised more birds, approximately 10 km south of Hottentot Bay and 1 500 - 2 500 m from the coast. Nearest active nests were only 20 m apart (range 20 - 80 m) and communal mobbing occurred during the nests. Another nest was discovered about 6 km SSE from the colony but was not checked for contents. Of the 11 colonial nests, nine were checked for contents and four had two-egg clutches; a frequency of 44%. All other nests were c/1. When first reported in 1977, nine pairs were recorded breeding, all with single eggs (n = 8) or chicks (Siegfried & Johnson 1977).

Egg volume (Length x breadth² x 0.48) (Monaghan *et al.* 1989) was not calculated for these eggs, but they have been for a larger sample of Damara Tern eggs throughout coastal Namibia (Nest record scheme). We then plotted egg volume against body mass for a sample of terns for which data on both were available (Cramp & Simmons 1985), and compared those species regularly laying two eggs with those laying one (Fig. 1). Terns laying single eggs laid increasingly larger eggs as body mass increased. However, for Damara Terns, a single large egg was not evident: egg volume was identical to that of several same-sized two-egg species (Fig. 1).

This argues against the idea that single eggs are an adaptive strategy enabling the laying of larger better quality eggs for reasons of increased hatchability, or chick growth (Parsons 1970, Nisbet 1978, Williams 1980). Instead it suggests some constraint to laying a second egg which is occasionally overcome in some areas.

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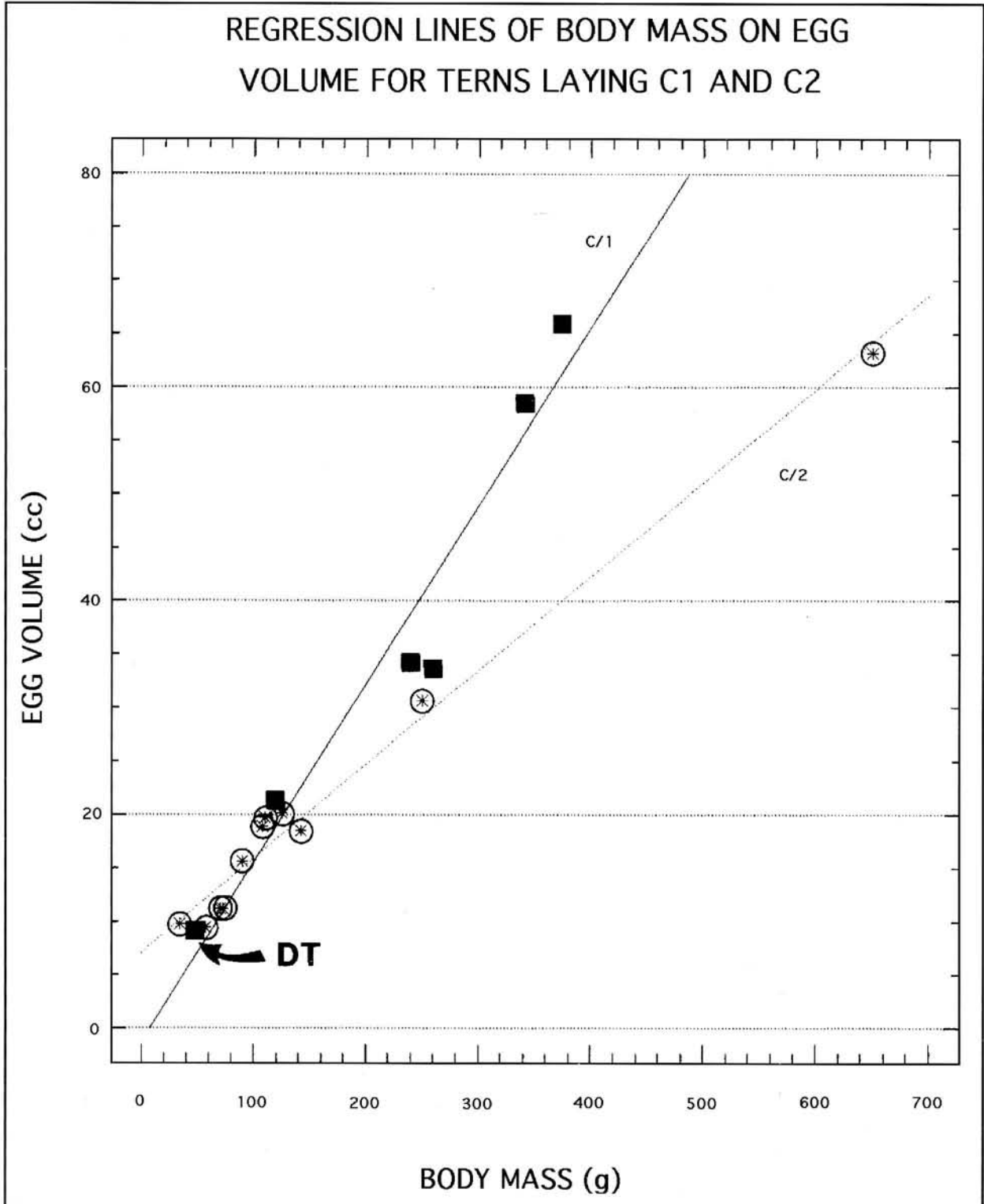


Figure 1: The difference in egg volume of terns laying one-egg clutches (c1) and two-egg clutches (c2), relative to body mass. Damara Terns (DT) lay eggs no larger than same-size congeners laying two eggs.

DISCUSSION

Relative to national averages (< 0.9%) the 1991 findings represent a very high frequency indeed. The most likely explanation is that the large clutches may reflect very favourable food resources since tern clutches are closely related to male food provisioning rates (Nisbet 1977, Monaghan *et al.* 1989). The Lüderitz area is also well known for its large near-shore Benguela upwellings (Shannon 1985) where fish availability is increased due to increased nutrient availability (Crawford *et al.* 1987).

Damara Terns in this area, therefore, may enjoy a relatively dependable and enhanced food resource relative to other terns along the Namibian coast. This would tie in with the finding that egg size has not increased among Damara Terns (relative to same sized congeners) as an evolutionary response to increase growth and survival of chicks. Instead birds appear to be constrained to a single in most cases.

The alternative, that clutches in some species are thought to be an adaptation to increase growth rate and thus reduce

the time that chicks remain vulnerable to predation (Frost & Shaugnessy 1976, Clarke & Wilson 1981) is unlikely in view of the lack of increase in egg size (Fig. 1). However, predation pressure is virtually non-existent on this highly isolated pan, and nests were unusually closely situated relative to averages from elsewhere (57 - 200 m: Frost & Shaugnessy 1976, Clinning 1978, Simmons & Braine 1994). Hence release from predation-limited clutch size may have had some bearing on the large clutches found at Hottentot Bay.

Other explanations for the two-egg clutches such as two females laying in one nest cannot be ruled out, but it seems unlikely in view of the vast amount of breeding habitat available on this and other salt pans.

If enhanced food resources from the Lüderitz upwelling cell contributed to the larger clutches, one would predict that more two-egg clutches should occur in south western Namibia. There are too few other nests known from the southern edge of the Damara Tern's Namibian range to assess whether two-egg nests are more common there. Geographic analyses however, indicate that only one c/2 has ever been recorded from the Skeleton Coast Park (n = 286: Simmons & Braine 1994) while R. and S. Braby (in litt.), found no c/2 nests in 214 nest records from the same area. Only two pairs of adults feeding two chicks in 180 nests (1.1%) were recorded by Tarr (in prep.), and none in 40 nests were recorded by Clinning (1978), in the West Coast Recreation Area, south of the Skeleton Coast. Only single-eggs have been reported in clutches from South Africa (Randall & McLachlan 1982) and the Elizabeth Bay colony in Namibia (Siegfried & Johnson 1977).

That terns in this southerly colony sometimes lay two eggs is therefore unexpected. Further records of clutch size in this area combined with observations of food resources, courtship feeding, chick growth, predation pressure and population density would shed light not only on the reasons for two-egg nests at Hottentot Bay but also the evolution of the unusual one egg clutch of the Damara Tern.

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