

# THE DEVELOPMENT OF PLAY BEHAVIOR IN A BOTTLENOSE DOLPHIN CALF (*TURSIOPS TRUNCATUS*)

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**INTRODUCTION** Play is an important component of the developmental sequence in many mammals and birds (Fagen, 1981) and often is defined as activity not directed towards the satisfaction of a utilitarian need. Investigators attribute a wide range of functions to play behavior (Fagen, 1981; Bekoff, 1984; Martin & Caro, 1985), including aiding the process of growth and development, learning about the environment, practicing adult activities, and establishing social relationships (Bekoff, 1988; 1992). All have in common that, as a result of playing when young, the individual is better able to perform some form of useful behavior later in life.

Different species play in different ways and over different periods of time, and it is important to realize that these structural differences may reflect a heterogeneity of function. Aquatic mammals such as cetaceans seems to exhibit play during their whole life and this seems inextricably linked to cultural learning (Norris & Dhol, 1980; Gewalt, 1989; Bel'kovich et al., 1991). The aim of the present work is to report data on a systematic observational study focussed on the development of play behaviour in one female of bottlenose dolphin born at Rimini Delphinarium (Italy).

**METHODS** Subject of the study was a newborn female bottlenose dolphins (*Tursiops truncatus*) housed in the Rimini Delphinarium, Italy (FIG. 1). "Blue" was born in the pool on June 26th, 1997. Mother-calf pair was constantly observed from birth to 52 weeks of age. Focal animal sampling (Altmann, 1974) sessions lasting 30 minutes were carried out for the calf according to a decreasing temporal schedule.

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 08:00am to 08:00 pm). A total number of 170 hours was recorded for the calf. A specific ethogram was first set up and then used for observations. Nine displays related to social-play, seven related to object play and four related to bubble-play were selected from the catalogue and then analysed (Tab. 1). Total and monthly mean frequency and duration were scored for all these behavioural categories, by means of a videocamera and Observer 3.0 software. Frequencies were analyzed by mixed-model factorial ANOVA.

**RESULTS** All the behavioral displays related to the three main categories of play studied in this work showed a positive relationship between frequency and duration. Social displays with other young animals were the most frequent play behaviors seen (72%), whereas the object ones showed higher duration values (49%) during the whole study (Fig. 2). Some significant monthly variations in frequency ( $F = 23,95$ ;  $gdl = 2$ ;  $p < 0,0001$ ) and duration ( $F = 2,87$ ;  $gdl = 2$ ;  $p < 0,005$ ) were found between the three main categories, providing evidence of

different developmental patterns possibly due to individual maturation (Fig. 3). In particular, it has been noted that social-play appeared since two weeks from the birth whilst bubble-play and object-play became visible only after one and two months respectively. However, bubble-play and object-play showed some similarities in their ontogenetic profile, displaying specific approach sequences in which observational periods were followed by “manipulation” acts involving the rostrum.

As for the different displays belonging to each play category, “chase” (duration 68%) and “leap” (frequency 31%) were the most highly represented into the social-play context as well as “mouth” (both duration and frequency over 30%) and “bite” (both duration and frequency over 50%) had the higher occurrence during object-play and bubble-play sessions respectively (Fig. 4).

**DISCUSSION AND CONCLUSION** It is important to note that the three main categories of play followed a definite order in their appearance. In fact, social play was the first to be recorded, showing its presence only few weeks after birth. As reported in the literature, a function of play can be to establish social relationships with peers and adults. Some of these may be pure affiliations, whereas others could be related to the establishment of dominant-subordinant relationships and to the tactics used in intra-specific competition. Blue showed play interactions mainly with the other young animals hosted in the pool, underlying the development of a strong social bond with them. Social play with the adults was recorded few times during the first year of the calf’s life.

Bubble-play and object-play appeared one month and two months after birth, respectively showing some similarities in the approaching/interaction phases. According to Defran & Pryor (1980) and Pace (2000), when captive adult and young bottlenose dolphins are given free opportunity to interact with objects in their tank they generally spend a considerable amount of time manipulating them with fins or carrying on their rostrum. It could be argued that such observations on the different time of appearance of the three play categories may find their possible explanation on more general features of social, sensory and motor maturation, depending on the changing capabilities of the developing organism. Play behaviour may perform critical roles in growth and development, through the use of muscles and coordinated movements. The manner and degree of the influence of play actions on maturation of specific muscle groups, as well as the sensory and motor nervous system remains to be clarified. Some observational studies provide preliminary evidence in this regard (Miller & Byers, 1991; Bekoff, 1992). Data from these studies highlight the likely importance of play behavior during development, and suggest another function of play - gaining information about the environment. This would be particularly true of diversive play as an orientational-investigational activity. By exploring and manipulating objects found in the surrounding environment, young animals accumulate specific information that may prove useful later in life. However, examining the types and amounts of play actions may provide information on developmental use of certain displays according to similar patterns from other functional context.

In conclusion, this work described the development of play in one captive bottlenose dolphin calf. The study was limited by the small sample size, but seems to reflect the learning flexibility and behavioral versatility of the young dolphins.

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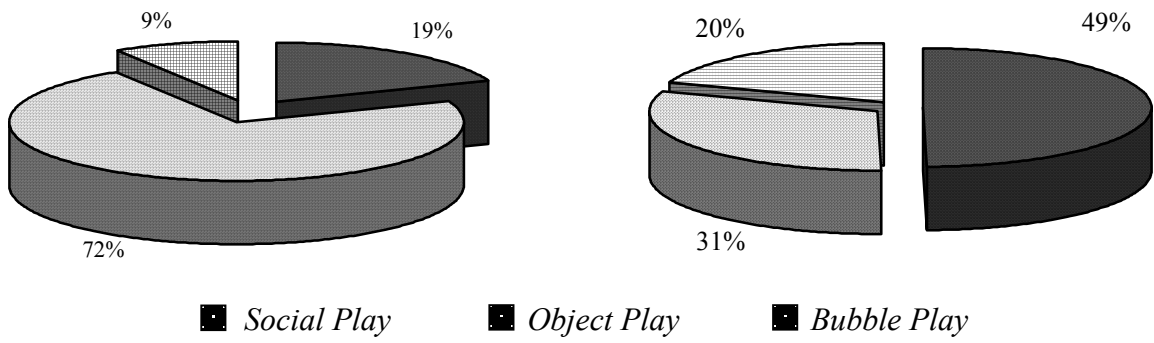
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**Table 1 – Behavioral categories**

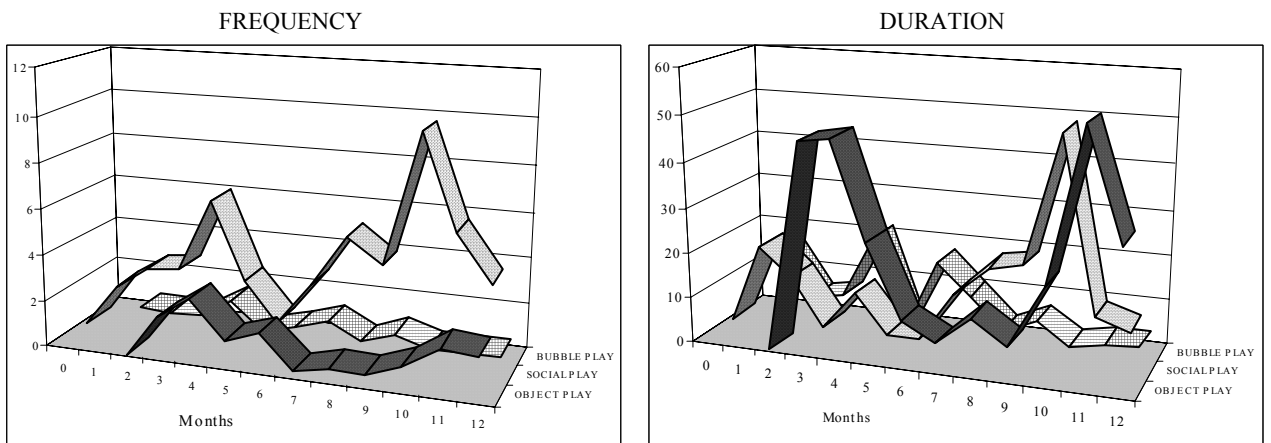
DEFINITION	REFERENCE
<i>Social Play</i>	
Swim (fast)	The usual mode of swimming or normal swimming posture (Renjun et al., 1994)
Chase	In varied form, but characteristically when chasing is in progress the animals swim inverted at high speed just below the surface (Saayman et al., 1973)
Push	Pushing with the beak, the side or ventral part another animal (Pilleri, 1986)
Contact	Any behaviour which involved physical contact between two animals (Nelson & Lien, 1994)
Tail slap	Flukes raised above the surface and ventral/dorsal side slapped downward, usually making a loud, percussive sound (Shane, 1990)
Breacking	Swimming quickly underwater, lifts itself out of the water on an angle so that the caudal peduncle and the tail remain underwater (Pilleri, 1986)
Leap	Entire body clears the water, exit and enter head first (Shane, 1990)
Slap	Jumping out of the water with an angle about 45°, half of the body is out of the water, then the animal drops against the surface of the water, lands on its side or its back producing slash and noise (Martinez & Klinghammer, 1995)
<i>Object Play</i>	
Transport	Transporting an object by using the outside of the beak, the flippers or the melon (Denkinger, 1996)
Push	Pushing or pulling an object with the beak (Denkinger, 1996)
Circle	Swimming around objects (Denkinger, 1996)
Play water	Spits water, bites the water (von Strait, 1996)
Mouth	Play with a number of different toys [...] carried in the mouth (Renjun, 1994)
Rub	Dolphin rubs head, side or other areas of the body on objects (Tizzi, 1995)
Throw	Play with a number of different toys [...] thrown above the surface of the water (Renjun, 1994)
<i>Bubble Play</i>	
Interest	The animals show interest for the bubble movements and follow it up to the water surface without touch it (Pace, 2000)
Push	The animals gently push the bubble without disrupt it (Pace, 2000)
Bite	The animals bite the bubbles to break off it (Pace, 2000)
Through	The animals pass through the bubbles to break off it (Pace, 2000)

**Fig. 1. Subject (\*) and social contest in the Delfinario Rimini**

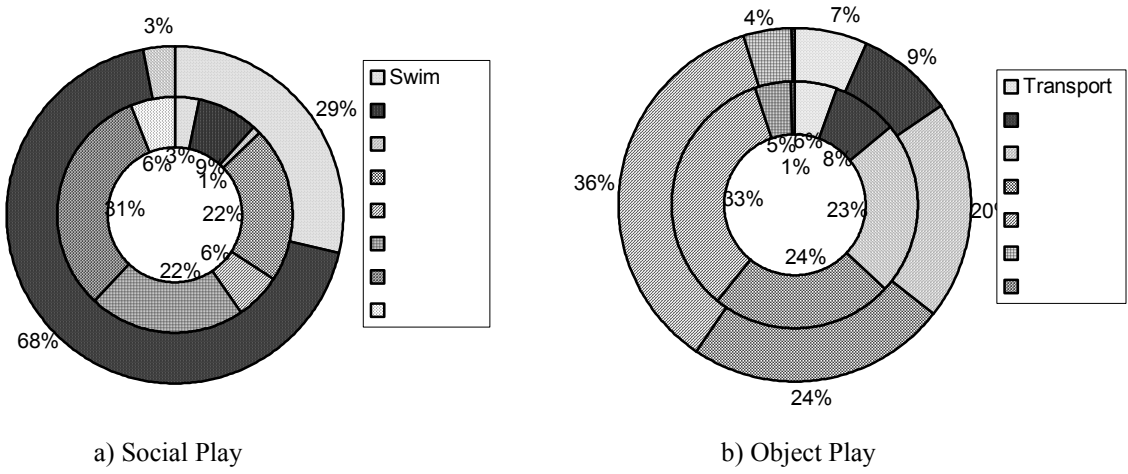
Name	Sex	Birth Date	Provenience	Residence in captivity
Speedy	m	1970	Adriatic Sea	17
Alfa	f	1979	Gulf of Mexico	9
Beta	f	1981	Gulf of Mexico	9
Sole	m	05/03/1993	Delfinario Rimini	captive-born Alfa x Speedy
Luna	f	05/12/1995	Delfinario Rimini	captive-born Alfa x Speedy
*Blue	f	26/06/1997	Delfinario Rimini	captive-born Beta x Speedy

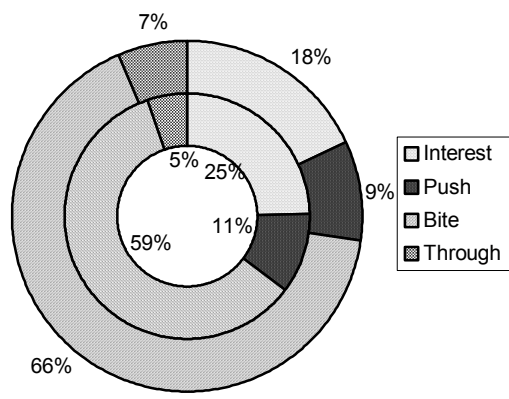


**Fig. 2 . Total frequency and duration of play behaviors during the whole study**



**Fig. 3. Monthly trend of play behaviors (mean frequency and duration)**





c) Bubble Play

Fig. 4. Total frequency and duration of the behavioral displays for each main play category  
 External ring = duration; Internal ring = frequency