

LEARNING MATERNAL CARE: A POSSIBLE EXAMPLE IN BOTTLENOSE DOLPHIN (*TURSIOPS TRUNCATUS*)



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INTRODUCTION

Association and/or cooperation between females during parturition, as well as interaction between infants and non-mothers (termed alloparental behaviour), are widely reported in social mammals.

Descriptive accounts of allomaternal care are abundant in captive and wild Cetacea. Most of these reports underlined the help/protection role of the behaviour, suggesting also the importance for non-mother individuals for gaining maternal skills (Learning to Mother: Hrdy, 1976). The basis of this functional hypothesis is that maternal behaviour is not completely innate but has a social learning component.

The main goal of this study was to investigate, in a comparative way, maternal behaviour of primiparous dams of bottlenose dolphin (*Tursiops truncatus*) versus multiparous ones, in order to explore the possible importance of learning maternal competences from experienced females in developing parental cares.

METHODS

Since 1993, a behavioural research program on maternal care in bottlenose dolphin has been conducted in two different Italian Dolphinarium placed in Rimini and Cattolica.


Each facility housed two females (a nulliparous one and a multiparous one) with their calves and, at the Rimini's Dolphinarium, two males (an adult one and a juvenile one) (Fig. 1).

A specific ethogram with a 33 total behavioural elements, organized into five main categories, was first set up and then used for the data collection (Table 1). Selected mother-calf displays including general interactions and physical contacts were analysed for the purpose of this study.

Focal animal sampling (Altmann, 1974) sessions lasting 30 minutes were carried out on each subject by means of a videocamera during 12 months *post partum*. Observation times were randomized among 3-hr periods and balanced for equal representation within a week and at different times of day (observational phase: from 08:00 am to 08:00 pm).

A total number of 466 hours of observation were recorded. Data were analyzed by means of Observer 3.0 software (Noldus, 1997) and chi-square Test.

Fig. 1. Subjects and environments



Rimini Dolphinarium			
NAME	SEX	BIRTH	ORIGIN
ALFA (multiparous)	F	1979	Mexico
BETA (nulliparous)	F	1981	Mexico
SPEEDY	M	1970	Adriatic
SOLE	M	03 May 1993	Alfa
LUNA	F	12 May 1995	Alfa
BLUE	F	26 June 1997	Beta

Cattolica Dolphinarium			
NAME	SEX	BIRTH	ORIGIN
CANDY (multiparous)	F	1978	Texas
ISA (nulliparous)	F	1986	Cuba
TABO	M	15 June 1993	Candy
GOLTA	M	06 July 1993	Isa

Table 1. Ethogram

GENERAL BEHAVIOUR			
SWIM	The usual mode of swimming or normal swimming posture (Reijnen et al., 1994)	FLEX	The tail and the head moved ventrally, the body form an arch and the muscle appeared flat. Then the animal relaxed and the tail was raised dorsally (Tavolga & Estepan, 1997)
EXPLORATION	Scanning horizontal/perpendicular to the bottom (Herzing, 1996)	OPEN MOUTH	The mouth is opened either partially or fully for some time; the tongue may be extended (Martinez & Klinghammer, 1995)
LOOP	Looping near surface (Martinez & Klinghammer, 1995)	SHAKING FLIPPERS	Shaking the flippers (von Steet & von Fersen, 1996)
POOL RUB	Dolphin is rubbing side/ventral, back area on bottom (Herzing, 1996)	SOMMERSAULT	Tail ventrally/dorsally over head in a somersault (Anonymous, 1990)
STAND	Dolphin is lying motionless (Herzing, 1996)	ROLL	The body is rotated through 360° on the longitudinal axis to either side of the dolphin (Reijnen, 1994)
REST	The animals floated at the surface of the water without any body movements, the blowhole only was exposed to the air (Reijnen et al., 1994)	JAW CLAP	An animal claps his jaws together forcefully to produce a sharp loud sound (Tavolga & Estepan, 1997)
VENTRAL ARCH	Bends head and peduncle towards belly (von Steet & von Fersen, 1996)		
GENERAL PHYSICAL INTERACTIONS			
RUB	Strenuous action in which one dolphin swimming at a fast pace advanced upon another and rubbed part of its body vigorously against her, vigorous contact of the two bodies along their length (Tavolga & Estepan, 1997)	CHASE	In varied form, but characteristically when chasing is in progress the animals swim inverted at high speed just below the surface (Sajman et al., 1973)
CONTACT	Any behaviour which involved physical contact between two animals (Nelson & Lien, 1984)	BITE	Open-jawed sparring and mock threat between two opposing animals and rake marks were sometimes left on the body (Sajman et al., 1973)
TAIL HIT	A dolphin strikes another violently with its flukes (Reijnen, 1994)		
MOTHER-CALF INTERACTIONS			
BEAK-GENITAL PROPUSSION	One dolphin uses its rostrum to nudge the genital area of another dolphin who is lying stationary on its side (Shane, 1990)	PUSH	Pushing with the back, the side or ventral part another animal (Pilleri, 1985)
HOLD DOWN	Dolphin, or group of dolphins, holds another down on bottom (Herzing, 1996)	NURTURANT	Mother appears to remove her calf from danger (Cockcroft & Sauer, 1990)
TUB	(see above)	CHASE	(see above)
CONTACT	(see above)	BITE	(see above)
SUCKLING	When the calf inserts its lower jaw into the mother's urogenital groove and the upper jaw is in contact with the lateral skin of the mammary gland, it suckles its neck as if drinking, with a cessation of tail flapping (Peddemors et al., 1992)	UNSUCCESSFUL SUCKLING	When there isn't cessation of infant body movements (Peddemors et al., 1992)
CLASP	Taking between flippers (Anonymous, 1990)		
PLAY			
PLAY WITH OBJECTS	Play with a number of different toys, plastic balls, rings, rubber tubes, carabines in the mouth of underneath a flipper, balanced on the rostrum or thrown above the surface of the water (Reijnen, 1994 - Ig, Lv)		
MOTHER-CALF INTERACTIONS			
BRACKING	Swimming slightly underneath, the tail cut the water on an angle so that only the caudal peduncle and the tail remain underwater (Pilleri, 1986)	SLAP	Flukes raised above the surface and ventral/dorsal side slapped downward, usually making a loud sound (Shane, 1990)
LEAP	Entire body clears the water, exit and enter head first (Shane, 1990)		

RESULTS AND DISCUSSION

Both nulliparous females (Isa and Beta) had the opportunity to observe the parturition of the other females (Candy and Alfa) before to give birth to their own calves. Isa assisted the Candy-Tabo pair for three weeks only, while Beta was associated to Alfa-Luna pair for two years. This diversity seemed to be not relevant for their activities since no statistical differences in the five behavioural categories were found between multiparous and nulliparous females in each facility over the study period (Fig. 2). However, some interactions appeared to be strongly significant for the purpose of this work (swimming in association, Fig. 3 and Fig. 4, and engaging in social interactions through physical contacts, Fig. 5).

Fig. 2.

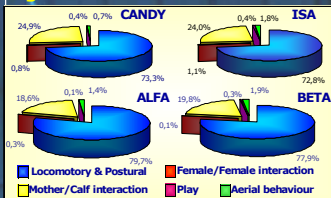


Fig. 3.

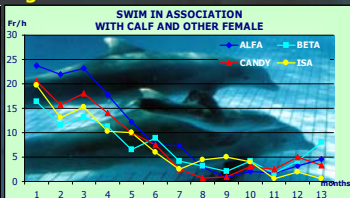


Fig. 4.

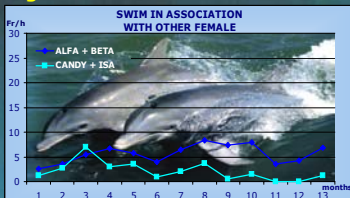
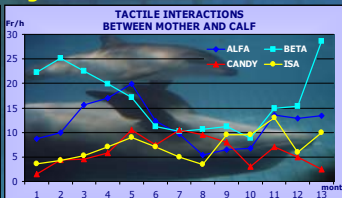


Fig. 5.



The analogous decreasing trend in the association between mother-calf pair and the nulliparous female (Fig. 3) again suggested a similarity among subjects and facilities, whereas the association between nulliparous female and multiparous one showed higher values at Rimini's Dolphinarium possibly related to presence of a more complex social environment. This difference between facilities was also observable in the expression of physical interactions (Fig. 5), with Beta being higher until the fourth month of the calf's life.

As a broad generalization, this study showed that the analysed values were similar between females housed in the same environment, but comparatively different among the two facilities. As suggested, these results may be related to the presence of other individuals (two males) in the Rimini's pool which led the nulliparous female to enforce her bond with the calf through proximity and physical interaction.

The lack of significant differences between nulliparous and multiparous individuals suggests that experienced females may represent a powerful mechanism of learning for the first-time mother (Isa and Beta showed a clear allomaternal behaviour before their delivery), while social contest may be crucial in determining the intensity of some behavioural elements related to maternal care.

CONCLUSION

In conclusion, these results underlines that the association between mother and non-mother individuals and the related social learning component has a central role in the acquisition of maternal skills, possibly rising the reproductive success for the inexperienced females. However, allomaternal behaviour seems to be an heterogeneous phenomenon without a single functional explanation, as demonstrated by the different ages and classes of the individuals involved, by the frequency and nature of the interactions, and by the different motivations of the cases reported.

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