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Source: Journal of Wildlife Diseases, 13(4) : 346-348

Published By: Wildlife Disease Association

URL: <https://doi.org/10.7589/0090-3558-13.4.346>

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VAGINAL CALCULI IN THE DOLPHIN

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Abstract: Examination of the reproductive tract of a mature spotted dolphin, *Stenella attenuata*, revealed 13 vaginal calculi, composed primarily of calcium phosphate compounds. Vaginal calculi also were found in two mature *Lagenorhynchus obliquidens* and in six mature *Delphinus delphis*.

INTRODUCTION

Vaginal calculi previously have been described in *Delphinus delphis* and *D. bairdi* by Harrison¹, as masses containing both organic and inorganic material up to several centimeters in length. We found 13 calculi in a mature *Stenella attenuata* which was killed incidentally in the purse seine fishery for yellowfin tuna, *Thunnus albacares*, in the eastern tropical Pacific in May, 1976. Vaginal calculi of various sizes and numbers also have been found in mature dolphins found beach-stranded in southern California between July, 1970, and August, 1975. (Table I)

MATERIALS AND METHODS

The composition of the vaginal calculi was determined using x-ray diffraction, electron scanning, x-ray fluorescence, and a urinary stone analysis kit.

RESULTS

X-ray diffraction showed the calculi to be composed of calcium phosphate compounds: $\text{Ca}_3\text{Al}_2(\text{PO}_4)_6(\text{OH})_6 \cdot 15\text{H}_2\text{O}$, $\text{Ca}_5(\text{PO}_4)_3\text{CO}_3$, $\text{Ca}_5((\text{P,Si})\text{O}_4)_3(\text{OH},\text{CO}_3)$ and $\text{Ca}_5(\text{PO}_4)_3(\text{OH})$. Electron scanning showed the primary composition of the calculi to be calcium and phosphorus with smaller concentrations of magnesium. Dark areas on the surface of the calculi contained lead and iron in addition to the above elements. X-ray

escence showed these calculi to be composed primarily of calcium with lower concentrations of phosphorus, iron, zinc, strontium, chlorine, potassium, manganese, magnesium, and sulfur. The urinary stone analysis kit showed that these calculi did not contain uric acid or



FIGURE 1. Thirteen calculi in the vagina of a sexually mature *Stenella attenuata*.

fluoroxalate. The 13 calculi in the above dolphin were approximately pyramidal in shape, the flat sides fitting together as in a mosaic to fill the entire vagina. (Fig. 1). The calculi were soft and crumbled on hard pressure. On section they appeared layered, with a center of crystalline nature. This dolphin was infected with larval *Monorygma* sp. throughout the external surfaces of its urinary bladder, uterus, and vagina. Histologic section of the vagina did not reveal any chronic inflammation. The uterus and bladder were normal.

DISCUSSION

Harrison¹ proposed that these calculi were remnants of vaginal plugs that had become impregnated with salts and form-

ed from coagulated seminal fluid. The vaginal sphincter in the dolphin forms a strong seal for the vagina; it is therefore conceivable that any uterine or vaginal secretion or residual seminal fluid might be trapped and inspissated within the vagina. X-ray diffraction analysis has shown the calculi to be composed of compounds identical to those found in mammalian bone. This leads us to believe that something other than cervical or seminal fluid is being trapped within the vagina. The cross sectional structure indicates that they were formed by concentric layer crystallization for an unknown time period. All the dolphins from which these vaginal calculi were obtained were sexually mature.

TABLE 1. Calculi found in dolphins.

Species	Length (cm)	Capture or Stranding Date	Other Reproductive Comments	Size and Number of Calculi
<i>Stenella attenuata</i>	175.0	5/76	10 corpora albicantia in left ovary 3 corpora albicantia in right ovary	13 calculi average 2.89 g 2.5 cm x 1.4 cm
<i>Lagenorhynchus obliquidens</i>	176.0	9/21/71	9 corpora albicantia and 1 corpus luteum present	2 calculi 2 cm x 0.8 cm
<i>Lagenorhynchus obliquidens</i>	199.0	3/4/72	7 corpora albicantia in left ovary	3 calculi 1.5 cm x 0.5 cm
<i>Delphinus delphis</i>	185.0	7/7/70	corpora albicantia present	1 calculus 3.5 cm x 1.0 cm
<i>Delphinus delphis</i>	182.0	9/2/70	1 corpus albicantia	bead-like, 0.5 cm diameter
<i>Delphinus delphis</i>	190.5	6/6/71	corpora albicantia present	bead-like, 0.5 cm diameter
<i>Delphinus delphis</i>	182.0	8/8/71	pregnant; fetus (53 mm)	3 calculi 2.0 cm x 0.8 cm
<i>Delphinus delphis</i>	172.0	8/12/72	3 corpora albicantia in left ovary	1 calculus 1.5 cm x 0.5 cm
<i>Delphinus delphis</i>	182.0	8/16/75	3 corpora albicantia in left ovary	5 calculi 1.0 cm x 0.5 cm

Acknowledgements

We would like to thank Dr. W. Perrin for providing the specimen of the genus *Stenella*, and Drs. Ridgway and Yammamoto for their x-ray fluorescence analysis. We would also like to thank Dr. J. Abraham and R. La Borde for their help on the analysis of the calculi using electron scanning and x-ray diffraction techniques.

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Received for publication 6 June 1977
