

Observed growth rate in a wild juvenile *Tursiops truncatus*

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Abstract

Studies were made on a sociable juvenile male bottlenose dolphin known to occupy a coastal area of ca 25 km² off Pembrokeshire, Wales between January 1984 and autumn 1985. Between August 1984 and October 1985, the dolphin grew in length from 2.286-2.709 m at a linear rate of ca 3.2 cm.month⁻¹. Increases in girth also occurred, with a temporary fattening in mid-summer 1985. Using a formula for converting length and girth measurements to body weight, the dolphin was calculated to have increased from under 200 kg to 295 kg over the period of observation, representing a net increase in weight of 0.24 kg.day⁻¹.

Introduction

In January 1984, an apparently solitary bottlenosed dolphin, *Tursiops truncatus*, was first recorded as a regular visitor to a narrow coastal area between 51°51'-51°52.5'N, stretching from Newgale (5°07'W) to The Cradle (5°12'W) off Pembrokeshire (see Fig. 1). From regular reports, the patrol-zone was dis-

covered to extend over ca 10 km and up to 2-3 km out to sea, comprising a home range of ca 25 km², similar to that reported for adult male bottlenosed dolphins off Florida (Wells, Irvine and Scott, 1980). The dolphin quickly became habituated to human company and would approach swimmers and divers readily, and permit handling and play. The dolphin was identified as a male, and clearly young, with an extremely scar-free and unblemished skin all-over, intact sharp teeth, and relatively small size for *T. truncatus* in U.K. waters, which can attain 4.1 m in length (Lockyer and Morris, 1985a; 1985b; 1986). The dolphin, known locally as 'Simo', remained resident until autumn 1985 when the animal disappeared. Between August 1984 and October 1985 however, we were able to study this dolphin and monitor measurements of length and girth regularly, and so record growth rate.

Methods

Anatomical measurements

The total length (L) from snout tip to tail fluke notch was measured in a straight line by using a tape held both at the snout and tail by us while swimming in

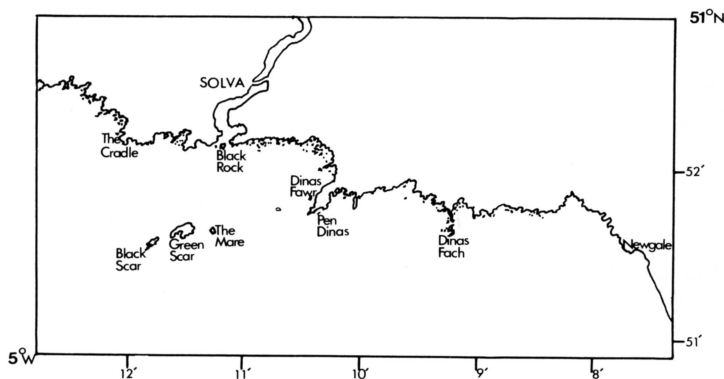


Figure 1. Map of the area patrolled by the dolphin 'Simo'.

wetsuits, one at each end of the animal. This was a relatively easy operation in which the dolphin could be rendered calm and often motionless by stroking and petting on the head and flanks, which he apparently enjoyed. Girths were measured either by the two of us using a tape or, before the dolphin grew too big, by one of us (of known arm-span), hugging the animal with overlapping arms. Girths were measured anterior to (G_1) and posterior to (G_2) the dorsal fin. Due to the relative difficulty of this procedure, girths were not as accurate as length, although they were still within 5 cm accuracy on remeasurement tests.

Body weight

During January–July 1986, a series of measurements of length, girth and weight was recorded by R. Morris for 10 Pacific bottlenosed dolphins kept at Sea World, Surfers Paradise, Gold Coast, Queensland, Australia. From these data, a weight/length/girth relationship was formulated enabling a body weight prediction for 'Simo' to be made. These dolphins were of smaller stature than the U.K./N. Atlantic stocks, but were thought to be similar in relative proportion.

Results

Anatomical measurements

In Fig. 2, the increase in body length is shown over a period of 396 days from an initial 2.286 m to 2.709 m—

$$1 \quad L = 228.336 + 0.108 t$$

where t is in days and L is in cm; s.d. of the constants = 1.149 and 0.004 respectively, so that increase in length averages $3.2 \text{ cm} \cdot \text{month}^{-1}$. This growth rate was highly significant with probability $P < 0.001$, degrees of freedom d.f. = 3, and L and t were significantly correlated with correlation coefficient $r = 0.997$. Fig. 2 also demonstrates an increase, if less regular, in girths G_1 and G_2 . Both show a sharp increase to a peak in late June 1985, falling off by September 1985, after which stability (G_1) or further increase (G_2) is evident. The dolphin was seen even by regular casual observers to fatten during the summer months, and this phase was evidently temporary, perhaps in relation to local fish abundance. Growth in the tail region (G_2) was found to be linearly related with length—

$$2 \quad G_2 = 0.823L - 75.366$$

where both L and G_2 are in cm; s.d. of the constants = 0.207 and 52.472 respectively. The correlation between L and G_2 was significant with $P < 0.05$, $r = 0.887$, d.f. = 3. However G_1 did not appear to correlate with G_2 or L , indicating perhaps that the fattening (as distinct from growth) process occurred

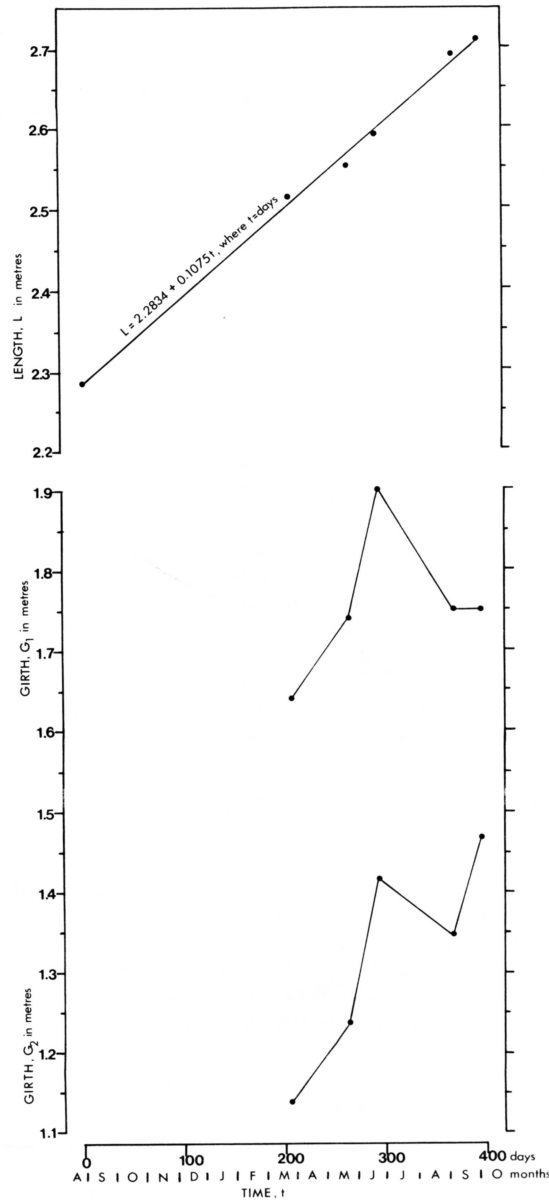


Figure 2. Observed growth in length and girth of dolphin 'Simo'.

mainly in this anterior-mid body region where girth is generally greatest.

Body weight

A step-wise multiple linear regression analysis on the length and girth data for the captive dolphins gave the relationship—

$$3 \quad W = 34.67L^{1.23}G_1^{1.36}G_2^{0.39}$$

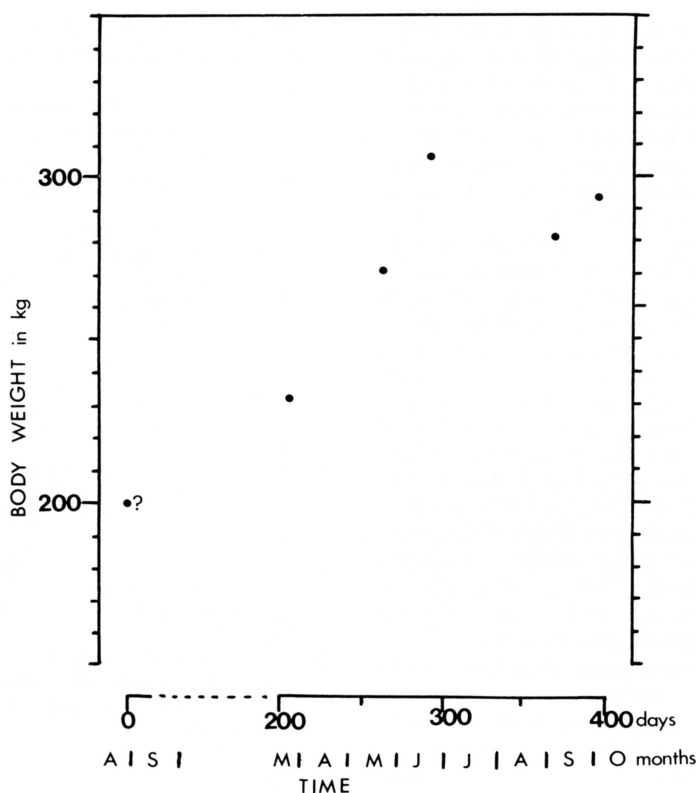


Figure 3. Predicted growth in body weight of dolphin 'Simo'.

where W = weight in kg, L , G_1 and G_2 are in m, and s.d. of the exponents are 0.39, 0.19 and 0.30 respectively and of the constant 1.36. The correlation of these anatomical factors is significant with $P < 0.001$, $r = 0.988$, d.f. = 6. Substitution of the data for 'Simo' into this equation 3 predicted growth from an interpolated value (girth values were incomplete for August 1984) of <200 kg to 294 kg (see Fig. 3) with a peak 307 kg in late June 1985. Overall, this represents a net weight increase of approximately $0.238 \text{ kg}\cdot\text{day}^{-1}$. However, between March 1985 and October 1985, 'Simo' grew from 233–294 kg, averaging an increase of $0.323 \text{ kg}\cdot\text{day}^{-1}$.

Discussion and Conclusions

The observed rapid linear growth in length confirmed the belief that 'Simo' was a juvenile, because mammalian growth declines exponentially with age (Brody, 1968) resulting in initial rapid rates which fall off after the first years and when puberty is reached.

There are growth data for both captive and wild bottlenosed dolphins, but none of these are for

animals from the U.K. and N.E. Atlantic waters. The specimens from this region are notably larger than those from Australia, the Pacific and South Africa (Abel, 1986, Bryden, 1972; 1986, Ross, 1977; 1984), so that it is difficult to assign an age to 'Simo'.

However, Ross (1977) records growth of a captive male *T. aduncas* to 1.5 m at 10 months, 1.95 m at 18 months, and 2.2 m at 35 months; also for a female to 2.47 m at 67 months and 2.55 m at 83 months. Birth size is in the range 0.84–1.12 m (Ross, 1977) with an average about 1 m in both *t. aduncas* and *T. truncatus* (Bryden, 1972; 1986, Ross, 1977) and maximum length of ca 2.55 m in *T. aduncas* (Ross, 1977; 1984) and 2.70 m in *T. truncatus* (Bryden, 1986). The growth rate of the Ross male dolphin in the first 18 months was linear at $5.28 \text{ cm}\cdot\text{month}^{-1}$, and in the period 18–35 months, only $1.47 \text{ cm}\cdot\text{month}^{-1}$. The female grew at only $0.5 \text{ cm}\cdot\text{month}^{-1}$ between 67 and 83 months. The initial rapid growth rate is in line with the findings of Sergeant, Caldwell and Caldwell (1973) for bottlenosed dolphins, and with the general mammalian growth pattern (Brody, 1968). Ross (1984) reported the suckling period lasted from 6–29 months in captive-born *T. aduncas*, and Bryden (1972) indicated a period of 11–16 months for *T.*

truncatus. Therefore we might estimate that 'Simo', who could attain up to 4.1 m in adulthood, and grew at a rate of 3.2 cm.month⁻¹, was probably about 2–3 years of age in August 1984, when he was 2.286 m in length. Although definitely juvenile, 'Simo' would clearly have been weaned to survive independently. Hohn (1980), using dentinal growth layer groups (one GLG = 1 year) in teeth of N.W. Atlantic *T. truncatus*, again a smaller-sized population, observed a range of mean size 172–210 cm for males of age 1–4 years. The bottlenosed dolphin usually increases in length by 53% in the first year of life (Hohn, 1980).

The predicted increase in 'Simo's' body weight at ca 0.24 kg.day⁻¹ minimum rate, is as expected, far greater than the rate reported by Abel (1986) at 0.042 kg.day⁻¹ for juvenile *T. aduncas* from Taiwan and Ryukyu Islands. It is clear to us, however, that simple weight/length formulae such as described by Abel (1986), Bryden (1986), Lockyer (1972) and Ross (1977) appear inadequate for accurate weight prediction from length alone. Results of these predictions for 2.709 m dolphin are 206 kg (Abel), 227 kg (Lockyer), 243 kg (Bryden and Ross), compared with the 295 kg calculated from formula 3.

Our observations demonstrate that there can be considerable variation in body weight relative to length in a growing wild, healthy dolphin, so that the girth (fatness) factor should be taken into account in any formula predicting body weight from anatomical measurements. We believe that mid-girth (G_1) may be a useful indicator of relative body fat condition.

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