OBSERVATIONS ON THE OVARIES OF AN ISOLATED MINKE WHALE: EVIDENCE FOR SPONTANEOUS STERILE OVULATION AND STRUCTURE OF THE RESULTANT CORPUS

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ABSTRACT

Examination of the reproductive organs of a parous "dwarf" minke whale who spent the last three months of her life alone in a Great Barrier Reef lagoon indicated that this animal ovulated spontaneously during this period despite illness. The structure of the resultant ovarian corpus provides further evidence that corpora lutea of "ovulation" cannot be distinguished from those of pregnancy in this species.

INTRODUCTION

Information from the reproductive organs of a minke whale*, *Balaenoptera acutorostrata*, which spent the last three months of its life in isolation in a small lagoon on the Great Barrier Reef, is relevant to two controversial topics in cetacean reproduction: (1) whether corpora derived from sterile ovulations can be distinguished from those of pregnancy and (2) whether ovulation can be spontaneous in wild cetaceans.

MATERIALS AND METHODS

The minke whale, first sighted in a small (approximately 250m × 150m × 10m deep) lagoon on Hook Reef (19°50'S, 149°13'E) on August 31, 1983, remained there until immediately before her death. Her carcass was found on the adjacent reef flat within four hours of death on November 28, 1983. While in the lagoon, the whale was checked several times each day by the pilots of light aircraft ferrying tourists to nearby reefs, the pilots reporting their observations to the Great Barrier Reef Marine Park Authority. No other whales were observed in the area during this time.

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The colouration of the flippers, shoulder regions and baleen of this minke resembled those of the diminutive form reported by Best 1985; this volume pp. 1-33 off Durban. This colour form is not included in the photographic records of 1200 minkes from the Antarctic which are held by Mr S. Wada, Far Seas Fisheries Research Laboratory, Shimizu, Japan and which he kindly allowed me to check.

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Necropsy commenced about 48hr after death. The whale was measured according to the standards of Norris (1961). The ovaries were excised and formalin-fixed for subsequent macroscopical and histological examination using methods similar to those outlined in Marsh and Kasuya (1984). The uterus was measured using a flexible tape, examined carefully for the presence of an embryo, and sampled for histology at the midlength of each cornu. The right mammary gland was likewise measured and sampled; in addition the depth of the gland was measured using vernier calipers. All histological samples were processed as outlined in Marsh and Kasuya (1984). The earplugs were not collected as they had disintegrated.

RESULTS

Details of the reproductive organs are summarized in Table 1. I had no difficulty interpreting their histology despite the interval between death and necropsy. Conspicuous stretch marks in the uterine serosa (see Benirschke, Johnson and Benirschke, 1980) and the histology of the mammary gland (see Mackintosh and Wheeler, 1929) indicated that the 7.1m long whale was parous and that she was not lactating. This agrees with Best's (Best, 1982) observations that whales of this colour form reach puberty at a smaller size than typical southern minke whales.

TABLE 1. DETAILS OF THE REPRODUCTIVE ORGANS OF THE MINKE WHALE
ALL TERMINOLOGY AS IN MARSH AND KASUYA (1984)

Component	Left	Right	Histological details
Ovary weight (g)	100.6	92.0	
Mean diameters of ovarian structures (mm)			
Corpus luteum/albicans		33.3	As in Marsh & Kasuya (1984) Fig. 19a.
Old corpora albicantia	13.5,12.5,11.0	13.5,10.9	
Corpus atreticum *a*	18.4		As in Appendix B to Workshop Report Fig. 2c, d (Perrin *et al.*, 1984)
Corpus atreticum *b*	6.0		
Largest follicle	3.0	3.5	
Diameter of each uterine cornu (cm)	8.8	8.8	Endometrial glands well developed and crowded; some hyalinzation of stroma beneath surface epithelium; as in Benirschke *et al.* (1980) Figs 21 & 22
Depth of mammary gland at midlength (cm)		1.8	Completely involuted as in Mackintosh and Wheeler (1929) Fig. 138

The right ovary contained what appeared to be a well-established yellow corpus luteum with a fibrin-filled centre (Fig. 1). The corpus was 33.3mm in

mean diameter. Histologically, this corpus showed signs of early degeneration into a corpus albicans (see Table 1). The whale showed no indications of recent pregnancy. The uterine cornua were equal in size and the endometrial histology was similar to that of specimens of *Stenella longirostris* and *Stenella attenuata* with an advanced corpus luteum of "ovulation" as described by Benirschke *et al.*, (1980). It thus seems certain that the corpus illustrated in Fig. 1 resulted from a sterile ovulation. The suggestion of Robins (1954) that only corpora lutea of pregnancy have fibrin-filled centres is thus untenable in the minke whale, and we conclude that corpora lutea of "ovulation" cannot be distinguished structurally from those of pregnancy. Many other cetologists have also come to this conclusion (for references see Marsh and Kasuya, 1984).

DISCUSSION

Despite our knowledge of the whale's activities in the three months prior to her death, it is impossible to be certain of the age of the corpus illustrated in Fig. 1, especially as the only comparable material is from seasonally limited catches of typical southern minke whales. The corpus falls within the size range of corpora lutea measured in 14 lactating minkes by Best (1982). Best classified these animals as "recently ovulated" and concluded that ovulations can occur during autumn and winter, but are most frequent in spring (the season when the minke was isolated in the lagoon).

C. Lockyer (pers. comm.) recorded a "post-ovulation, sterile, regressing" corpus luteum in the ovaries of three non-lactating typical southern minke whales, all of which were killed in January. The corpus illustrated in Fig. 1 was smaller than any of the three measured by Lockyer (which ranged from 3.78cm to 4.5cm in mean diameter), possibly reflecting the tendency for the size of the corpus luteum to be positively correlated with body size. However, Lockyer advises that two of the corpora she measured definitely appeared older (more regressed) than the one in Fig. 1.

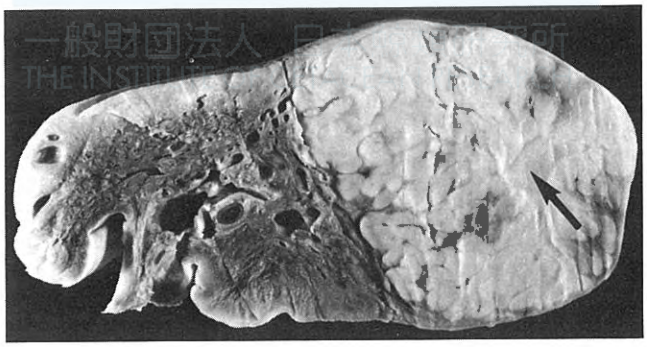

Fig. 1. Cross-section through the right ovary showing the corpus luteum/albicans of "ovulation" with its fibrin-filled centre (arrowed). The scale bar represents 1 cm.

Kirby and Ridgway (1984) concluded on the basis of hormonal monitoring of captive dolphins, that *Tursiops truncatus* and *Delphinus delphis* can ovulate spontaneously. If the minke ovulated spontaneously while alone in the lagoon she did so despite the fact that she was ill during this period. The pathologist present at the necropsy (Dr R. Speare, Graduate School of Tropical Veterinary Science, James Cook University) could not determine the cause of death but reported that (1) the whale had suffered (and recovered) from chronic peritonitis at least one month before death (2) a chronic gastric ulcer and two acute gastric haemorrhages were present in the second stomach (3) the blubber especially in the neck region was oedematous indicating starvation. This last symptom was consistent with the progressive encaving of the neck region which was photographically documented during the whale's tenure in the lagoon. Ridgway (1972) cites this as a sign of severe weight loss in porpoises.

If the whale last ovulated before entering the lagoon, the corpus in Fig. 1 must have been at least three months old. This seems unlikely in view of the observations of Sawyer-Steffan, Kirby and Gilmartin (1983) who monitored five, assumed ovulations in captive *T. truncatus*. The assumed ovulations were assessed by elevated serum progesterone levels which dropped markedly within one month, suggeting the corpus luteum of each of these animals was active for only a few weeks. I conclude that the minke whale ovulated spontaneously while alone in the lagoon despite her illness.

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