COMMON BOTTLENOSE DOLPHIN

Tursiops truncatus

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INTRODUCTION

This document seeks to describe the living conditions of the species Common Bottlenose Dolphin in its natural habitat, as well as the consequences of captivity on the health of the individuals living at Barcelona Zoo both now and in the past.

Given the scarcity of public information on the subject, this document also aims to confirm the number of dolphins that have passed through this zoo since its opening. At this point we would like to pause for a moment to reflect on the following aspects, which will broaden understanding of this document.

We believe that it is no minor matter to call attention to the dolphins that have lived at the Zoo: initially captured from the wild, several of them died a few days or months after birth, or were separated from the family group upon being sent to other zoos for various scientific reasons. This will help us understand how the current structure of zoological gardens affects each of the animals that live in them.

This information is important as visitors usually only see dolphins in shows, an image promoted on Barcelona Zoo's own website, seen in its information file: “The common bottlenose dolphin is possibly the most well-known cetacean. The species appears most often in dolphinariums and water parks all over the world, where it captivates audiences with its acrobatics”.[1]

Despite the fact that the 2012-2020 strategic plan intends to expand facilities, as well as put an end to shows in the Aquarama, Barcelona Zoo nonetheless plans to keep this species and continue breeding it in captivity, even though it is not included in any reintroduction programme.

In order to provide numerical and descriptive data of the dolphins at Barcelona Zoo, from its beginnings, we have used the following database, up-to-date as of 2013: http://ceta-base.com/phinventory/deceasedphins/[2]

Given Barcelona Zoo's lack of transparency (as a public body) with regard to the information on births, deaths and transfers, we consider this database to be a useful descriptive tool although there may be errors as regards specific data. However, the veracity of the data on current dolphins up to 2013 and the coincidence of data for animals in the first years of the dolphinarium, according to documents attached on the following page, confirms its descriptive usefulness; descriptions that can be adjusted to the real image of the dolphins that have lived in the dolphinarium. In any case, we invite Barcelona Zoo to make the corrections that it deems appropriate.

The dolphins that have lived at the zoo, initially captured from the wild, allow us to understand how the current structure of zoological gardens affects each of the animals that live in them.

1 Barcelona Zoo website: bit.ly/1z1ejZZ

2 As notified in the database itself: 'The information given on this page has been obtained through a number of sources considered trustworthy, and is as up-to-date as possible. Please take into account that the very nature of this data is dynamic – animals move around, give birth and die. We cannot guarantee the accuracy or integrity of the information contained on this site. We appreciate your patience with any errors.”

DOLPHINS AT BARCELONA ZOO

The dolphinarium at Barcelona Zoo opened in 1965, and has always accommodated the species Tursiops truncatus or common bottlenose dolphin (Mediterranean subspecies).

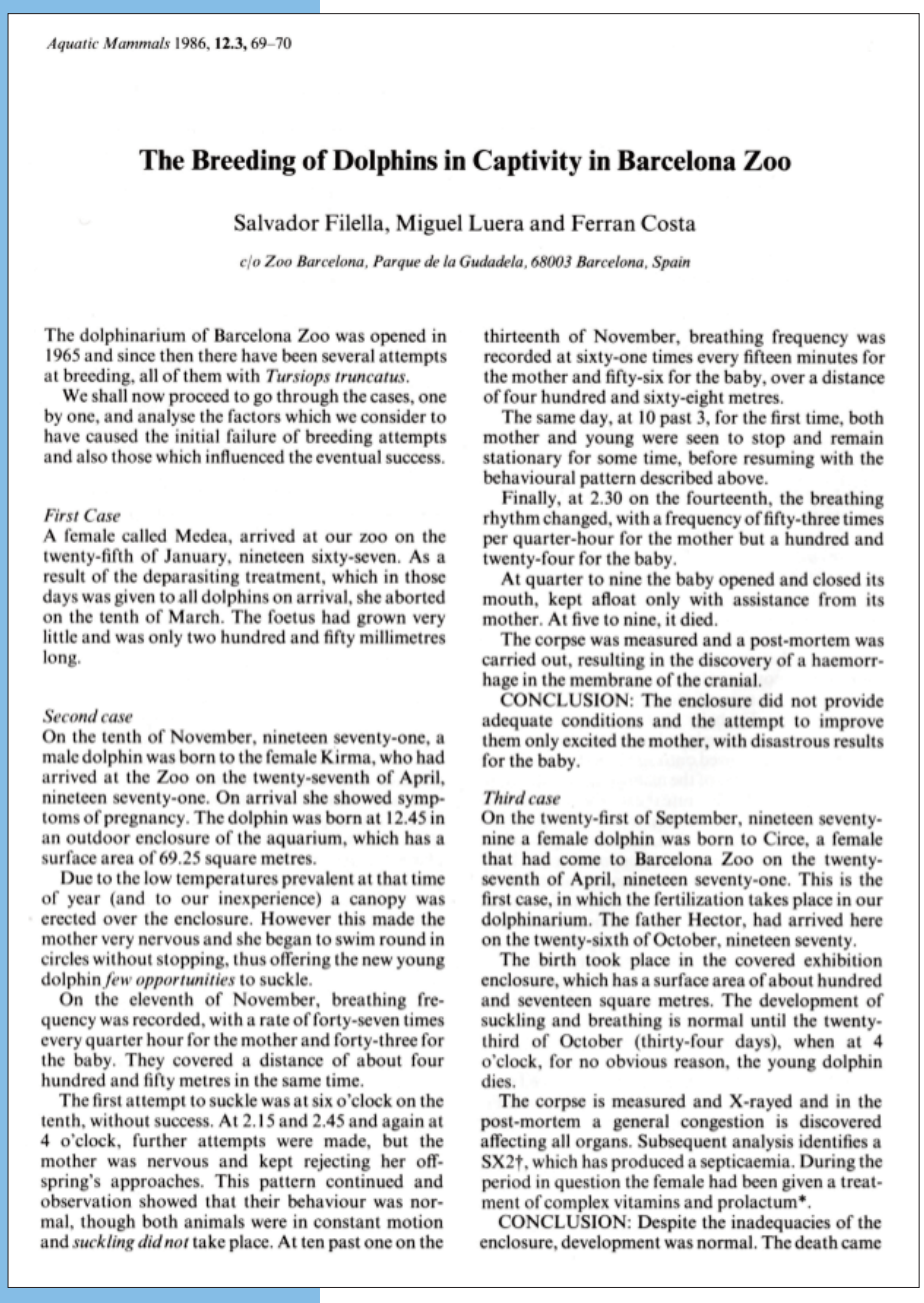
Although the dolphin is not at risk in the wild, this is not the case for the Mediterranean subspecies, which the IUCN (International Union for Conservation of Nature) classifies as Vulnerable: bit.ly/1Qrgk7d

Barcelona Zoo breeds these dolphins in captivity within the European Endangered Species Programme (EEP) headed by the European Association of Zoos and Aquaria (EAZA), of which Barcelona Zoo is a member.

The following chapter reveals the results of these captive breeding programmes.

At present, there is no reintroduction programme associated with this captive breeding programme.

As indicated in our introduction, we attach the following article as a means of verifying the use of the database ceta-base.com: "The Breeding of Dolphins in Captivity in Barcelona Zoo".



Aquatic Mammals 1986, **12.3**, 69–70

The Breeding of Dolphins in Captivity in Barcelona Zoo

Salvador Filella, Miguel Luera and Ferran Costa

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The dolphinarium of Barcelona Zoo was opened in 1965 and since then there have been several attempts at breeding, all of them with *Tursiops truncatus*.

We shall now proceed to go through the cases, one by one, and analyse the factors which we consider to have caused the initial failure of breeding attempts and also those which influenced the eventual success.

First Case

A female called Medea, arrived at our zoo on the twenty-fifth of January, nineteen sixty-seven. As a result of the deparasiting treatment, which in those days was given to all dolphins on arrival, she aborted on the tenth of March. The foetus had grown very little and was only two hundred and fifty millimetres long.

Second case

On the tenth of November, nineteen seventy-one, a male dolphin was born to the female Kirma, who had arrived at the Zoo on the twenty-seventh of April, nineteen seventy-one. On arrival she showed symptoms of pregnancy. The dolphin was born at 12.45 in an outdoor enclosure of the aquarium, which has a surface area of 69.25 square metres.

Due to the low temperatures prevalent at that time of year (and to our inexperience) a canopy was erected over the enclosure. However this made the mother very nervous and she began to swim round in circles without stopping, thus offering the new young dolphin *few opportunities* to suckle.

On the eleventh of November, breathing frequency was recorded, with a rate of forty-seven times every quarter hour for the mother and forty-three for the baby. They covered a distance of about four hundred and fifty metres in the same time.

The first attempt to suckle was at six o'clock on the tenth, without success. At 2.15 and 2.45 and again at 4 o'clock, further attempts were made, but the mother was nervous and kept rejecting her offspring's approaches. This pattern continued and observation showed that their behaviour was normal, though both animals were in constant motion and *suckling did not* take place. At ten past one on the thirteenth of November, breathing frequency was recorded at sixty-one times every fifteen minutes for the mother and fifty-six for the baby, over a distance of four hundred and sixty-eight metres.

The same day, at 10 past 3, for the first time, both mother and young were seen to stop and remain stationary for some time, before resuming with the behavioural pattern described above.

Finally, at 2.30 on the fourteenth, the breathing rhythm changed, with a frequency of fifty-three times per quarter-hour for the mother but a hundred and twenty-four for the baby.

At quarter to nine the baby opened and closed its mouth, kept afloat only with assistance from its mother. At five to nine, it died.

The corpse was measured and a post-mortem was carried out, resulting in the discovery of a haemorrhage in the membrane of the cranial.

CONCLUSION: The enclosure did not provide adequate conditions and the attempt to improve them only excited the mother, with disastrous results for the baby.

Third case

On the twenty-first of September, nineteen seventy-nine a female dolphin was born to Circe, a female that had come to Barcelona Zoo on the twenty-seventh of April, nineteen seventy-one. This is the first case, in which the fertilization takes place in our dolphinarium. The father Hector, had arrived here on the twenty-sixth of October, nineteen seventy.

The birth took place in the covered exhibition enclosure, which has a surface area of about hundred and seventeen square metres. The development of suckling and breathing is normal until the twenty-third of October (thirty-four days), when at 4 o'clock, for no obvious reason, the young dolphin dies.

The corpse is measured and X-rayed and in the post-mortem a general congestion is discovered affecting all organs. Subsequent analysis identifies a SX2†, which has produced a septicaemia. During the period in question the female had been given a treatment of complex vitamins and prolactum*.

CONCLUSION: Despite the inadequacies of the enclosure, development was normal. The death came as a surprise to us, due to the lack of apparent symptoms.

Table of measurements for two young *Tursiops truncatus* (Montagu 1828) born in Barcelona Zoo on 10/4/71 and 21/9/79 respectively

Measurements	Baby male: Born 10/4/71 died 14/Ç/71	Baby female: born 21/9/79 died 23/10/79
Total length	1.100 mm	1.180 mm
Length from tip of upper mandible to centre of navel	495 mm	574 mm
Length of pectoral fin	225 mm	233 mm
Width of tail lobes (tip to tip)	205 mm	267 mm
Length of base of dorsal fin	210 mm	185 mm
Length from tip of upper mandible to depression of pectoral fin	270 mm	305 mm
Length from tip of upper mandible to the corner of the mouth	147 mm	160 mm
Length from tip of upper mandible to centre of eye	170 mm	195 mm
Length from tip of upper mandible to apex of adipose panicle of forehead	43 mm	50 mm
Length from centre of eye to ear orifice	30 mm	47 mm

Fourth case

On the fifth of November, nineteen eighty a female, called Alicia, was born to Circe and Héctor. She died on the twenty-first of February, nineteen eighty-two, at the age of fifteen months. As the pregnancy was detected at an early stage, for the first time the mother was moved to the large tank (six metres deep, with a surface area of three hundred and eighty square metres). The baby's behaviour was normal in all aspects and she developed perfectly.

When she was moved onto solid food, she suffered from the competition of the male of the group, a new phenomenon for us. Because the mother was producing less milk and at the same time, the young dolphin was reluctant to consume fish, the latter began to lose weight alarmingly. As a result, both mother and baby were moved to the hospital enclosure, where Alicia was force-fed on small sardines with cod-liver-oil. Eight days after beginning this treatment and despite an apparent improvement, the baby died, on the twenty-first of February, nineteen eighty-two.

In the post-mortem we discovered injuries in the oesophagus and an accumulation of fishbones in the stomach.

Samples of the lungs, spleens, kidneys and liver showed them all to be perfectly normal.

CONCLUSION: When the baby was moved onto solid food, competition with the male and unsuitable techniques of force-feeding prevented the animal from feeding properly.

Fifth case

On the twenty-ninth of June, nineteen eighty-two, a female was born to Nika and Hector, in the large tank. She dies immediately after birth due to a congenital malformation of her tail vertebrae, which made it very difficult for her to swim. The body was X-rayed.

Sixth case

Inuk was born on the twentieth of September, nineteen eighty-three to Circe and Triton.

She was born at 7 o'clock in the large tank. When she was five months old, the male was withdrawn from the tank, to avoid the problems caused by competition, when she was moved onto solid food. We must also point out that during Inuk's development Ulysis, a young male killer-whale, had been in the tank with mother and baby, proving an excellent playmate for the young dolphin and contributing a great deal to the fact that she had developed normally and happily with us.

CONCLUSIONS: Judging from our experience, the depth and surface area of the tank are of great importance; the change to solid food must be made when demanded by the young dolphin and, in this there must be no interference from other members of the group. Solid food must be varied and small, e.g., the young of salmon and hake, squid, mussels.

A table of measurements is appended (Table I).

This report has been compiled by Salvador Filella, Miguel Luera and Ferran Costa.

*Nicotinamide, 200 mgms by Casen Laboratory, Barcelona
†Staphylococcus type × 2.

Between 1965 and 1989, Barcelona Zoo acquired 24 dolphins captured from the wild. Anak is the only remaining survivor today.

This article compiled by Barcelona Zoo looks at six cases of dolphins (studies that we did not analyse):

. Medea, female captured in the wild, who arrived at the Zoo in 1967. She suffered a miscarriage.
. Kirma, female captured in the wild, who arrived pregnant at the Zoo in 1971, giving birth a few months later. The calf died.
. Circe, female captured in the wild, who arrived at the Zoo in 1971. She had a female calf in 1979. The father, Héctor, arrived in 1970, also captured from the wild. The calf died.
. Alicia was born in 1980, daughter to Circe and Héctor. She died at the age of 15 months.
. In 1982 a daughter was born to Nika and Héctor, she died immediately after birth.
. Inuk was born in 1983, son of Circe and Tritón.

These animals are identified on the website cetabase.com bit.ly/1DYI6RK, from which we extracted the following data:

Between 1965 and 1989, Barcelona Zoo acquired 24 dolphins captured from the wild. Anak, captured in Cuba in 1989, is the only remaining survivor today.

Regarding the dolphins whose date of birth/acquisition and death we know, we obtained the following information:
. Nika: Acquired in around 1970 and died in 2011. She lived in the Zoo for 41 years.
. Kirma and Circe: Born in around 1971 and died in 1991. They lived in the Zoo for approximately 20 years.
. Calf of Kirma and Unk born in 1971, died a few days later.
. Calf of Circe and Héctor, born in 1979, died a few days later.
. Alicia: Calf of Circe and Héctor, born in 1980 and died in 1982, lived less than 2 years.
. Thethys: Acquired in 1982 and died in 1985, lived in the Zoo for 3 years.
. Daughter of Nica and Hector, died on the day of birth.
. Inuk: Calf of Circe and Unk, born in 1983 and died in 2005, lived 22 years.
. Moana: Acquired in 1989 and died in 2002, lived 13 years.
. Ona: Calf of Anak and Inuk, born in 1999 and died in 2000, lived only a few months.
. Glaç: Calf of Nereida and Inuk, born in 2006 and died in 2009, lived 3 years.

Barcelona has transferred three animals to other zoos, one of which was captured from the wild: bit.ly/1zV6Gzc

We compared these dolphins' lifetimes with their life expectancy in the wild. Dolphins can live for up to 58 years; on average, females live to about 50 and males to about 40-50.

In captivity, and according to the Zoo's own website, 'longevity is over 30 years'.

CURRENT STATUS

There are currently six individuals in the dolphinarium:

Anak: Born in the wild and captured in Cuba in 1989. Between 28 and 29 years old. She arrived at Barcelona Zoo in October 1990. Mother of Leia, Nuik and Kuni.
Blau: 15 years old, born in July 1999. Son of Inuk and Moana. Father of Nuik.
Tumay: 13 years old, born in April 2002. Biological son of Inuk and Moana, who died shortly after the birth. Nika (who died in 2011) adopted him as her own son, even secreting milk for him.
Leia: 11 years old, born in August 2003. Daughter of Anak and Inuk.
Kuni: 9 years old, born in May 2006, son of Inuk and Anak.
Nuik: 2 years old, born in October 2012, calf of Anak and Blau.

Dolphins on show at the Aquarama

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Daily average movements are 33-89 km, but dolphins in deep waters can make migrations up to 4,200 km.

BOTTLENOSE DOLPHINS IN THE WILD

RANGE: All over the world in temperate and tropical waters, from New Zealand to the south, to 45º north, reaching the Faroe Islands in the North Atlantic.

HABITAT: Temperate and tropical waters, normally along the coastline and on the continental platforms. Opposite the coasts of North America, they generally inhabit waters with surface temperatures of between 10 and 32º C. They also live in bays, lagoons, canals, river mouths and deep oceans. They are not generally found in waters towards the poles, beyond 45º, in either of the two hemispheres, except north of Europe and south of New Zealand.

ACTIVITY PATTERNS: Active both during the day and at night. Common behaviours include: travelling, feeding, resting and socialising. They can be active aerially.

- Maximum speed achieved: 35 km/h
- Normal speed: 5-11 km/h
- Measuring: 1.9-3.8 metres
- Weight: 136-635 kg
- They can live up to the age of 58; females up to about 50 years and males up to 40-50.

DISPERSAL, HOME RANGE AND SOCIAL ORGANISATION

- Territorial movements and ranges vary hugely along their distribution areas. Most coastal individuals are not migratory and reside for long periods in a particular area: some retain territorial ranges for many generations. Some coastal populations that reside in the species' distribution extremes, in cold waters, migrate seasonally. **Daily average movements are 33-89 km, but dolphins in deep waters can make migrations up to 4,200 km**.

- Their life is based around relationships with their pod, formed by a **family (sometimes up to 5 generations), who are very united and help each other.**

- **Most groups consist of 2-15 individuals, although groups of more than 1,000 individuals have been found.** The group structure varies enormously with factors such as sex, age, reproductive condition and relationships. The relationship between mothers and their calves is very strong, but other affiliations can be stable or not over time. The most common sub-groups consist of: guard groups, juveniles of mixed sex, strongly bonded pairs, and lone adult males. They can form mixed groups with other species of dolphin, normally the Indo-Pacific bottlenose dolphin (Turiops aduncus), the Atlantic spotted dolphin (Stenella frontalis), Chinese white dolphin (Sousa chinesis) and Atlantic humpback dolphin (Sousa teuszii).

- Their **encephalization quotient** (the brain/body mass ratio) is second after humans'. There is evidence that they possess advanced skills in learning “languages”, they have a memory capacity comparable to a human being's, they understand concepts such as rules and social relationships, they have shared attention, they can recognise themselves in mirrors and seem to have a sense of “themselves”.

- They have their **own culture**: They use different hunting techniques depending on the region in which they live and on the social group in which they are included.

- It has been demonstrated that some **use tools**: for example, the bottlenose dolphins of Shark Bay (Australia) use some sponges to protect their snout as they trawl the seabed in search of prey.

- **Learning** takes place from generation to generation.

- Dolphins **consolidate bonds:** Having sexual relationships and caressing one another. It is one of the few animal species that can have sexual relations for purposes other than reproduction. In a group of dolphins, a female usually has sexual encounters with more than one male.

- **They help one another:** Sometimes, a group of dolphins has been seen helping one of its family members which has difficulty swimming (due to a malformed fin, having lost part of its dorsal fin due to shark attack, or amputation from a boat propeller). A mother has also been observed helping a newborn calf or transporting and pushing a dead calf, as the rest of the group protect or help her.

- In a situation of **social conflict**, one of the solution strategies of the attacked dolphin is to flee.

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Feeding strategies are transmitted culturally from mother to calf, passing from generation to generation.

FOOD

• Having a very varied diet, they devote a large part of the day to searching for food. 80-90% of the time is spent underwater.

• **Cooperative feeding** (fishing and hunting strategy such as pursuing fish to the beach to trap them or trawling for shrimps) is typical. However, they generally exhibit individual strategies for catching fish and plenty of variation: hunting at great speed, beating fish out of the water with their fins, producing bubbles to direct prey to the surface and stunning them with percussive jumps and tail movements ("kerplunking").

• Food strategies depend on the target prey and their location (open sea or near the coast) and are **transmitted culturally from mother to calf, passing from generation to generation.**

• Depending on age and sex, they feed in different areas: lactating females, together with their calves, feed close to the coast; juveniles frequent open seas when they eat; and adult males and the rest of the females feed even further from the coast.

COMMUNICATION

• By means of caresses, sounds and adopting specific postures depending on what they wish to express. They have their own language: they are called by name and use **different sounds depending on what they wish to communicate**. In Moray Firth (Scotland), they produce low-frequency bellow-like calls, which clearly correlate to the common or Atlantic salmon. Any nearby dolphins quickly head for the spot in response to these calls; it is believed these have evolved due to their role in manipulating prey rather than attracting fellow dolphins.

• They can recognise the calls of fellow dolphins with whom they had been in contact 20 years previously, demonstrating that they have a **long-term memory.**

DOLPHINS IN CAPTIVITY

The 2012-2020 strategic plan involves the construction of a new dolphinarium within the current Zoo perimeter. This new facility will span approximately 2,083 m2, seven times the dimensions of the current one.

It will be a unique open-air space with variable depths between 1.5 and 5 metres (at present the maximum depth is 3.5 m). This unique space will be formed by the main pool, one quarantine (away from the public eye) and one naturalised pool, all three of which are connected. Dolphins will always be visible to visitors, incorporating an underwater viewing area. Shows in the stands will be stopped.

This project aims to guarantee and improve the wellbeing of the animals, following the requirements of the European Association of Aquatic Mammals.

These renovations will serve to alleviate, to a certain degree, the consequences of captivity suffered by these animals. Likely it is the best thing that can be done for these individuals specifically.

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However, this commitment to the animals' well-being will be true provided that the Zoo does not continue the captive breeding of some animals not included in any reintroduction programme. This is because expanding the facilities will not stop continued support of the problems caused by captivity.

CONSEQUENCES OF CAPTIVITY

As we have described in the previous chapter, no pool, however large, will be able to meet the vital needs of an animal as complex as the dolphin.

CONFINEMENT

- They spend over 50% of the time on the surface, floating inactively.

- They have less than 1% of the space available to them in their natural habitat. Due to the lack of basic space, they cannot swim at normal, habitual speeds.

- They eat dead fish and enjoy much less variety. Most of the time their food is frozen fish, which they have to earn by working (shows).

- When they experience conflicts, there is nowhere for them to go.

- Complete absence of environmental enrichment: there are no other marine species, there is no marine vegetation, there is no cohesive family social group, there is no predatory behaviour, diet is not at all varied and is received in a totally artificial way, they experience sounds that would not exist in the sea (applause, shouts, whistles from the trainers, music, water purifier).

- They don't use their echolocation system; they have nothing to explore.

PHYSICAL AND PSYCHOLOGICAL CONSEQUENCES

- The confined situation turns stress into chronic or non-adaptive stress, causing aggressive behaviours.

- They have to be dosed with vitamins and on many occasions benzodiazepines or hormones to stop:

  - Harassment of females,
  - Confrontation among males,
  - The group harassing an individual,
  - Aggression, above all in males

- They have to be given antacids to try to prevent gastric ulcers.

- Family relationships are broken as a result of exchanges and the sale of specimens from one dolphinarium to another. There is a very high percentage of mothers rejecting their calves, largely caused by the stress of enclosure, as well as females forced to be mothers too early.

- Greater incidence of neonatal death.

- The only stimulus they receive is in training and the shows: although they are distracted, the sounds of music, shouts, clapping, and stamping on the platform generates stress.

- Endoscopes must be performed in order to extract objects swallowed in the pool (trainer whistles and any object that falls into the area by accident, including the pool paint). In order to perform these procedures, sedatives are used, which, on occasion, are also used to stop the aggressive behaviour of some dolphins. During the gastric endoscopes, ulcerative areas are detected, very possibly due to the stress of captivity. As a result, they are sometimes administered antacid drugs.

- They are given vitamins, which are lacking in the type of diet they receive.

- They regularly receive doses of antiparasitic drugs, antibiotics and antifungals due to the high incidence of Candidiasis.

- The diseases that occur in dolphinariums are, on many occasions, the result of immunosuppression caused by stress.

- Some microorganisms that affect marine mammals in captivity and are zoonotic (can be passed on to humans) are: Erysipelotrix, Brucella, Candida albicans, Mycobacterium marinum, Actinobacillus, Salmonella.

- In the USA, diseases were detected caused by two viruses exclusive to the captive state (not observed in cetaceans in the wild): the Virus West Nile and the Saint Louis disease.

STEREOTYPIES (signs of chronic stress) and other types of diseases observed in dolphins in zoos:

- Turning constantly and in the same direction in the pool.
- Floating without doing anything for a long time.
- Poking the head repeatedly to the surface, the body in vertical position in the pool.
- Biting walls and the pool bars, which causes dentition problems. Sometimes, root canal procedures or drilling the teeth must be carried out in order to avoid systemic infections through the damaged dental pieces.
- Rubbing the head and chin against the walls: this causes lesions to their delicate skin.
- Vomiting.

They have less than 1% of the space available to them in their natural habitat. Family relationships are broken as a result of exchanges and the sale of specimens from one dolphinarium to another.

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