

**Bottlenose Dolphin (*Tursiops truncatus*)  
Behavioural Catalogue in controlled environment**

Erika Esposti Apiccino<sup>1</sup> and Raffaella Tizzi<sup>2</sup>

<sup>1</sup>*Università Politecnica delle Marche, P.zza Roma, 60121 Ancona, Italy  
(erikaesposti@libero.it)*

<sup>2</sup>*Delfinario Rimini, Lungomare Tintori 2, 47900 Rimini, Italy  
(raftizzi@tin.it)*

**Introduction**

Since ethological research cannot prescind from the description, classification and measurement of the behaviour, the main starting points of a behavioural study are the research hypothesis formulation, the aim definition, the subject selection and also the setting up of a specific ethogram for the studied species (Mainardi, 1992).

A species ethogram is a set of comprehensive descriptions of the characteristic behaviours of a species (Brown, 1975). It is built up through: A) a preliminary phase of meticulous behavioural observation, that give the possibility to formulate questions and hypothesis and to become familiar with the subjects, their behaviour and sampling methods; B) the collection of behaviours' descriptions obtained from past studies and available literature and C) laboratory tests that allow to analyse each behavioural aspect by putting the subject in simplified situations (Mainardi, 1992; Lehner, 1996).

Because of the animal behaviour complexity, sometimes could be not easy to recognise and classify an activity.

A reasonable approach for classifying behaviours is to proceed according to a hierarchy scheme. The first level is represented by the general category, the broadest level of classification, followed by the behavioural pattern, i.e. the grouping of several behavioural acts together into a reasonably predictable and stereotyped pattern, the behavioural act, the unit of a behavioural pattern and, finally, the component part (Lehner, 1996).

While developing behavioural catalogues, it is important to classify an activity in the appropriate main category (Müller *et al.*, 1998). The categories should be independent with all the acts included in the cluster sharing the same properties. However some behaviours may belong to more than one category, as they can assume different meanings according to the specific functional contexts in which they are displayed (Mainardi, 1992).

As for cetaceans, while a large number of published behavioural catalogues describe the activities, the attempt to unify and clarify the terminology in use is rare. The consequence is that different studies are not or are very hardly comparable (Ostman & Folkens, 1996; Müller *et al.*, 1998).

Sometimes different terms are used to describe the same behaviour. For example, "*respiration*" (Martinez & Klinghammer, 1978), "*breath*" (Ostman,

1985) or "blow" (Silber, 1986) are all used in an interchangeable way to refer to exhaling and inhaling air (Ostman & Folkens, 1996).

At the other hand, a same term is used by different scientists to indicate very different behavioural patterns such as in the case of "tail slap", used to point a slap on the water surface with the tail (Johnson & Norris, 1986; Norris *et al.*, 1994; Herzing, 1995) or even a strike against another animal (Miles & Herzing, 2003), which other Authors refer to "tail hit" (Dudzinski, 1996; Mann & Smuts, 1999).

Therefore, behaviours must be defined with accuracy, precision and unambiguity while descriptions in the ethogram should be clear, detailed and complete. Moreover, drawings, photographs and video sequences represent useful supplements to written descriptions for enhancing details' intelligibility and behaviours' identification (Mainardi, 1992; Lehner, 1996; Dudzinski, 1998).

In this context, the aim of the present work was the setting up of a *Tursiops truncatus* Behavioural Catalogue in captive environment, that attempt to unify current terminology and is supported by explanatory video sequences of each behaviour.

## **Methods**

### *a) Literature Search*

The first step in the catalogue setting up was the collection of a great number of scientific articles focused on cetacean behaviour, accumulated via a wide bibliographical research.

### *b) Looking for Descriptions and Data Input*

The following step was to look for behavioural descriptions. Each behavioural unit was drawn out from the source and systematically put into in a row of an Excel spreadsheet, together with information (if present) about original code, main category, subcategory, definition, species, captive or wild environment, reference.

At the end of this phase, a total of 2615 behavioural units were identified.

### *c) New Main Categories and Codes*

All behaviours with the same functional finality were grouped together into a new main category while an identical three letter code was given to every behavioural unit representing the same activity, even if originally indicated with different names by different Authors.

At the end, a total of 136 different codes were obtained.

### *d) The *Tursiops truncatus* Behavioural Catalogue*

The successive step was to choose just one definition for every code, according to the following priority *criteria*: a) description clarity, b) definition specifically referred to *Tursiops truncatus* or strictly related species, c) publication year (with priority to recent articles) and d) journal impact factor.

Therefore, from the whole list 74 behavioural units were selected to compose the "Tursiops truncatus Behavioural Catalogue" in controlled environment.

The table of the catalogue shows in the first column the three letter code, followed by the name of the behavioural unit, the complete definition and the specific reference, exactly as they appear in the original article.

The catalogue presents 7 main categories:

- 1) Locomotory & Postural Behaviour (n= 23)
- 2) Social Behaviour (n=17)
- 3) Mother/calf Related Behaviour (n=8)
- 4) Sexual Behaviour (n=9)
- 5) Aerial Behaviour (n=9)
- 6) Bubble Related Behaviour (n=6)
- 7) Play Behaviour (n=2)

#### e) *The Video Catalogue*

Starting from a more than 1000 hours video archive, collected in about ten years of bottlenose dolphin quantitative behavioural studies at the Rimini Delfinario, the software *Observer* (Noldus) was applied for finding video occurrences of all the behavioural units included in the catalogue.

After the screening of numerous aerial and underwater images, different sequences were selected according to their quality and clarity. Then, using the software *Pinnacle Studio 8 SE*, the different extracts were assembled in an exemplary video of the behaviour, by cutting and sometimes slowing actions for enhancing their comprehension.

At the end, 74 video sequences, precisely corresponding to the relevant units included in the Behavioural Catalogue, were arranged.

### **Conclusion**

Reasons for studying animal behaviour include the curiosity about the living world and the desire of learning about the relationships between animals and their environments, in order to establish general principles common to all behaviours, to better understand our own behaviour and to preserve environment and species (Drickamer & Vessey, 1992).

However, observer errors can contribute to a decrease in both reliability and validity of scientific researches. Therefore, results are only as good as the observers are (Kazdin, 1982).

In this view, the present work allowed to obtain a useful tool, crucial from both a theoretical and methodological point of view.

First of all, not only the *Tursiops truncatus* Behavioural Catalogue seems to be essential for the development of quantitative ethological researches on this species, but it also represents the only scientific basis that allow an hypothesis formulation (Lorenz, 1960). In fact, since ethological researches cannot leave out the classification and measurement of the behaviours, the ethogram only with its comprehensive descriptions of behavioural patterns ensures that the observer has consistent identification of an activity each time it is observed (Mainardi, 1992).

At the other hand, from a more practical point of view, the catalogue permits to immediately expand the topic and, thanks to the fundamental support of the images, to perform an easier identification of behaviours.

## Literature Cited

- Brown, J.L. (1975). *The evolution of behaviour*. Norton, W.W., New York. 761 pp.
- Drickamer, L.C., & Vessey, S.H. (1992). *Animal Behaviour*. Brown Wm. C. Publishers, Dubuque, Iowa. 479 pp.
- Dudzinski, K.M. (1996). Communication and Behaviour in the Atlantic spotted dolphins (*Stenella frontalis*): relationships between vocal and behavioural activities. (Dissertation thesis Texas A & M University, College Station, Texas). 215 pp.
- Dudzinski, K.M. (1998). Contact behavior and signal exchange in Atlantic spotted dolphins (*Stenella frontalis*). *Aquatic mammals* 24.3, pp. 129-142.
- Herzing, D.L. (1995). Ethogram Atlantic spotted dolphins, *Stenella frontalis*. *Working Paper for the ECS Workshop on Ethograms*. Lugano, Switzerland, February 1995.
- Johnson, C. M., & Norris, K. S. (1986). Delphinid Social Organization and Social Behavior. In: R.J. Schusterman, J. A. Thomas, & F.G. Wood (Eds.), *Dolphin Cognition and Behavior: A Comparative Approach*. Lawrence Erlbaum Associates, Publishers, Hillsdale, New Jersey, London. pp. 335-346.
- Kazdin, A.E. (1982). *Single-case Research Designs*. Oxford University Press, Oxford. 368 pp.
- Lehner, P.N. (1996). *Handbook of ethological methods*. Cambridge. 672 pp.
- Lorenz, K. (1960). Methods of approach to the problems of behaviour. In: *The Harvey Lectures 1958-1959*, Academic Press, New York. pp. 60-103.
- Mainardi, D. (1992). *Dizionario di etologia*. Einaudi editore. 868 pp.
- Mann, J., & Smuts, B. (1999). Behavioral developments in wild bottlenose dolphin newborns (*Tursiops* sp.). Reprinted from: *Behaviour* 136.5. Brill-P.D.B. 9000-2300 PA Leiden. The Netherlands.
- Martinez, D.R., & Klinghammer, E. (1978). A partial ethogram of the killer whale (*Orcinus orca* L.). *Carnivore* 3, pp. 13-27.
- Miles, J.A., & Herzing, D. (2003). Underwater analyses of the behavioural development of free-ranging Atlantic spotted dolphin (*Stenella frontalis*) calves (birth to 4 years age). *Aquatic mammals* 29.3, pp. 363-377.
- Müller, M., Boutiere, H., Weaver, A., & Candelon, N. (1998). Ethogram of the bottlenose dolphin (*Tursiops truncatus*) with special reference to solitary and sociable dolphins. *English Translation of Vie Milieu* 48.2, pp. 89-104.

- Norris, K. S., Würsig, B., & Wells, R. (1994). Aerial Behavior. In: K.S. Norris, B. Würsig, R. Wells, & M. Würsig (Eds.), *The Hawaiian Spinner Dolphin*. University of California Press, Berkeley and Los Angeles. pp. 103-121.
- Ostman, J. (1985). An ethogram for dolphin social behaviour, and observations on changes in aggressive and homosexual behaviour among two subadult male bottlenose dolphins (*Tursiops truncatus*) in a captive colony. (Unpublished master's thesis, San Francisco State University).
- Ostman, J.S.O., & Folkens, P.A. (1996). *A vocabulary to describe cetacean behavior*. University of California, Santa Cruz. pp.26.
- Silber, G.K. (1986) The relationship of vocalizations to surface behaviour and aggression in the Hawaiian humpback whale (*Megaptera novaeangliae*). *Canadian Journal of Zoology* 64, pp. 2075-2080.