Annual Changes of Urinary Progesterone and Estradiol-17β of the Dugong (Dugong dugon) in Captivity

Authors: Wakai, Yoshihito, Hasegawa, Kazuhiro, Sakamoto, Shinji, Asano, Shiro, Watanabe, Gen, et. al.

Source: Zoological Science, 19(6) : 679-682

Published By: Zoological Society of Japan

URL: https://doi.org/10.2108/zsj.19.679
Annual Changes of Urinary Progesterone and Estradiol-17β of the Dugong (Dugong dugon) in Captivity

Yoshihito Wakai¹, Kazuhiro Hasegawa¹, Shinji Sakamoto¹, Shiro Asano¹, Gen Watanabe²* and Kazuyoshi Taya²

¹Toba Aquarium, Toba, Mie 517-8517, Japan
²Tokyo University of Agriculture and Technology Fuchu, Tokyo 183-8509, Japan

ABSTRACT—Levels of urinary progesterone and estradiol-17β were measured twice a week in a female dugong, Dugong dugon, in captivity for two years from April 1996 to April 1998. The dugong showed 14 ovarian cycles during the period of study. Concentrations of progesterone ranged from 0.01ng/mg creatinine (Cr) to 1.94ng/mg Cr and the length of estrous cycle was 53.6±8.6 (mean±SEM) days based on intervals of urinary progesterone peak-to-peak measurements. Concentrations of urinary estradiol-17β ranged from 0.9pg/mgCr to 23.7pg/mgCr, and tended to peak just prior to elevations of progesterone during the first year of study. This is the first report demonstrates that the ovulatory cycle of the dugong is about 50 days. The present findings suggest that measurement of urinary progesterone is a useful method to detect ovarian cycle of the dugong in captivity.

Key words: Dugong, estrous cycle, urine, progesterone, estradiol-17β.

INTRODUCTION

The dugong, the only herbivorous marine mammal that is strictly marine, has a range extending through the tropical/subtropical waters of the Indo-West Pacific. It is listed as vulnerable by the IUCN(1996). Since the 1960s, aquarium and institutions in several countries including USA, Australia, Thailand, Indonesia, Japan and Singapore have attempted to keep dugong in captivity. Most attempts were unsuccessful. Most studies on reproduction in wild dugongs have been obtained from carcasses (Marsh et al., 1984a, b; Marsh, 1995; Boyd et al., 1999) or limited field observations of mating (Anderson, 1997; Preen, 1989). Dugongs have been kept in captivity at Toba aquarium since 1977. Mating behaviour between a male and a female dugong has been observed since 1995. During this time, the female has not conceived. Nowadays, through improvements in captive husbandry, hormonal levels based on urine analyses in female dugongs can be measured. In the present study, we monitored changes in urinary progesterone and estradiol-17β of a captive female dugong from April 1996 to April 1998.

MATERIALS AND METHODS

Sample Collection and Radioimmunoassays

Urine samples were collected from “Serena” twice weekly by floating her on the back, whilst applying pressure to urogenital area with fingertips (Fig. 3). The samples (less than 20ml) were frozen at –20°C until assayed. Progesterone and estradiol-17β were measured by the double antibody RIA system using ¹²⁵I-labeled radioligands (Taya et al., 1985). Antisera against progesterone (GDN 337; Gibori et al., 1977) and estradiol-17β (GDN 244; Korenman et al., 1974) were provided by Dr. G.D.Niswender (Animal Reproduction

*Corresponding author: Tel. +81-599-25-2555; FAX. +81-599-25-2587.
E-mail: wakai@umi-net.toba.mie.jp

Downloaded From: https://bioone.org/journals/Zoological-Science on 17 Feb 2020
Terms of Use: https://bioone.org/terms-of-use
and Biotechnology Laboratory, Colorado State University, Fort Collins, Co, U.S.A.). The intra- and interassay coefficients of variations were 3.5% and 13.4% for progesterone and 4.8% and 5.8% for estradiol-17β, respectively. Urinary concentrations of progesterone and estradiol-17β were indexed using creatinine(Cr) concentrations to account for fluctuations in the dugong’s fluid intake (Taussky, 1954).

RESULTS

Urinary progesterone levels ranged from 0.01 to 1.94 ng/mgCr, with a total of 14 ovarian cycles from April 1996 through April 1998 (Fig. 4). The mean length of the estrous cycle was 53.6±8.6 (mean±SEM) days based on the intervals between urinary progesterone peaks (Fig. 5).

During the first year of the observation, urinary estradiol-17β levels ranged from 0.9 to 23.7 pg/mg Cr and tended to peak just prior to elevations in progesterone (June, July and August in 1996 and January, February and April in 1997). However, its cyclicity was not as distinct as progesterone.

The dugong’s clitoris appeared 13 times just prior to elevations in progesterone. Its appearance did not always correspond to the peak of urinary estradiol-17β.

DISCUSSION

The cyclic changes in progesterone occurred continuously through the observation period, which is consistent with Marsh et al. (1984a)’s report that wild female dugongs
are polyestrous. However peak values of progesterone tended to be lower during summer time when the air temperature rose, although the water temperature did not change much. Day length might affect cyclicity in some extent in this species.

Concentrations of estradiol-17\(\beta\), unlike progesterone did not show remarkable cyclic changes during the first year of this study. However, 6 peaks of estradiol-17\(\beta\) were observed at the intervals of 7 progesterone peaks. In future studies, it will be necessary to measure the concentrations of estradiol-17\(\beta\) more frequently by sampling urine at short intervals, and to observe in the context of estrous behaviour.

The clitoris was exposed between progesterone peaks except during the peak from October to December 1996. During the period of estradiol-17\(\beta\) measurement, the clitoris was observed 7 times. Appearances of the clitoris seemed
to coincide with the low progesterone and the increase of estradiol-17β.

The female’s behaviour changed during clitoris exposure. She swam constantly around the tank, rubbed her urogenital area against the wall, and lost her appetite. At the aquarium, the first cyclic change in the appearance of the clitoris was observed at 8 years of age, close to the minimum age (9 years) when the female dugong reaches sexual maturity (Marsh et al., 1984a). In contrast to the evidence of reproductive seasonality in wild dugongs (Anderson 1997; Boyed et al., 1999; Brownell et al., 1979; Marsh et al., 1984b; Marsh, 1995; Preen, 1989) there was no evidence of seasonality in captive dugongs.

ACKNOWLEDGMENTS

We acknowledge the assistance of Toba Aquarium Dugong staff members who have helped in collecting urine samples from “Serena”. And we also thank Helene Marsh, School of Tropical Environment Studies and Geography, James Cook University, Australia, for assistance with the manuscript.

REFERENCES


(Received January 21, 2002 / Accepted March 25, 2002)