

## Orinoco-Freshwater-dolphins (*Inia geoffrensis*) using self-produced air bubble 'rings' as toys

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### Summary

In contrary to the fact that, commonly, River dolphins (*Platanistidae*) are considered as to be less conscious or 'intelligent' than other Odontoceti, Orinoco dolphins (*Inia geoffrensis*) kept since 1975 in Duisburg Zoological Gardens are presenting an extremely playful and 'inventive' behaviour. Besides the use of different types of balls, sticks, pots, and brushes as tools or toys, Duisburg's *Inias* build up self-made air bubble 'rings' to swim through or—by means of air bubble 'beds'—to lay in. Special attention may be drawn to the fact that some of those air bubble 'constructions' are used by (or made for) younger relatives.

### Zusammenfassung

Unter den innerhalb der Odontoceti meist als wenig lernfähig eingestufteten Flußdelphinen (*Platanistidae*) treten seit 1975 im Zoo Duisburg gehaltene Orinokotoninas (*Inia geoffrensis*) als im Gegenteil spielfreudig und 'erfindungsreich' hervor. Nach a. O. früher beschriebenen Gebrauch unterschiedlicher Kompakt-Gegenstände (Bälle, Stöcke, Töpfe, Bürsten) als Spiel- und Körperpflegegerät werden Fälle mitgeteilt, in denen sich *Inias* ihre 'Geräte' aus selbstproduzierten Luftblasen herstellen: Luftblasen-Ringe, um — Geschicklichkeitsübung? — hindurchzuschwimmen, Luftblasen-'Betten', um sich—taktiles Wohlgefühl?—darin zu wälzen. Von u. U. grundsätzlicher Bedeutung dürfte sein, daß ein Flußdelphin von ihm hergestellte Luftblasen-'geräte' auch von einem (jüngeren) Artgenossen benutzen ließ.

### Introduction

Tool use has been of special interest in the observation of animal behaviour for decades. Tool making has even been believed to be an important sign of difference between early men and apes, until further investigations were made by Kortlandt (1962, 1967) and Lawick-Goodall (1963, 1967). What can be declared as a tool is a question of definition (drops of water or grains of sand ejected from *Toxotes* or *Myrmeleon* towards its prey, are certainly not such

tools!); in addition to that it is obvious that there are transitions between tools built for working and their optional exploitation as a tool for playing viz.—a toy. In this context the air bubble rings of *Inia* are exclusively made for playing, whereas the well-known 'bubble-nets' of *Megaptera* are a part of food intake behaviour.

In spite of the very essential importance of this fact we rarely take notice that in mammals we can find definite differences between terrestrial and aquatic species' concerning their play behaviour. In terrestrial mammals many parts of play behaviour are limited to a comparatively short period of their youth: remember for instance the well-known scene of a litter of Red fox cubs scrambling in the entrance of the burrow. In opposite to that, the German-Dutch-Danish name, 'Tümmler' or 'Tuimelar', was given to the Bottlenose dolphin (*Tursiops truncatus*) because of its willingness or disposition to play during its whole life span. 'Well-adapted aquatic mammals can play nearly up to senility, because the water is carrying a big part of their body weight . . . The loss of body weight in the water (see Archimedes) leaves capacities for romping and jumping, a luxury behaviour normally reserved for young' (Gewalt, 1985). So adult members of *Lutrinae* or pinnipeds may be observed making activities of juggling or balancing just for fun; surfing (*Arctocephalus*, *Zalophus*) and other kinds of water-supported play behaviour are very common. Groups of dolphins at nearly all stages of age feel stimulated to bow-riding as soon as a ship gets a certain minimum of speed. The name of the Pacific 'Spinner dolphin' (*Stenella longirostris*) is derived from the speciality of this species to spin over and over again about their longitudinal axis when leaping, obviously 'just for fun' (Gewalt, 1985). Contrary to Fagen (1981), 'nothing at all is known of play in baleen whales', water as a medium seems to offer some possibilities of play behaviour, even with the very heavy body weights of *Mysticeti*, e.g. 'sailing' by means of the erected fluke by *Eubalaena*, carrying bundles of kelp for *Eschrichtia*, (Payne, 1976, Dozier, 1980, Gewalt, 1988).

Under the advantageous combination of physical support in the water, agility in movement and a



**Figure 1.** Carrying around different objects (3 rings of solid plastic, 1 rugby ball) as play behaviour. Photo: Dr W. Gewalt, Duisberg Zoo.

highly developed brain capacity, one would indeed expect very special performances in play behaviour; so it seems to be rather surprising that there are only a very few observations mentioned. In Beck's (1980) 'Animal tool behaviour' no cetacean is registered, Fagen (1981) devotes 42 lines only, though he notes: 'Cetacean play is important because these animals' specialized body forms and aquatic habits require general concepts of play free from implicit assumptions about quadrupedalism or terrestrialism'. As in the endless sea or in muddy rivers, possibilities of observation are very limited, only since the construction of dolphinarium or oceanaria have things improved; but the readiness of small Odontocetes for play behaviour and exercises has been mainly used, not by ethologists, but by trainers, normally practising the so-called 'positive reward training'; the dolphin is getting a piece of fish if he has responded accidentally, or as play behaviour, in the right way;— 'handstands' or somersaults in a dolphin of course cannot be forced by the so-called 'putting-through-method' (Hediger, 1963).

Defran, R. and K. Pryor (1980), 'The Behavior and Training of Cetaceans in Captivity' in 'Cetacean Behavior' (edited by Louis M. Herman/New York), stated that still today relatively little information

is available on species other than the Bottlenose dolphin.

### Observations

Concerning river dolphins, Hediger (1969) had to criticize that our knowledge of physiological and behavioural capacities of these interesting animals is very poor and that our experience in keeping them under zoo conditions has a 25 years' delay compared with other cetaceans.

For this reason our *Inias* imported in March 1975, from the Rio Apure (Venezuela) (Gewalt, 1978), after being acclimatized in Duisburg Zoo's Tonina-Pool, have been the object of several physiological and ethological investigations (Kamminga (1979), Pilleri (1979), Dral (1981)) etc. It was most remarkable that the untrained animals demonstrated a very creative degree of ingenuity in using different objects, given in the pool (balls, pots, brushes, tubes), as toys and to put them together in a fascinating number of different arrangements. 'A Boutou\*' can carry a ball under each flipper, pick up some plastic rings on the upper and the lower jaw of the rostrum and tickle a companion by means of a brush taken in the mouth

\*Local name of *Inia* in the Amazon river district.

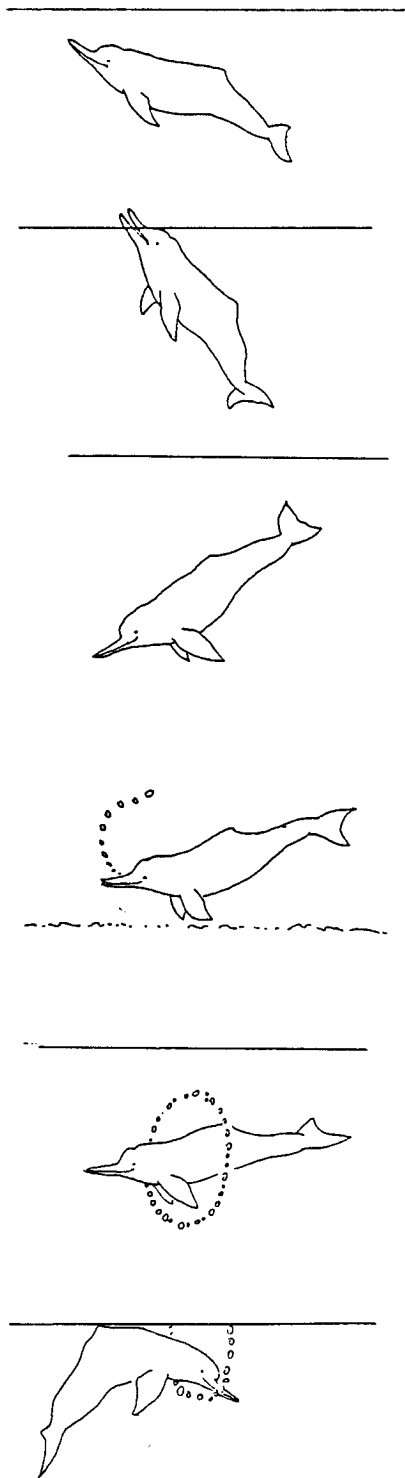
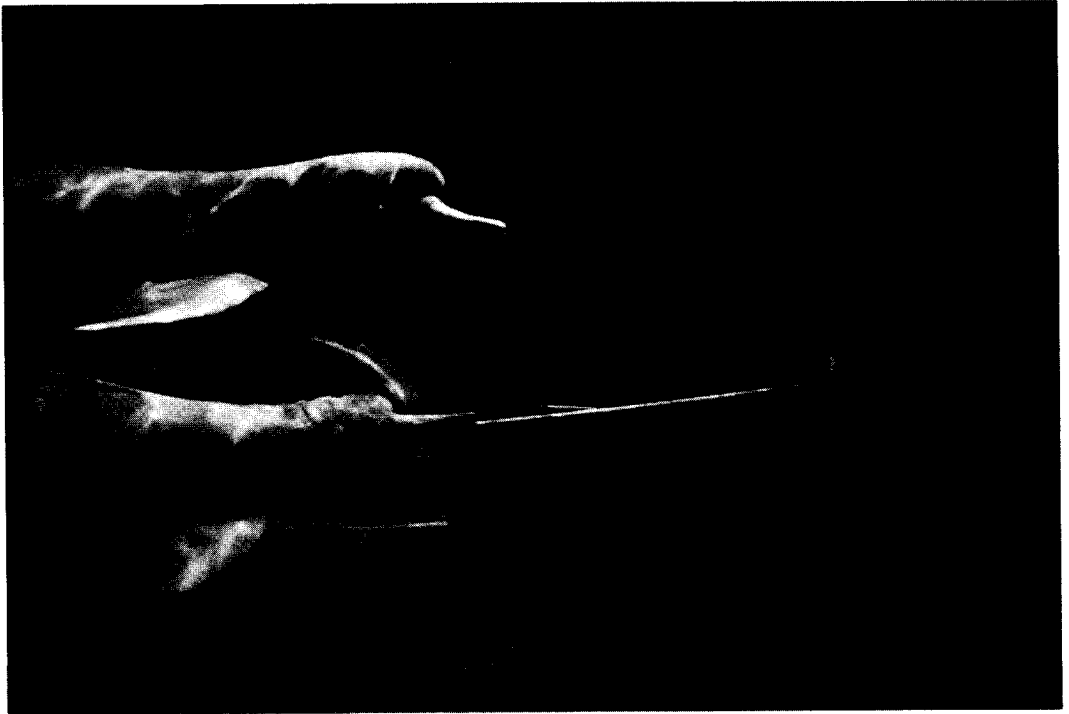


Figure 2. Making an air bubble-ring and using it for play. Drawing: Dr W. Gewalt, Duisburg Zoo.

(Gewalt, 1987); other examples are given from Horstmannshoff (1975), Stachelhaus (1977), Pilleri *et al.* (1980), Kröger (1984), and Sylvestre (1985) (Fig. 1). Without describing the whole repertory; it seems to be more highly developed than any similar behaviour known up to now from other cetaceans either free living or kept in Zoo Duisburg (*Tursiops truncatus*, *Sotalia guianensis*, *Phocoena phocoena*, *Cephalorhynchus commersoni*, *Delphinapterus leucas*) and which latter is mainly restricted to pushing a piece of wood, of kelp or of ice on the surface.

A specifically remarkable type of play in our *Inias* has been observed, first in 1984, and with some interruptions in the following years. There is no need for given objects, the wanted 'toy' is produced by the dolphin itself. Unlike normal breathing out, the *Inia* puts its rostrum out of the water, opens the long 'beak' and takes some air in the mouth (Fig. 2). After that the animal dives to the bottom of the pool waiting for the end of the self-produced water turbulences. Then it opens a small part of one side of the mouth bringing out air bubbles which rise in a row. A special head turning movement transforms the string of air bubbles into a well shaped ring which slowly floats upwards to the surface. This ring is then passed by the dolphin in the same way as a 'tiger-through-the-ring-performance' in a circus, without touching the ring and in a very skilful manner. If possible he immediately turns back on himself, to repeat the same exercise from the other side; due to the rapidity of the air bubbles' emerging to the surface and the limited level of water (only 180 cm in the show-pool) such a second attempt is rarely successful. As to be pointed out again, our *Inias* were never trained before by other means, they never before had a chance to get a knowledge of the object 'ring'; in the muddy waters of their natural environment they did not have any possibility to see air bubbles or other submerged things. (An arched concrete construction covered with brushes for skin scratching/comfort behaviour was set in the pool after the mentioned observations. Otherwise the animals only have at their disposal the 15 cm diameter plastic rings, known as childrens' toys on beaches etc.)

In only a single case we observed that an air bubble 'ring' was produced by air from the blow-hole. As far as we know at least the 'bubble-nets' (Jurasz, 1979, Earle *et al.*, 1979, Giddings, 1984) of the Humpback whale *Megaptera*—'curtains' consisting of air bubbles provided to encircle krill and other small prey—are blow-hole made (Fig. 5); this would mean that 'constructions' from air bubbles in cetaceans can be produced in two distinct manners, for two very distinct functions and in members of two very distinct suborders. As I learned in the meantime, in the Aquaria of Vancouver and New York, White Beluga whales (*Delphinapterus leucas*) have been observed using air bubbles as 'toys': in a similar manner to a

**Figure 3(A)****Figure 3(B)**

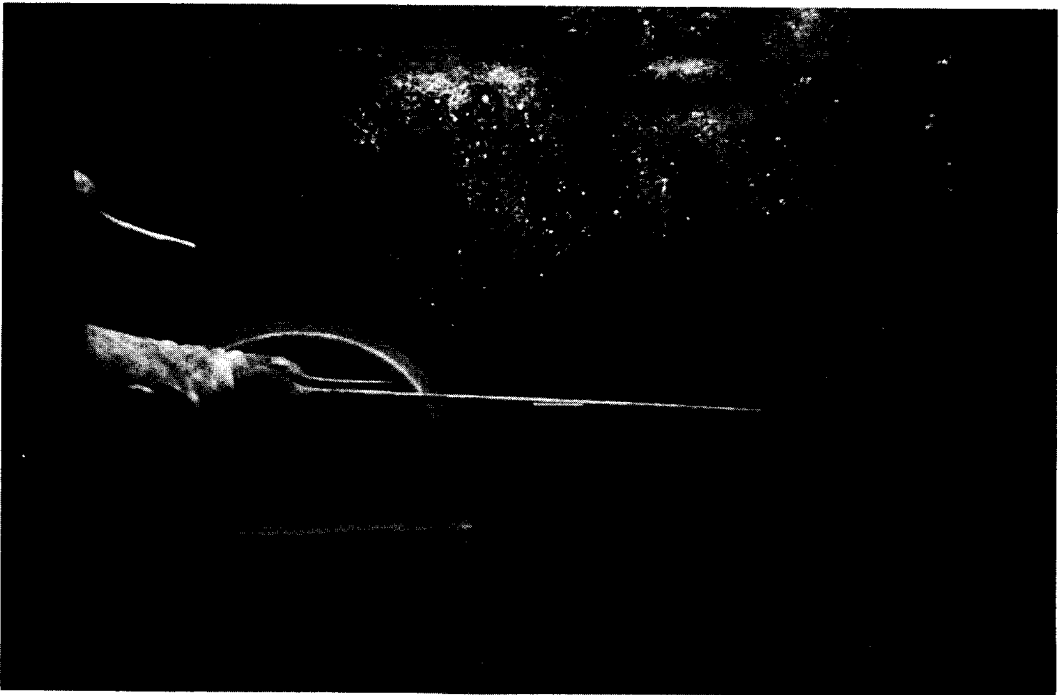


Figure 3(C)

**Figure 3.** (A) *Inia geoffrensis*-♂ 'Baby' (born end of 1974) using a scrubbing brush as lance and getting a narwhal-like shape. At the top the 5 years elder 'Vater', in the background a newly installed brush-armed arch of concrete, a usual equipment for skin scratching and similar comfort behaviour in dolphinaria. (B) In spite of the water heaviness and resistance the stroke is executed downwards with such an amount of strongness and velocity, that the surface gets a real 'split'. The other specimen 'Vater', close to the actor's left flipper, seems to wait for the result. (C) On the whole length of the stick a curtain of prickling and glittering air bubbles comes up. Sometimes the *Inias* are satisfied with looking or listening, but normally they prefer to use it as a kind of stimulating shower; this can be done by the partner (top left in waiting position) or from the 'shower-maker' himself; the latter can keep the stick in his mouth or release it as well.

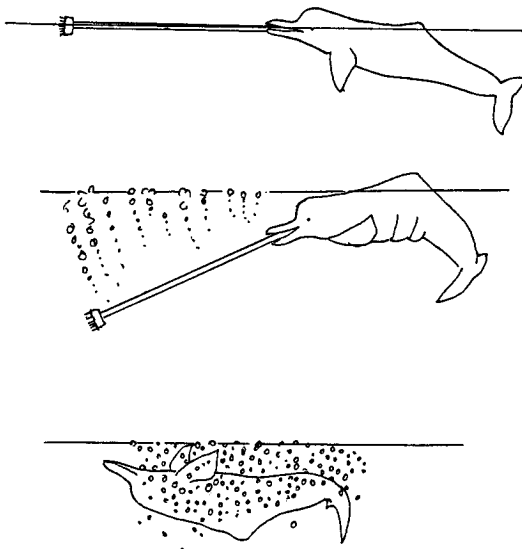
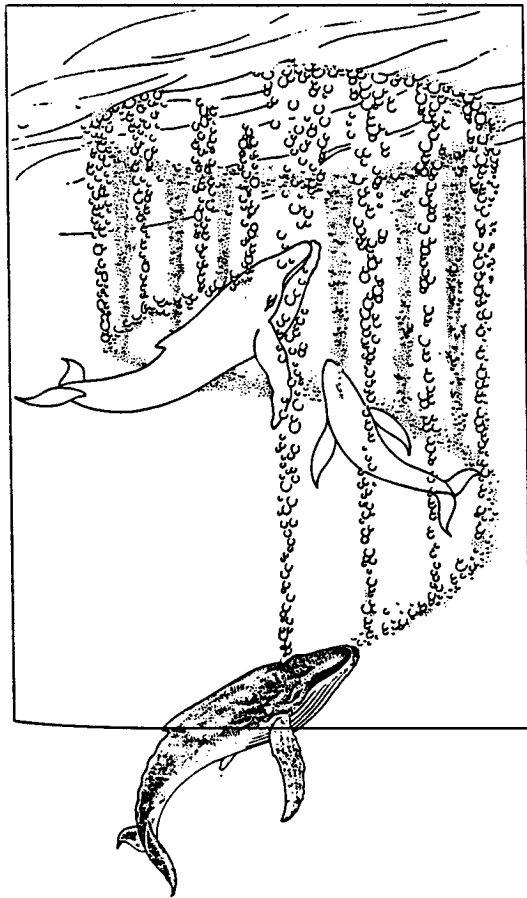


Figure 4. The same procedure as figure 3, schematized.

smoker exhaling his tobacco smoke, they let a cloud or a ring of air bubbles emerge from their mouth to put the head into it (M. A. Newman, L. E. Garibaldi, personal communication).

As observations made in Duisburg Zoo's Toninapool in summer 1987 indicate, there may be still another function system—body care? winning a tactile pleasure?—founded on air bubble production:

After the normal procedure of cleaning and new filling of the pool the keeper left a scrubbing brush as a toy (a wooden stick of 140 cm length and in front a compact and rough crosswise brush) which was used for the present like a 'Narwhal play'; that means to be held like a lance (Fig. 3a) (Gewalt, 1979, Pilleri *et al.*, 1980, Sylvestre, 1985); activities like this are mostly observed with some concern, you can get the impression that the stick will be rammed into the gorge or at least will break off some teeth. After that the elder specimen (called 'Vater') takes the scrubbing brush, which is rising up to the surface, into its mouth approximately 15 cm from the outer end of the stick, and then it



**Figure 5.** The famous bubble net-making of *Megaptera* (from a drawing in Gewalt, 1987, based on Schlecht's painting in Earle *et al.*, 1979).

snatches the scrubbing brush back into the water about 90 cm deep in spite of the high burden of the angle (Fig. 3b). By reason of the very jerky vehemence of this procedure, on the whole length of the brush-stick, including the brush itself, a curtain of air bubbles comes up (Fig. 3c). Into this rising effusion of 'pearls' rushes either the bubble-producer himself or the already waiting partner (a younger specimen called 'Baby'), in order to roll themselves for a short time, and obviously with great pleasure (Fig. 4).

Besides the attraction of catching them in time, the 'purpose' of the air bubbles, produced with such an amount of single-minded effort, seems to be the benefit of a special kind of caressing massage, similar to 'whirl-pools'. 'Although individuals of many species' including wasps, blue jays, and chimpanzees, construct and use tools (Beck, 1975, 1978), no non-human species is known to modify or fashion objects

for the use of its young in play'—Fagen (1981). As far as purposely made air bubbles are justified to be declared as 'objects', the mentioned use of them by a (younger) member would be of special interest (besides the fact that in the meantime this younger specimen is also able to produce its own air bubbles).

The classification of both specimens elder ('Vater') and younger ('Baby') should not disguise the fact that both *Inias* are fully adult, namely more than 16 and 13 years old respectively. Moreover a certain dominance of 'Vater' during struggling or fighting does not preclude that all inventions of play activities were initiated exclusively by him; 'Baby' is very active too and not only in the role of a partner or collaborator. Homosexual activities—very common in cetaceans' groups, even those including females—are practised by both. The total of play and movement behaviour is enormous, increasing or being changed by new inventions from day to day.

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