Growing up socially:

The role of mother-calf separations and behavioural development of a dolphin calf

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dolfinarium

Introduction

In bottlenose dolphins (*Tursiops truncatus*), the precocious locomotor abilities of infants allow for mother-calf separations from an early age. Three non-mutually exclusive hypotheses for this behaviour are discussed in the literature:

- **Social development hypothesis**[1]: calves benefit from the separations by gaining social experience and relationships
- **Learning-to-parent hypothesis**[2]: unexperienced females benefit by parenting experience, increasing future reproductive success
- **Allomaternal care hypothesis**[2,3]: allomother(s) protect infant so mother can afford to spend more time on foraging, socializing, or resting

The aim of this research was to study the function of mother-calf separations refering to these three hypotheses, and to map the behavioural development of the calf.

Methods

Conducted at *Dolfinarium* in Harderwijk, The Netherlands, the study focused on the newborn calf "James". Underwater observations were conducted in the visitors area from May 26th, 2017, until January 2018. James was housed in a 696 m^3 saltwater pool containing 2 to 8 other dolphins of varying ages, including his mother. Two observational methods were used:

1) **All occurrence sampling** of behavioural **events**, consisting of 5 minutes focal samples
2) **Instantaneous time sampling** of behavioural **states**, occuring at 20 seconds intervals within each 5 minute focal sample

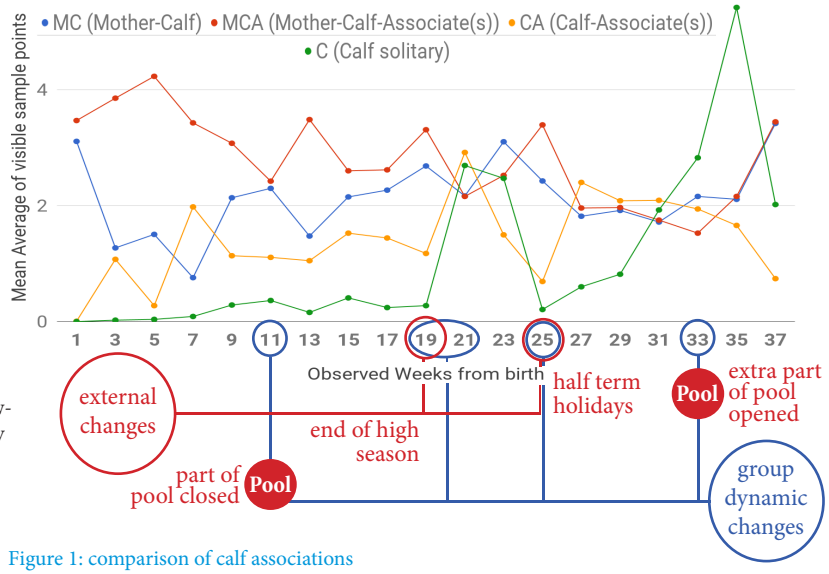


Figure 1: comparison of calf associations
Associate = any other individual within 2 metres of the calf
Separation = distance between mother (M) and calf (C) greater than or equal to 2 meters

Mother-calf separations

The sex, parous state, kinship and age of associates seemed to have no effect on the mother-calf separations. Thus, hypotheses 1 and 2 were **not supported** by analysis and comparisons.

Some support was found for hypothesis 3. When separate from the calf, *Locomotor play* and *Foraging behaviour* of the mother increased. However, these increases were not significant.

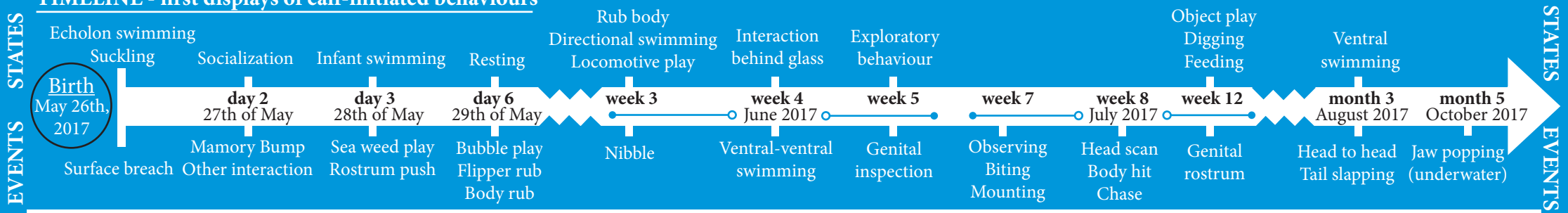
Calf associations (Figure 1)

With respect to socialization between mother, calf and associates, as shown in Figure 1, **Calf solitary behaviour (C)** and **Calf-with-Associate(s) (CA)** behaviour increased significantly (Pearson's correlation 0,71; 0,48, t-tests P<0,001; P<0,001 resp.).

From Figure 1, peaks in associative behaviour of the calf, such as in week 21 (significant values for C and CA, z-test = 1) seem to coincide with changes in **pool group dynamics** and **external changes**. In week 19, number of visitors - and hence noise level - dropped due to the end of high season, while in week 25 this increased due to half term holidays.

In week 11, part of the group was separated and moved to another part of the pool, which closed. In week 33, this part of the pool opened again to James' group.

TIMELINE - first displays of calf-initiated behaviours



Calf behavioural development

From **Figure 2**, it can be derived that (Pearson correlations and t-tests):

- The number of behavioural **states** increased (corr. 0,20; P<0,001)
- The number of behavioural **events** decreased (not significant)
- **Nursing behaviours** showed a decrease over time (corr. 0,034; P<0,001)
- **Swimming positions, play behaviour and foraging behaviour** increased (corr. 0,44; 0,69; 0,83 and P<0,001; P<0,001; P<0,001 resp.)
- The dip in both states and events at week 19 seems to coincide with season ending, while the dip at week 25 coincides with increased number of visitors due to half term holidays. This was not significant.

Furthermore, **number of visitors** has a significant negative effect on the **number of visible sample points, the number of different states** and **interaction behind the glass** (Pearson correlations and t-tests: corr. 0,47; 0,35; 0,28 and P<0,001; P<0,001; P<0,005 resp.).

Number of visitors seemed to have the largest effect on **visible sample points** during the first 18 weeks from birth.

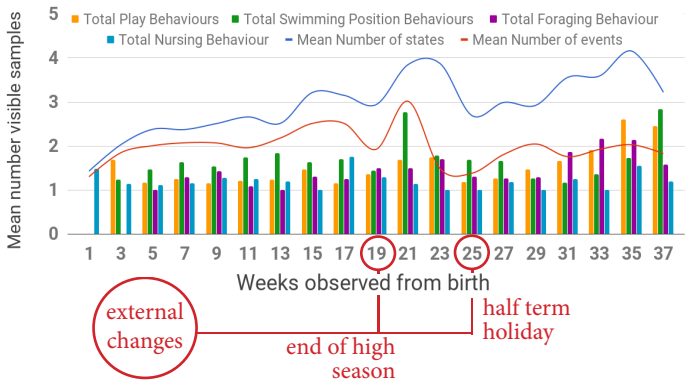


Figure 2: calf development over time; states, events and behaviours

Conclusions

Mother-calf separations

- Due to the preliminary nature of the study, it was not possible to defer any definitive conclusions about the three **mother-calf separation** hypotheses. However, mother-calf separations likely serve to allow the mother to spend time playing and foraging.
- **Calf associations and solitary calf behaviour** seemed to be influenced by either group dynamic changes or number of visitors.

Calf behaviour

- The majority of **calf-initiated behavioural states and events** was first displayed during the first three months.
- An increase in **number of visitors** caused the calf to swim further away from the glass wall connecting the pool and the visitors area and to decrease behavioural diversity. This indicates that number of visitors could have an effect on the behaviour of the calf.

References

1. Gibson, Q.A. & Mann, J., 2008a. Early social development in wild bottlenose dolphins: sex differences, individual variation and maternal influence. Animal Behaviour, 76(2), pp.375–387.
2. Mann, J. & Smuts, B.B., 1998. Natal attraction: allomaternal care and mother–infant separations in wild bottlenose dolphins. Anim. Behav, 55(5), pp.1097–1113.
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