

# ISSUES AROUND CETACEANS IN CAPTIVITY

&

## Potential for Commercial Dolphin-Watching in Tunisia



With the support of:



Report by Chloé Yzoard, Réseau-Cétacés © July 2009

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  - Establishes an informative network to denunciate the living conditions of cetaceans in captivity to put an end to their capture and to rehabilitate captive dolphins, porpoises, beluga whales, killer whales...
  - Sets up an action plans to fight against cetacean slaughters for instance in Japan, Peru and in the Faeroe Islands.
  - Monitors the “friendly” wild dolphins «Dony/Randy» and «Jean-Floc'h», broadcasts information about them to the public and to the authorities, and manages the issues related the particularities of these dolphins
- Is a Member of the Vigilance and Action for the Animal Welfare Committee.

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## INTRODUCTION

Tunisian and Czech groups are currently building the “Sea World Complex” tourism resort at Hammamet, in Tunisia. The commercial project aims at increasing the husbandry capacity and the entertainment offers on the site. The future resort will include a high standing hotel, commercial and real-estate structures, as well as aquatic animation units within an aquatic theme park and a dolphinarium. At the same time, a Tunisian group is also planning to open a dolphin facility at la Goulette, by the Tunisian capital, Tunis.

There is currently no dolphinarium in Tunisia. Some Tunisian citizens have already showed their opposition against the establishment of this type of attraction on their territory. This entertainment is based on the performance of anthropomorphic shows of poor educational content by trained wild-born or captivity-born cetaceans. The bottlenose dolphin (*Tursiops truncatus*) is the cetacean species most commonly exhibited in international marine parks.

Studies carried out in wild and in artificial environments now allow a better understanding of the biological, ethological and ecological requirements of the bottlenose dolphin. These predators daily swim dozens of kilometres in search of preys and live within social groups characterised by their complex and mobile structure. On the basis of these scientific data on the species, the capture of wild specimens and the maintenance of dolphins in captivity is now discussed. The species incompatibility for the confinement in captivity was underlined by a number of studies and by sixty years of operations of dolphinariums worldwide. A range of problems linked to life conditions in captivity was highlighted. Dolphins housed in artificial environments are confronted with a range of provocative environmental challenges. Captive dolphins suffer from abiotic environmental strains such as chemically-treated water and the exposure to loud sounds. Confinement-specific stressors include restricted movements, a reduced retreat space, forced human contact and proximity, maintenance of abnormal and artificial social groupings, restricted feeding opportunities and unnatural food sources based on dead fish and the performance of shows in exchange of food awards.

On these bases, the use of captive cetaceans for exhibition and commercial purposes has become morally questionable. As a response, a number of countries have adapted their legislations in order to ban dolphinariums on their territories. These decisions are based upon reports produced by expert commissions in charge of assessing the case of cetaceans in captivity. The confinement-specific issues to the impact of the captures of live specimens on wild populations and on marine biodiversity are strong arguments that suggest that commercial, scientific, educational or entertainment justifications are no longer sufficient to support the opening of new dolphinariums, such as those planned at Hammamet or La Goulette.

This report aims at providing a synthesis on the protection status of the bottlenose dolphin and on the issues around the species in captivity. The opening of dolphinariums at Hammamet and La Goulette imply a non-ethical use of dolphins, of probable wild origin. This report formulates its opposition to this project and suggests the commercial alternative of a sustainable dolphin-watching. This branch of ecotourism allows a sustainable and commercial use of the cetaceans, as halieutic resources, through the regulated observation of wild specimens in their environment. The bottlenose dolphin is a common species along Tunisian coasts and specimens are frequently observed by tourists and fishermen. Sustainable dolphin-watching is an opportunity for long-term economic, scientific and educational development of the local communities of Hammamet, La Goulette and other Tunisian coastal cities.

## 1. THE BOTTLENOSE DOLPHIN: A PROTECTED SPECIES

### 1. 1 Protection

Wild populations of bottlenose dolphins (*Tursiops truncatus*) benefit from a total protection in Tunisia. A number of laws, conventions and agreements aim at ensuring the protection and conservation of the species and its natural habitat at national and international levels.

#### 1.1.1 In Tunisia

Dolphins are totally protected within Tunisian territorial waters by national laws. This protection is ensured by the Law on Fishery n° 94-13, January 31, 1994, and by the Ministerial Decree, September 28, 1995, that manages the organisation of Fisheries. As mentioned in the International Workshop on Bycatch within the ACCOBAMS Area (September 2008), the **Tunisian legislation prohibits the capture, trade and the maintenance of cetaceans in captivity within its territory.** The regulations prohibit the use and possession of some fishing gear, such as drift nets, that are responsible for a strong mortality in wild cetaceans. Finally, the Réseau National de Surveillance et d'Échouage [National Surveillance and Stranding Network] was established in three coastal sectors (North, South, East) to rescue distressed cetaceans and monitor the strandings. Furthermore, Tunisia ratified a number of international conventions, agreements and protocols related to the protection of cetaceans and their habitat:

- The ACCOBAMS Agreement (24 November 1996) *ratified by Tunisia and adopted by the Law n° 2001 - 68 of 11 November 2001*;
- The Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (Barcelona, 10 June 1995), *ratified by Tunisia and adopted by the Law n° 98 - 15 of 23 February 1998*;
- The Bern Convention on the Conservation of European Wildlife and the Natural Habitats (19 September 1979), *ratified by Tunisia and adopted by the Law n° 95-75 of 7 August 1995*;
- The Bonn Convention on the Conservation of Migratory Species of Wild Animals (19 June 1979), *ratified by Tunisia and adopted by the Law n° 86-63 of 16 July 1986*;
- The United Nations Convention on the Law of the Sea (Montego Bay, 1982), *ratified by Tunisia and adopted by the Law n° 85-6 of 22 February 1985*;
- The General Fisheries Commission for the Mediterranean, *ratified by Tunisia and adopted by the Law n° 2002-35 of 1 April 2002*;
- The Convention on Biological Diversity (Rio, 1992), *ratified by Tunisia and adopted by the Law n° 93-45 of 3 May 1993*;
- The Action Plan for the Conservation of Cetaceans in the Mediterranean (PNUE/PAM), 1991;
- ONU Conventions on Biological Diversity, New-York, 1992;

- The Convention concerning World Cultural and Natural Heritage (UNESCO), Paris, 1971;
- The African Convention on the Conservation of Nature and Natural Resources, Alger, 1975.

### 1.1.2 In Europe

- The RAMOGE (1979) Agreement between France, Italy and Monaco, aims at protecting Mediterranean fauna and flora.
- The European Directive: The bottlenose dolphin (*Tursiops truncatus*) is listed in the Annex II of the Council Directive «Habitats» 92/43 of 21 May 1992 on the Conservation of Natural Habitats (Fauna and Flora).
- The PELAGOS Agreement on the creation of a Sanctuary in the Mediterranean for the protection of marine mammals, prohibits "the deliberated take or intentional perturbation" of the mammals.

## 1.2 Commercial trade

### 1.2.1 Regulations

National legislations of numerous countries protect their wild populations of cetaceans from anthropogenic threats (fisheries, trade, capture of live specimens, use of lethal fishing gear). Oppositely, some countries consider cetacean capture and trade as a source of income. Thus, Japan, Cuba, the Salomon Islands, or Russia authorize the capture of live specimens for exhibition, trade and export purposes, within their territorial waters. Nevertheless, no monitoring of the populations targeted by these captures is currently ensuring the sustainable exploitation of the stocks.

The trade and exports of wild-caught dolphins respond to the recurrent demands for live specimens from dolphinariums worldwide. Indeed, dolphin facilities depend on this regular supply to compensate the mortality and the deficient reproduction of dolphins in artificial environments. The arrival of wild-caught specimens from these countries provides valuable new genetic material for "breeding programs" in existing facilities, and supplies animals to new facilities.

Listed in the Annex II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 1973), the bottlenose dolphin is not currently considered as an endangered species. However, the trade of live specimens must be strictly controlled to maintain the current status of the species (CITES, article 2, 2001). Bottlenose dolphins are subject to an international trade, authorised under strict conditions: an export permit and/or a re-export certificate must be delivered by the authorities, and exports must not be prejudicial to the survival of the species. Regarding the Black Sea bottlenose dolphin subspecies (*Tursiops truncatus ponticus*), the CITES (*ratified by Tunisia and adopted by the Law n° 74-12 of 11 March 1974, ratifying the JORT n° 73 of 14 May 1974, p.1002*) delivered a zero specimen quota for trade purposes. The status of the Mediterranean populations is defined as vulnerable in the Red List of the International Union of Conservation of Nature (IUCN/ACCOBAMS, 2006).

## 1.2.2 Norms

The maintenance of dolphins in captivity is regulated by a number of regulations, variable according to the countries. They define parameters of minimum standards for husbandry such as pool dimensions, environmental enrichment, veterinary care, food, transport or water quality.



For instance, the French Code of Environment applied to zoological parks requires that the institutions satisfy « biological and conservation needs of the different species, by adapting the enclosures in accordance to each species and so as to maintain quality breeding conditions [...]». The European Council Directive "Zoos" 1999/22/CE of 29 March 1999, regarding the maintenance of wild animals in a zoological environment, requires that Member States guarantee living conditions to their animals that respond to the biological requirements and to the conservation of the different species. Among these conditions, zoological parks must provide specifically adapted enclosures." It is also specified that European zoos must "participate to investigations that directly benefit the conservation of the species".

A regulation of the Commission of the European Communities, establishing the conditions on the delivery of import permits for live cetaceans, and covered by the regulations CEE n° 3626/82, defines the minimal pool deepness at 5 meters on 20 % of its surface (3.5 meters on the remaining surface), and minimal water volume to a minimum of 1 500 m<sup>3</sup> (for five dolphins belonging to the species *Tursiops truncatus*). Point n° 21 of the norms (B) mentions that "the pool water must not be prejudicial to the animal health. The water must be clear, colourless and odourless, except for a light smell of chlorine compounds."

"The building of a dolphinarium must respond to specific norms, determined by the law, and in accordance with the Decree of 24 August 1981 for France, and to the CEE Regulation n°3626/82 of 3 December 1982 relative to the application of the CITES regulations in the community. The exhibition pools of the dolphins must have a minimal surface of 800 m<sup>2</sup>, a minimal height of 1.5 times the average length of the species sheltered (4.5 meters for the *Tursiops truncatus* species) and the ceiling must be at least 5 meters high in covered installations. The main exhibition pool must be backed with an isolation pool dedicated to sanitary controls and veterinary cares (...)."

Moreover, guidelines of minimal standards for housing captive dolphins were established by the European Association for Aquatic Mammals (EAAM). As well as the dimensions and the composition of the infrastructures, other husbandry parameters include the noise, the aquatic environment, the food, veterinary cares, general hygiene, ethics, education and research (EAAM, official site). The transport of live marine mammals must respect the IATA regulations on the transport of live animals.

## 2. THE DOLPHIN-CLOWN INDUSTRY

### 2.1 A fictitious smile

Two belugas whales were the first cetaceans ever exhibited to the public, in 1860, by the circus Barnum in the United States. Nevertheless, the dolphinarium industry really started with the opening of the Marine Studio of Florida, in 1948, with the first dolphins being trained by the Circus Barnum tamer in 1956, and the export of the first shows abroad, in 1966. During the 1960's, the TV show *Flipper* made the species popular among a public quickly seduced by the playful, altruistic and smiley appearance of the dolphin-actor. During this period, marine parks that exhibited their first dolphins, captured in the Gulf of Mexico, enjoyed a real success. The public could watch animals apparently performing their tricks with pleasure and dexterity in their concrete tanks. This dolphin-clown caricature, always happy and dedicated to man, that the series and marine parks still broadcast nowadays, is not representative of the wild and self-conscious predator. The dolphinarium industry was built on an illusion the public believes in with conviction; dolphins are obedient and disciplined animals that enjoy performing shows.

The flourishing industry developed worldwide at the incessant price of wild cetaceans that supplied parks and aquariums. In the United-States, the Marine Mammal Inventory of the National Marine Fisheries Services (NOAA), unique institution in charge of the captive marine mammals data confirmed the death of 1127 bottlenose dolphins during the past 30 years on the North-American territory. More than half of the 875 individuals reported, and from which the age could be determined, did not reach 10 years and 83 % died before they reached 20 years (Kestin, 2004). A number of scientific publications highlight the negative impact of captures and life in captivity on the cetaceans; likely to be the causes of the high mortality rates among captive specimens (ex. Small and DeMaster, 1995a, 1995b; Clubb and Mason, 2003).

### 2.2. The dolphinarium industry

Few animals generate as much money as the marine mammals. On the international market, the value of a single dolphin is estimated as US\$ 5 millions (Kestin, 2004). This includes the costly life insurances fees contracted by the owners, because dolphins are frequently moved between facilities in order to increase the probability of successful reproduction. The value of a bottlenose dolphin on the market went from US\$ 300 in the 1960's to US\$ 100 000 nowadays. This astonishingly high price is justified by the million dollar a single animal can generate per year. In the United States, dolphins are considered as guarantees to obtain loans in American banks. Even dead, they generate money to their owners who contracted rich life insurance policies. The lucrative trade of captive dolphins generates large amounts of money for multinationals. The companies commercialise products at the image of their captive dolphins, killer whales and beluga whales, and obtain copyright on their names (Shamu® and Shouka®, for instance). Their benefits are boosted by the expensive entrance tickets and the sale of a wide range of souvenirs to their visitors.

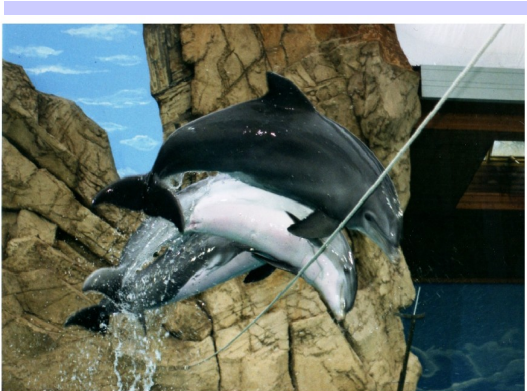
During the past years, several countries in the Caribbean and in Latin America have opened their own facilities in an attempt to attract tourists in search of cheap dolphin facilities. The lack of national legislations controlling the dolphinarium

industry, inadequate infrastructures, inappropriate food, and non-existent veterinary cares still cause today high mortality rates among the captive population of these dolphinariums.

Commercial interests have also led novice countries in the field of dolphin trade, like Japan and the Salomon Islands, to organise massive captures of entire pods of wild dolphins. The lack of knowledge in cetacean management caused the deaths of dozens of individuals within their precarious enclosures at the Salomon Islands. A recent study showed that the dolphinarium industry was directly implicated in the cetacean hunts at Taiji, Japan, famous for the traditional slaughter of hundreds of cetaceans each year (WDCS, 2006). As well as the usual collective slaughter, Japanese fishermen now select the most beautiful specimens in order to sell and export them to national and international marine parks.

### 2.3 Educational value

The maintenance of dolphins in captivity would be ethically receivable if it significantly contributed to the education and to the awareness of the public on the conservation of the species. In these conditions, the individual well-being is secondary after the educational benefits of the exhibition of the species to the public.



The “educational” justification supporting captive dolphin shows is however weak in front of the exceptional benefits generated by the industry. Moreover, no sociological study has ever proved that the exhibition of cetaceans had educational benefits, which are anecdotal (Reeves and Mead, 1999; Reynolds *et al.*, 2000). Dolphin shows, similar to circus performances, have a discussed educational value. It is indeed difficult to attribute a pedagogical content to the anthropomorphic or comic tricks that constitute most dolphin shows. Cetaceans vocalize on demand, voluntarily strand on the border of their pool and perform series of synchronized jumps and spirals in exchange of fish. The nature of the installations and dolphin performances are not representative of their natural habitat, the life of wild cetaceans, the complex social structure of their pods and the predation strategies adapted to regions and preys. Brief morphological explanations from trainers do not constitute an educational base sufficiently important to justify the maintenance of dolphins in captivity. The information received by park visitors could even be prejudicial to the public general knowledge and to the respect towards the animal world, as well as minimise the interest for the protection of the species in their natural habitat (Frohoff, 2005).

### 2.4 Ethical considerations

Ethical norms of the standards of captive dolphin husbandry of the EEAAM stipulate that no animal transfer should be carried out without the previous agreement delivered by the authorities, except in an emergency, and that no animal should be sold, lent or given to a facility that does not respect these norms.

Nevertheless, the maintenance of cetaceans in captivity raises questions of animal welfare and ethical orders, although they are under-estimated face to the commercial and scientific preoccupations (Reeves and Mead, 1999; Reynolds *et al.*, 2000). The keeping of large carnivores for educational, commercial and scientific purposes was discussed by a study by Clubb and Mason (2003). The authors aimed at analysing adaptation problems and their manifestations in large captive predators. They concluded that "the keeping of wide-ranging large carnivores should be fundamentally improved or suppressed."

Very few dolphinariums exclusively define themselves as commercial establishments. These facilities auto-determine themselves scientific research and conservation centres. Some use "conservation" or "breeding programs" arguments to justify the import of dolphins or the opening of new dolphinariums (HSUS/WSPA, 2006), but neither conduct research on the species nor contribute to their conservation. In the framework of ex-situ conservation programs, the keeping and breeding of threatened species in captivity allow the increase of the population and the posterior reintroduction of captive-born individuals in their natural habitat. Nevertheless, no ex-situ conservation programs of threatened cetacean species have been accomplished with success, nor captive-born specimens of the world's most endangered cetaceans, such as the vaquita (*Phocoena sinus*) or the Baiji dolphin (*Lipotes vexillifer*) have been reintroduced into the wild. Ex-situ conservation attempts of the vulnerable sub-species of the Black Sea bottlenose dolphin (*T. truncatus ponticus*) had disastrous consequences on the wild-born dolphins kept in captivity for breeding purposes, and did not contribute to the conservation of the species (Entrup and Cartlidge, 1998).



Dolphins are mammals known for their high sociability (Mann *et al.*, 2000), their complex behaviour including the use of tools (Krützen *et al.*, 2005), the transmission of culture to the following generations (Rendell and Whitehead, 2001), language denoting individual identity (Janik *et al.* 2006) and self-consciousness (Reiss and Marino, 2001). Captive-born cetaceans have never hunted live preys, are dependant from the dead fish provided by their trainers, and have always been submitted to a conditioning from humans; as a result, they are unfit candidates for survival in the wild. Captive-born individuals have not acquired the necessary knowledge to satisfy their vital needs or to face the threats in their natural environment. Life in captivity also prevents the cultural transmission of dialects and predation strategies specific to some preys and regions. Finally, according to vets and biologists, to optimise the chances of reintroduction of captivity-born individuals into the wild, these must evolve in an environment close to their natural habitat and they must not undergo any conditioning or habituation process by humans (HUHS/WSPA, 2006; Bremmer-Harrison *et al.*, 2004). To conclude, captive-born specimens are more likely to be used for exportation, exhibition and reproduction purposes, and thus to contribute to the expansion of the dolphinarium industry, than for their reintroduction into the wild for conservation reasons.

Captivity is often justified by the establishment of scientific programs that will contribute to the improvement of the conservation of wild populations. In practice, the investigations are often conducted on the management of captive populations and veterinary medicine to the detriment of the conservation of the species (Rose, 2004). As far as the studies on dolphin behaviour are concerned, they do not seem to bring further elements likely to improve the conservation of wild cetaceans, because of their artificiality (Mayer, 1998).

Although captive populations are isolated within different facilities, the single exhibition of captive specimens to the public has incidences on the conservation of the species (Rose, 2004). Indeed, the significant income generated by these animals contribute to stimulating the opening of new institutions, the captures of wild individuals from unknown populations and the import of dolphins to unsuitable structures. Finally, among the ethically controversial aspects of the maintenance of dolphins in captivity, the capture of wild individuals is certainly the most difficult to justify.

## **2.5 National legislations against the industry**

Several countries have formulated their opposition to the captivity of cetacean for commercial purposes. Following the production of expertise reports on the life conditions of captive cetaceans, and thanks to new data on the biological requirements of the species, several governments have taken measures to ban the opening of dolphinariums, the import of cetaceans and the confinement of the species in captivity within their territories. Thus, Poland, Austria, Denmark, Hungary, Croatia, South Carolina (United-States), Brazil, and India banned the exploitation of captive dolphins. The specific cases of the United Kingdom, Norway, Belgium, Australia and Chile are detailed as follows:

### **▪ The United-Kingdom**

In the 1980's, the Ministry of Environment studied the issues around dolphins in captivity. Two experts were charged to produce a report about the situation of the dolphinariums in Great-Britain. The report aimed at determining whether "the benefits in term of education, scientific research, or reproduction of cetaceans in captivity, were worth the import of wild dolphins for show performances" (WDCS). The inquiry exposed serious dysfunctions within the existing facilities. In response to these problems, the report established a series of standards that defined the husbandry conditions that would best respond to the ethological and social needs of the dolphins (Klinowska and Brown, 1985). The government approved these norms and compelled the facilities to apply them if they wanted to keep on operating. Unable to respond to these costly criteria, all British dolphinariums closed.

### **▪ Norway**

The National Board for Animal Ethics assessed the relevance of a potential dolphinarium establishment on the Norwegian territory. The expertise underlined the complex social structure of the species and long distances that dolphins swim daily: two parameters that are not reproducible in a controlled environment. The report emphasised high mortality rates and the altered reproduction of captive dolphins, even within the best facilities. Consequently, Norway did not approve the implantation of future dolphinariums on its territory.

- **Belgium**

American behavioural biologist, and author of various publications on stress in marine mammals for the International Whaling Commission (IWC), Dr Frohoff has recently assessed the specific case of the Boudewijn Seapark of Bruges. The results revealed the presence of two anxiety-inducing factors threatening the welfare of the dolphins: high and chronic stress levels and a lack of retreat space, likely to increase the risks of aggression, injury and disease transmission among the captive population. The alarmist report on the dolphinarium led to the establishment of a ministerial commission in charge of assessing the issues around dolphins in captivity.

- **Australia (except Queensland)**

In 1985, the Committee for the Animal Protection of the Australian Senate produced a report about the suffering undergone by cetaceans in captivity, and of which the most frequent manifestations are abnormal behaviour, high mortality rates, reduced lifespans, altered reproduction and stress. The Committee concluded that "cetaceans should not undergo the suffering that the privation of freedom and the conditions of life in captivity may cause them".

- **Chile**

Following the death of two dolphins imported from Cuba, shortly after their arrival in the national facility, the authorities established a strict control on the importation conditions of the species. After rejecting all dolphin importation requests for five years, the government eventually prohibited the capture, captivity and export of cetaceans on its territory. The regulations now ban the exhibition of cetaceans, sea lions and marine turtles in Chile.

### 3. ADAPTATION TO CAPTIVITY

#### 3.1 Supply

The rules of offer and demand is also applied to the dolphinarium industry. High mortality rates and the altered reproduction of captive cetaceans stimulate the captures of wild specimens that will ultimately supply international facilities. Few cetacean species reproduce successfully in captivity, and in spite of sixty years of operation, generations renew themselves with difficulty in tanks (Rose, 2004). A minority of facilities maintain their captive populations to stable levels due to breeding programs. On a global point of view, the industry still depends on the capture of wild-caught dolphins to supply their tanks. Consequently, a large part of the dolphins exhibited to the public in aquatic parks are wild animals (Rose, 2004).

The economic success of multinationals stimulate the commercial interest for the capture and trade of wild dolphins. Thus, entrepreneurs from developing countries, willing to reproduce the success of international theme parks, open their own facilities. Capture and trade of wild cetacean specimens has grown into a real industry in the Caribbean, Asia and Oceania, where Japan and the Solomon Islands have recently integrated this trade by organising important capture campaigns (Reeves *et al.*, 2003). Following their captures, wild specimens undergo a transitory period of "desensitization", before being exported by plane, often over long distances, to worldwide destinations.

Although the trade of wild specimens is regulated by CITES (cf. 1.2.1 Regulations), the populations targeted by these captures are not sufficiently known to guarantee the sustainable exploitation of the stocks. Indeed, the countries involved in this trade often lack the financial means to conduct the monitoring of their cetacean populations. The captures are therefore likely to have devastating consequences on some stocks: population decrease, unbalanced male-female ratio, collateral deaths, group disintegration, social disorganisation, reproduction problems or the separation of the females and their calves. The sub-species of the Black Sea bottlenose dolphin (*Tursiops truncatus ponticus*) suffered a strong diminution of its population due to intensive hunts and to the capture of live specimens to supply the aquariums of the region. Now vulnerable, a capture quota of zero individual has been maintained by the CITES since 2002.

#### 3.2 Capture

On an international level, the capture of wild bottlenose dolphins for entertainment, scientific and cultural purposes represents a major threat on wild populations (IUCN, 1996). Any capture of wild animals results stressful, whatever the techniques used (NOAA, 2002; Curry, 1999). The physical responses of stress caused by the captures and the transport in cetaceans are described posteriorly (4.3 Stress).

Captures are prejudicial to individuals as well as to the populations they belong to (Lusseau and Newman 2004; Williams and Lusseau 2006). The capture of wild dolphins is carried out in a brutal way using fast boats and nets. The dolphin pod is detected and then encircled with nets extended by motorized boats, sometimes after a several hour chase. The selected dolphins, predominantly young females with a high reproductive potential, are initially separated from their counterparts and then individually captured. Placed on a stretcher, each specimen is hauled on board of the boat, where a team will determine its sex and the health status.

Numerous animals get injured or die from the successive shocks generated by the capture process. The chase and capture may cause muscular conditions that affect the physiological status of the mammals and the post-capture survival. These individuals then show a predisposition to predation and accidents (Williams and Thorne, 1996). These practices cause the social separations of individuals affectively close. During the capture process, individuals frequently get drowned or injured in the nets, pregnant females may abort and mothers may be separated from their calves. Moreover, fragile species or individuals can succumb from heart attacks. Contrary to other mammals, the use of anesthesia as a method to facilitate wild animal capture and handling is impractical in cetaceans, because they consciously control their breathing. Out of water, the terrestrial gravity exerts a pressure on the respiratory tracts, occasioning a discomfort in the cetacean. Moreover, their fragile skin gets rapidly dehydrated and cracked in contact with the air and must be covered by a specific hydrating lotion (Hernandez and Hernandez, 2000). The animals definitively selected are placed in individual boxes and are transported to the desensitisation enclosures.

### 3.3 Desensitisation

The newly captured dolphin is separated from the social group it was affectively attached to, and undergoes direct contact with humans and physical barriers for the first time. The next step following the capture is the desensitisation of the wild animals. It includes the habituation to humans, the maintenance in an artificial, closed and reduced environment, the acceptance of hand-feeding and dead fish. A fundamental phase of the desensitisation process is the acceptance of dead fish, instead of life preys, and hand-feeding. If animals do not adapt rapidly to this new diet, they will have to be intubated and force-fed to prevent any risk of dehydration or under-nutrition (cf. Picture).



The wild dolphin challenged by confinement-specific and stressful factors passes through an initial period of adaptation to life in captivity judged "critical" by the experts. Stress, confinement and transport often lead to the death of wild dolphins during the first days and weeks following their capture (Martin, 1990). According to Small et DeMaster (1995b), the risk of mortality of a dolphin during the first 30 days is a factor six. The strong mortality incidence linked to the deficient adaptation is statistically problematic as it generates a significant bias during the first 60 days of captivity. Small and DeMaster (1995b) found a solution by establishing an acclimatization period defined as "interval of time of relatively high mortality, that must be treated separately from the long-term estimations in husbandry assessments of aquatic and zoological parks" (p.510). The desensitisation period is consequently not included in the calculations of survival rate linked to the arrival of the animal in the facility. The animals that die during these 60 days post-capture are not included in the general husbandry data. Nevertheless, some parks process to their own captures or supervise local capture operators. The mortality caused by the capture should therefore be included in the practice of husbandry of the facility.

### 3.4 Wild vs. Confinement



In its natural environment, a bottlenose dolphin swims up to 100 kilometres/day on its territory and the species is able to dive down to 200 meters. The dolphin is a sociable species. Tight bonds exist between mothers and their offspring, however, inter-individual relationships are characterised by a great flexibility (CITES, 2001). The size and social structures of a dolphin pod presents important seasonal and annual variations. The members of the pod communicate by the mean of whistles and vocalisations. Each dolphin has its own individual repertory. Studies have also shown the potential of acoustic apprenticeship in dolphins as they imitate the whistles of other individuals (Janik *et al.*, 2006). They also use echolocation to detect their surroundings and to hunt their preys.

In the wild, the daily routine of a dolphin is composed of four classes of activities: search of prey (33%), displacement, rest and social interactions. This predator shows a great behavioural flexibility; hunt techniques are elaborated and variable according to the regions and the preys targeted. At sea, 80% of their activities occur underwater (CITES, 2001).

Dolphins housed in artificial environments are confronted with a range of provocative environmental challenges. Captive dolphins suffer from abiotic environmental strains such chemically-treated water, food based upon dead preys and exposure to loud sounds. Confinement-specific stressors include restricted movements, a reduced retreat space, forced human contact and proximity, maintenance of abnormal and artificial social groupings, restricted feeding opportunities and the performance of shows in exchange of food rewards.

In absence of live preys in their enclosures, dolphins depend on the dead fish administered at the surface from the hand of their trainers, which considerably increases their activity period at the surface. Hand-feeding and food control are the basis of conditioning and training in cetaceans. Dolphins will be progressively trained to perform on demand a range of tricks and conducts. After the successful performance of the trick required by the trainer, the dolphin receives a food reward. The series of tricks elaborates a show for public exhibition. Consequently, the participation to shows is strongly motivated by food awards. Some conducts are also learnt to ease veterinary controls and treatments.

The lack of environmental enrichment in captivity causes the under-stimulation and depression of captive animals, which reinforces their positive behaviour towards their trainers. No published study has confirmed that interactions with the public reduced boredom in captive dolphins.

## 4. CAPTIVITY EFFECTS

### 4.1 Survival and life span

Small and DeMaster (1995a) analysed the data from the *Marine Mammal Inventory Report*, managed by the *National Marine Fisheries Services*, so as to define captive bottlenose dolphins survival rate for the period 1940-1992. Other studies analysed the survival rates of wild populations and captive populations of the species (Table 1).

**Table 1.** Annual reciprocal mortality rates of bottlenose dolphins (*Tursiops truncatus*) in captivity and in the wild (**Source:** HSUH/WSPA, 2006)

Species	Mortality rate in captivity			Mortality rate in the wild	
	DeMaster & Drevenak (1988)	Duffield & Wells (1991)	Small & DeMaster (1995a)	Woodley et al. (1994)	Wells et Scott (1990)
<i>Tursiops truncatus</i>	7,0 % <sup>a *</sup>	7,4 % <sup>*</sup>	5,6 % <sup>a</sup>	5,7 % <sup>a</sup>	3,9 % <sup>a</sup>

<sup>a</sup>Non-juveniles only included on the statistics

\*No statistical comparisons were made between wild and captive dolphins data

No study has yet demonstrated that captivity was favourable to the survival of dolphins by reducing the mortality rates of captive specimens in relation to their wild counterparts, even in juveniles, and thus after sixty years of operation of dolphinariums (Woodley et al. 1997). Although, according to DeMaster and Drevenak (1988), and Duffield and Wells (1991), captive and wild dolphins show similar survival rates and life spans, other studies show that the annual mortality rates are higher in captive dolphins than in wild dolphins (Woodley *et al.*, 1994; Small and DeMaster, 1995a). Moreover, the individual survival, all ages included, significantly varies according to the facilities (Small and DeMaster, 1995a).

It is difficult to determine how long dolphins live in the wild and in captivity. Short durations of the data collection, small populations and reduced geographic areas are limiting parameters of field studies. At Sarasota Bay in Florida, studies carried out for the past 36 years on a population of 140 wild dolphins, attest the presence of four 50 year-old dolphins. According to the biologist from the Zoos and Aquariums Association (AZA), the lifespan of dolphins in captivity is 20 years (Kestin, 2004). In the United-States, the industry declared the deaths of 1127 bottlenose dolphins, of which over 50% never reached 10 years, and 83% the age of 20 years. Captive-born dolphin died younger than those captured in the wild, or rescued from strandings (Table 2).

**Table 2.** Average age reached by dolphins that died in captivity according to their origins

Origin	Total	Average Age
Captured in the wild	469	15,5
Rescued from strandings	7	9,5
Born in captivity	313	2,5
Captivity-born and that survived their first year	118	6,3

**Source:** Data from the Marine Mammal Inventory Report (MMIR), NMFS (Kestin, 2004)

According to the dolphinarium industry, captive cetaceans are nowadays healthier and live longer than at its beginning; thanks to better knowledge on the species, as well as more appropriate feeding and veterinary cares. In spite of the precautions taken by scientists to assess the lifespans of wild and captive dolphins, some parks do not hesitate to announce that captive dolphins live longer than their wild counterparts. On their official website (2007), the Marineland of Antibes declared that "the lifespan [of bottlenose dolphins] is estimated as 35 years old or more. In marine parks, their lifespan is favourably extended because natural threats (predators and diseases) are eliminated or very reduced". This information, although not supported by any scientific study, is indeed better accepted by the visitors. It would be profitable for some parks to broadcast false informations about the lifespan of their captive dolphins.

According to experts of the dolphinarium industry, thirty more years will be necessary to define the exact lifespan of dolphins in captivity. The survival of wild dolphins is threatened by various factors naturally present in their habitat; predation, starvation, intoxication, accidents and diseases (Reynolds *et al.*, 2000). On the contrary, captive dolphins do not face the hazards of life at sea. The question then rises of the reasons why captive dolphins die in such high proportions in captivity.

#### 4.2 Causes of mortality

The data analysis of 500 captive dolphins, reported on the *Marine Mammal Inventory Report* of the *National Marine Fisheries Services* reviews the causes of mortality in captive dolphins (Kestin, 2004). They include:

Accidental (195)		Pathological (101)		Infrastructural (33)	
Drowning	76	Ulcers	36	Works	1
Accident/Injury	52	Stress	24	Malnutrition	9
Ingestion of foreign objects	37	Heat exhaustion/Exhaustion	15	Excess of chlorine	6
Poisoning	9	Salmonella/Botulism	10	Inappropriate food	3
Asphyxiation	8	Hyperthermia	7	Strikes	3
Electrocution	6	Anorexia/starvation	6		
Food obstruction	4	Overwork	3		
Attacks from guard dogs	3				
Handling (45)		Behavioural (29)		Medical (66)	
Transfer/Transport	26	Attack from other dolphins	27	Anaesthesia/Intervention	57
Captures	19	Lost of a companion	1	Reaction to drugs	9
		Autodestruction	1		

**Source:** Data from the Marine Mammal Inventory Report of the National Marine Fisheries Services

Accidents represent a significant cause of mortality in captive dolphins in North-American facilities, although they could be avoided by appropriate preventive measures in a number of cases (for example attacks from guard dogs, electrocution, ingestion of foreign objects).

According to medical publications, bacteriological infections would be the first cause of mortality in captive dolphins (Dhermain *et al.*, 2002). Captive specimens are particularly sensitive to septicaemia and to respiratory pathologies, such as bacterial pneumonia. The part of allergies and secondary immune deficiencies were determined in the pathogenesis of infectious diseases in cetaceans (Birkun *et al.*, 1990). Furthermore, heart pathologies, autistic deviation and *post-partum* complications are frequently reported in captive cetaceans. Gastric ulcers represent half of the deaths reported in French dolphinariums (Com. SOS Grand Bleu). Although they are rarely represented in the wild, pathogens of the types *Candida albicans*, *Trichophyton* sp., or *Rhizopus* mycosis, which cause fungus infections, are specifically found in captivity (Dhermain *et al.* 2002).

Captive-born dolphins are subject to perinatal mortality caused by various conditions (Garner *et al.*, 2002). The mortality of captive-born calves is not inferior to the calves born in the wild (Woodley *et al.*, 1997). The causes of mortality include inappropriate or insufficient maternal care, inadequate nursing, incomplete foetal development and attacks from other dolphins within the enclosures.

### 4.3 Stress

Dolphins suffer high and maintained levels of stress, due to the confinement-specific pressures and abiotic environmental strains, which could partially explain the high mortality rates of captive specimens (Rose, 2004). A number of publications highlight physiological effects of stress in dolphins as a result of captures, life in captivity and medical handling.



- Stress causes *immunosuppression*, thus increasing the *risk of acquiring infections and allergies* (St. Aubin and Dierauf, 2001), by affecting plasmatic levels of iron, glucose, and eosinophilus white cells in the blood (St. Aubin and Geraci, 1990). The quality of immune system is compromised if viruses, parasites, and toxins are over-imposed to the effects of stress (Romano, 1993).
- During the capture process, the intense muscular activity affects the level of muscular enzymes (CK and AST), which reflects *muscular damages* (Geraci and Medway, 1973; St. Aubin and Geraci, 1989), and causes *myopathy, hyperthermia and heart lesions* (Forney *et al.*, 2002).
- Chronic stress generates thyroid dysfunction among captive individuals (Ridgway and Platton, 1971; St. Aubin and Geraci, 1992; St Aubin *et al.*, 1996).
- Captive dolphins that have been regularly handled for years still show physiological responses to the stress of the capture, even in the calmest conditions (Thompson and Geraci, 1986).
- Pathologies linked to stress include *cardiomyopathy, adrenocortical hyperplasia* (Kuiken *et al.*, 1993), *cortical cysts* (Lair *et al.*, 1997), a form of *acute chronic stress* (Myrick and Perkins 1995) and *arteriosclerosis*.

- Stress *alters the normal reproductive functions* in mammals. Restricted movements, a reduced retreat space, forced human contact and proximity, maintenance of abnormal and artificial social groupings, restricted feeding opportunities, the performance of shows, the exposure to noise, veterinary handling and transfers are stressful factors that alter the fertility of captive animals.
- Females can present *reproductive anomalies*, such as altered ovulations and receptivity, difficulties of implantation of the embryo, spontaneous abortion, high calf mortality and nursing problems.
- Other manifestations of stress include anorexia, lost of weight and antisocial behaviour.

#### **4.4 Breeding programs**

Captive breeding programs of cetaceans do not represent a palliative to captures in the wild. Indeed, the renewal of the genetic patrimony will eventually require the contact with wild -born animals.

Furthermore, the lack of control of captive breeding and the absence of fertility regulation programs of sexually mature animals are likely to cause infrastructural and ethical problems. Some facilities, like the Bruges Dolphinarium and the Park Asterix, carry out active breeding programs but already possess insufficient infrastructures for their existent population.

##### **▪ Overpopulation**

The dimensions of the tank determine the maximal dolphin population, according to the husbandry standards for marine mammals in captivity. The reproduction of adult dolphins can significantly increase the captive population in the installations, which will eventually exceed the maximal authorised population.

For instance, at the Park Asterix, the tank initially built for eight dolphins, contained up to eleven individuals until three adult males were transferred to the Cité Marine of Planète Sauvage, in November 2008. Facing overpopulation, the extension of the infrastructures and the transfer of animals are applicable measures, but they generate stress for the transferred and delocalized animals. The medical regulation of fertility is a privileged and stressless option, but it runs counter to the multinational commercial aspirations of the multinationals.

##### **▪ Inbreeding**

Captive breeding in tanks is also favourable to the reproduction of members genetically close. Dolphins that reproduce successfully in their tanks are likely to reproduce with their own offspring, when the calves will have reached their sexual maturity, and if no preventive measures will have been taken.

In practice, in August 2004, Athena, a female born at the Park Asterix, gave birth to a young male. The father of the calf is suspected to be Pichy, Athena's father, dominant male of the group and progenitor of all the calves in the captive population. The results of the genetic tests have not been published.

## 4.5 Abnormal behaviour

Research programs carried out for several decades at Sarasota Bay in Florida and Shark Bay in Australia, underline the incredible sociality of bottlenose dolphins and show their complex hierarchical structure (Tolley *et al.*, 1995). The primary social unit of dolphins is a mutable group, called pod, submitted to movements and interactions between its members. The social structure of the pods is matrilineal with sexual separation. Females maintain close bonds with their calves. They form dynamic groups with other females and their respective offspring (Shane *et al.*, 1986; Tolley, 1995). Males have solitary tendencies and form small coalitions, often duos or trios. They dedicate a large part of their time interacting and establishing social relationships between different groups. Males occasionally join the main group for reproduction purposes (Shane *et al.*, 1986).

In captivity, the social organisation is determined by hierarchies of dominance (Samuels and Gifford, 1997), which contrasts with the more dynamic conjuncture found in the wild, where aggressive conducts are less recurrent thanks to the possibility to retreat. Antagonistic behaviour of dominant males towards subordinates is frequently observed among captive individuals (Cadwell and Cadwell, 1977; Herman, 1980). In presence of hierarchically superior individuals, and with a reduced retreat space, subordinate dolphins suffer from a chronic anxiety-inducing situation in the tanks. These tensions are often responsible for interindividual aggression (cf. Picture), manifestations of stress and physical injuries likely to degenerate in bacterial infections and even to the death of the individuals involved (Waples and Gales, 2002; Buck *et al.* 1987). Increased aggressiveness can also lead dolphins to injure trainers or visitors, in particular if swim-with-dolphin or “dolphin therapy” programs are operating. Even trained, dolphins remain wild and unpredictable animals, capable of injuring confirmed trainers (Norris 1967; Defran and Pryor, 1980). Mazet *et al.* (2004) also suggest that physical contact with dolphins implies significant sanitary risks for humans.

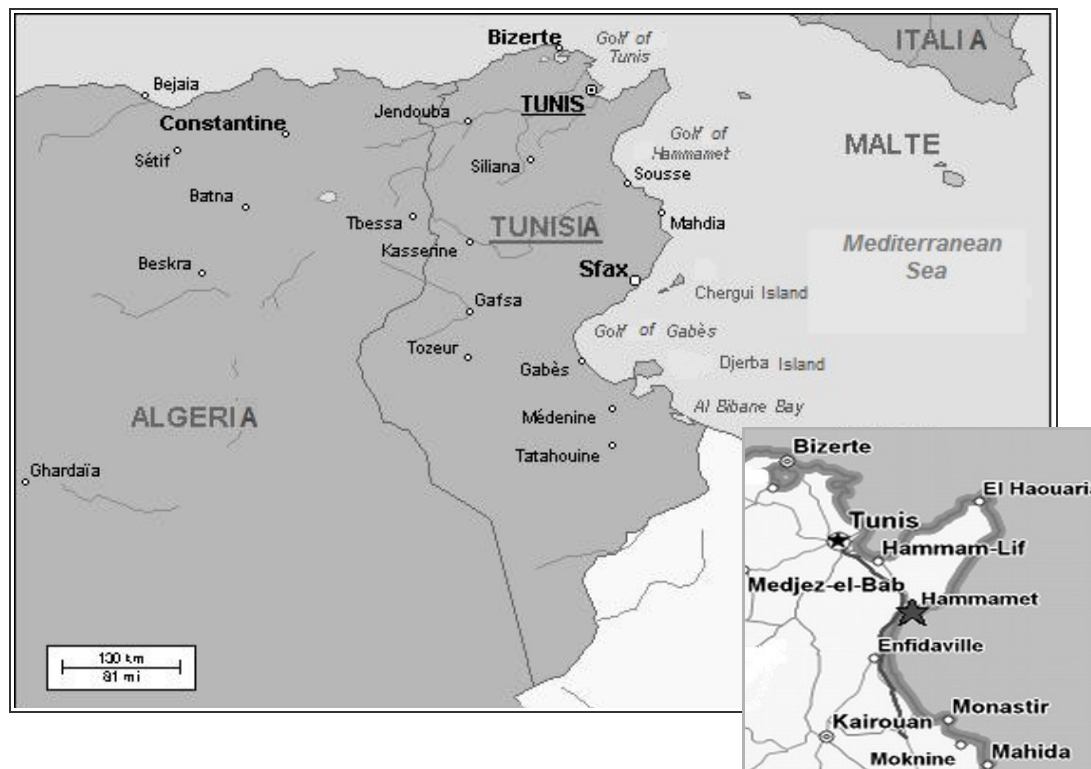


Life in tanks generates stereotyped behaviour in captive dolphins such as swimming in circle and apathy (stillness at the surface or at the bottom of the pool; cf. picture above). Stress is displayed by a range of manifestations such as recurrent, and undergone body blows, deep and repeated inspirations, a solicitation behaviour, collisions with tank walls and the opening of the mouth towards visitors (Frohoff, 2005). Studies also show that captivity affects dolphin acoustic behaviour (ex. Miksis *et al.*, 2002). Dolphins imitate the whistles of their trainers (Miksis *et al.*, 2002). Mothers and aunts produce aggressive vocalisations towards their offspring in order to keep them by their sides, which has never been observed in the wild (McCowan and Reiss, 1995).

## 5. HAMMAMET & LA GOULETTE DOLPHINARIUMS

### 5.1. Hammamet

Hammamet is a city located at the south-east of the Northern part of the Cap Bon Peninsula, 64 kilometres south of Tunis and 85 kilometres north of Sousse. With a population of 63 116 inhabitants (2004), Hammamet covers 3 600 hectares along the Mediterranean coasts.



Popular destination in Tunisia for foreign visitors and Tunisians alike, Hammamet was the first tourist resort of the country, during several years. The city centre is characterised by an imposing Medina. The tourist zone includes an ancient and reduced section at Hammamet-North, and the development of a more extended and recent area at Yasmine Hammamet. Beaches along the Golf of Hammamet attract tourists in search of fine sand and aquatic sports. The local culture is marked by traditional weaving, carpet-making, copper engraving, basket-making, pottery, ceramics and jewellery making. An International festival is organised annually in July-August at Hammamet. Other tourist activities include equestrian shows, performances of popular dances, or parades in traditional clothes.

Before and during the second World War, the “Tunisian Saint-Tropez” welcomed prestigious visitors and celebrities such as Jean Cocteau, the Duke of Windsor, the General Eisenhower or Winston Churchill. After the Tunisian independence in 1956, a Tourism Promotion Plan was established at Hammamet to develop both husbandry capacities and recreational activities. For the past years, the expansion of the hotel zone took place at Hammamet and the lack of respect to the local architectural heritage contributed to a light degradation of the site.

## 5.2. The "Sea World Complex" project

The recent visit of the presidential couple from Czech Republic in Tunisia initiated the building of a new tourist resort and real estate complex at Hammamet (Le Renouveau, 17 of April 2009). As part of a partnership between Tunisia and the Czech Republic, the Czech President, Mr Vaclav Klaus, accompanied by his wife Mrs Livia Klausova, gave a start of the construction of the future 20 ha resort named "Sea World Complex". It will include high standing hotels and of a 5 000 beds capacity, "Sea World Residences", an aqua-park and a dolphinarium. The total duration of the works is estimated at 30 months. The Czech President stressed the importance in developing bilateral relationships between both countries.

Two deals were signed on 16 April 2009 between the Tunisian group *Mrabti*, operator of tourism and industry, and the Czech group *PSJ* (Tunisia Online news, 15 of April 2009). The private group *Mrabit* was funded in 1999 by Mohamed Faouzi Mrabit, the owner of the Hotel Club Bousten at Hammamet and of *G.M. Travel Agency*. The Czech group *PSJ* had already collaborated with the Tunisian group *G.M. Constructions* in the extension of the harbour "La Goulette " in Tunis. Following this successful collaboration, the Czech Group reinforces its interest for the Tunisian market by providing financial assistance and technical know-how to the projects. The finance of the projects is assured by the bank sector through export loans from the Czech Republic to Tunisia (*PSJ*, 4 of February 2009).

The first contract deals with the building of a float glass plant, the first of its kind in Africa, for a cost of 150 million euros (270 million dinars (MTD)), with 20% Czech participation, that will start in November 2009. This project will contribute to the creation of 1 000 jobs, including 500 executives.

The second agreement is the building of the « Sea World Complex », a tourism resort and real estate complex for a 120 million euros investment (216 million dinars (MTD)). The "Sea World" Residences" will be located between Hammamet and Yasmine Hammamet. The project is carried out by "*M.F.M. Tourism Resort Development*", a real estate group located at Gammarth. No data is available on the origin of the dolphins or on the nature of the dolphinarium installations.

## 5.3. La Goulette Dolphinarium



A second dolphinarium project is planned at La Goulette near Tunis, the Tunisian capital. The *Goulette Shipping Cruise* (GSC) Society, a subsidiary of the Group *Princesse Holding*, owned by Mohamed Sakher El Materia, has just announced the opening of a dolphinarium "dedicated to the preservation of the animal species" (Businessnews, 15.06.2009). With a future capacity of 3 000 visitors, the dolphinarium will present shows performed by trained dolphins, within a tourist resort.

The establishment of a dolphinarium at La Goulette aims at providing a recreational activity to the disembarking passengers of cruises at the harbour. La Goulette is indeed the first recreational Tunisian harbour with 90% of activities from all cruisers on the site. The number of passengers from cruises at La Goulette is expected to reach 1 million in 2010, 1.5 millions in 2015, and 2 millions in 2020.

Since 2006, the GCS society has invested in the development of La Goulette harbour to reinforce and increase the attendance of the passengers on the site. GSC won an invitation to tenders for the management of the cruisers traffic at the harbour. On 8 March 2009, the terminal was inaugurated and received the first contingent of tourists. The current 40 million dinars investment from GSC aims at developing the management and the assistance of the ships, the harbour and maritime activities linked to the management of passengers, as well as commercial and entertainment activities within the 6 500 m<sup>2</sup> tourist village (Princesse Elmareti official website).

GSC is planning to import eleven bottlenose dolphins from Cuba into the future La Goulette dolphinarium (Espace Manager, 15 June 2009). These dolphins are probably wild-caught; Cuba is indeed one of the world leader in wild dolphin trade for exhibition and export purposes. It is therefore paradoxical that the GSC group uses the argument of « preservation of the species » to sustain the opening of a dolphinarium by importing dolphins of probable wild origin.

#### 5.4. Entertainment offers

A number of entertainment offers including theme, aquatic and zoological parks exist around Tunis and Hammamet :

- **Hannibal Park**, located at Port Kantaoui, 10 kilometres from Sousse, proposes various attractions such as roundabouts and a pirate boat.
- Sousse shelters the **Aqua Palace Port El Kantaoui** in the Golf of Hammamet.
- At Yasmine Hammamet, the theme park "**Carthageland**" offers a range of entertainment options such as roundabouts, slides and boat-rides.
- At Bouficha, 35 kilometres from Hammamet, the **Friguia Park and Aquarium**, exhibits crocodiles, giraffes, ostriches and flamingoes in large enclosures. The Aquarium sector also presents sea lions to the public.
- The **Belvédère Zoological Park at Tunis**, located 60 kilometres from Hammamet, possesses more than 150 animal species, including 61 mammals, 94 birds and 5 reptile species.

There is currently no dolphins in captivity in Tunisia. Bottlenose dolphins are common species along Tunisian coasts. Pods are frequently observed from boats or the border by fishermen and tourists. The commercial and ethically controversial projects of Hammamet and La Goulette dolphinariums must be rejected to develop the commercial alternative of dolphin-watching. Cetacean-watching is a branch of tourism in expansion. The potential of development of such activities in Tunisia is significant. The operation of sustainable dolphin-watching activities will have a positive impact on the socio-economic, educational and scientific development of the communities along Tunisian coasts.

## 6. DOLPHIN-WATCHING IN TUNISIA

### 6.1 Ecotourism and Dolphin-watching

Tourism is the first source of currency for 83% of developing countries and the first source of currency for a third of the poorest countries (WTO, 2005). In 2004, the growth of ecotourism was three times higher than that of the global tourism industry (WTO, 2004). Ecotourism is defined by the International Society of Ecotourism (1991) as "a responsible visit in natural habitats where the resources and the well-being of the populations are preserved." This branch of tourism must contribute to the well-being of the local populations and have light environmental consequences. An increasing number of tourists now tends to choose their destinations and activities according to the conservation efforts provided by the countries and to the potential of observation of the species in their environment. Cetacean-watching is a recreational activity of the ecotourism industry (Buglass, 1995). It is defined as "any activities involving recreational and commercial observation of cetaceans in the wild, including the use of all water waft and aircraft, noise and playback of sound, feeding, swimming and diving" (ANZECC, 2000)



The development of dolphin-watching coincides with the increasing popularity of marine mammals. Furthermore, it helps raising awareness on the importance of conserving cetaceans (Spradlin *et al.*, 2001). Encounters with wild cetaceans generate strong feelings in cetacean-watchers, such as surprise, gratification and pleasure the observers discover wild animals, occupied with their daily activities such as hunting, resting or socialising. The simple apparition of cetaceans approaching dolphin-watching boats or jumping out of water is a delight to adult and children observers.

Whale-watching trips have become increasingly important for several local communities in term of direct and indirect incomes, education and scientific research (Hoyt, 1995). Dolphins and whales are also symbols of a healthy marine environment, which contributes to reinforcing local pride.

### 6.2 Cetaceans in Tunisia

Field and monitoring studies determined the presence of baleen whales (mysticetes), toothed whales and dolphins species (odontocetes) within Tunisian territorial waters. Common species in Tunisia include the fin whale (*Balaenoptera physalus*), the sperm whale (*Physeter macrocephalus*), the bottlenose dolphin (*Tursiops truncatus*), the common dolphin (*Delphinus delphis*) and the striped dolphin (*Stenella coeruleoalba*). Other occasionally observed species are the Minke whale (*Physalus acutorostrata*), the long-finned pilot whale (*Globicephala melas*), the Risso's dolphin (*Grampus griseus*), the killer whale (*Orcinus orca*) and the harbour porpoise (*Phocoena phocoena*) (ACCOBAMS, 2004).

The bottlenose dolphin is the most commonly observed cetacean along Tunisian coasts. Dolphins are present off the island of Djerba in June, July and August. A pod regularly follows boats and ferries that link Djerba to the continent. Other populations are present in Sayada, Zembra, Zembretta, La Galite, Bizerte, La Goulette, the Golf of the Ras and the Rmal Peninsula. Resident groups occupy reduced territories by the coasts whereas other pods seem to live at sea and migrate towards the coasts in the summer.



The relative density of bottlenose dolphins is estimated at 0,9 animals/km<sup>2</sup> (coefficient of variation: 30%), in a 15 nautical mile-long band, from Sousse to La Chebba (Naceur *et al.*, 2004). The population is estimated at 3 977 individuals in this area (trust interval: 1982 to 7584 individuals). The species is more abundant in the Golf of Gabès than in the Golf of Hammamet. Bottlenose dolphins are observed on average 9,3 miles away from the coasts, predominantly in waters less than 100 meters deep. The great majority of observations concerned groups composed of 1 to 8 individuals, with an average of 5 individuals. Dolphins are observed in 25% of monitoring efforts. In 43% of groups, females were observed with juveniles or calves (Naceur *et al.*, 2004).

A legend told by Pliny the Younger (Latin writer, 62-114), Pliny the Elder's nephew, deals with the friendship between a dolphin and a boy at Hippo, a village located at the North of Tunisia. A young boy was in difficulty at sea, when a dolphin rescued him and took him to the shore. The village population befriended with the cetacean. Soon, people from the surroundings rushed to Hippo to observe and approach the famous animal. Some priests even considered the dolphin as a messenger from the Gods. Unfortunately, the overpopulation generated by the influx of visitors as well as the tax rises imposed on the inhabitants led to the slaughter of the cetacean.

### **6.3. Dolphin-watching potential in Tunisia**

Tunisia occupies a central place in the Mediterranean region. Its continental plateau is composed of lagoons, islets and islands, such as Djerba, La Galite, Le Galiton, Zembra, Zembretta, Kuriat and Kerkennah. This popular destination, particularly among European tourists, has indeed many assets: an accessible geographical situation, political stability, as well as cultural and exotic surroundings and landscapes, the desert and an important diversity of natural ecosystems, fauna and flora.

Tourism activities that focus on the observation of dolphins consist in taking tourists on board of boats with the objective to observe wild cetaceans in their natural habitat, for entertainment, recreational, and educational purposes on an recreational, organisational or commercial basis. The 1300 km long coasts and the regular observation of cetaceans from the shore and boats are two major factors that highlight the significant potential for dolphin-watching in Tunisia.

In spite of the current deficit of dolphin-watching activities in Tunisia, in term of promotion, control and development, the known and stable presence of some sedentary and rather important populations close to the coasts, is a high guarantee to encounter dolphins during dolphin-watching tours, for relatively short travelling durations and reduced costs. Climatic and sea conditions are stable during the summer. The quality of dolphin-watching boats and of their staff are also favourable (Mhenni, 2005).

Dolphin-watching tours are already operating on different sites along Tunisian coasts. These tours are organised on board of small boats, and are offered to tourists from Monastir, Djerba, Mahdia and dEl Attaya harbours. Tours on large boats, with a capacity 200 passengers, are also available from Yasmine Hammamet and dEl Kantaoui, at Sousse (Mhenni 2005). Tours operators use the presence of dolphins within the visited areas as a main commercial argument to sell their tours. Nevertheless, the active search for cetaceans is not necessarily carried out at sea, and the encounters with dolphins are often fortuitous. The advertising promoting these dolphin-watching tours is non-existent at both national and international levels. Hoyt (1995) does not mention Tunisian dolphin-watching activities in his report on international cetacean-watching. Finally, no data is available on the income generated by these activities (Mhenni, 2005).

Various limiting factors are currently restricting the development of dolphin-watching activities in Tunisia. The sedentary populations, well known by the boat captains and accessible to tour-operators, are relatively reduced. As a result, boat traffic will have to be managed optimally in order to minimise the disturbance caused by dolphin-watching operations, and to prevent the overexploitation of the resource. Groups including females with their calves are particularly sensitive to disturbance, and will be subject to specific precautions. Finally, optimal climatic conditions are limited to the mid-June to mid-September period (Mhenni, 2005).

Bottlenose dolphins are subject to a strict protection within Tunisian territorial waters. Nevertheless, the lack of application of the regulations can lead to abuses. Boat captains sometimes commit condemnable acts by harassing, disturbing and approaching dolphin pods too close or rapidly. Moreover, the lack of specialised guides on dolphin-watching tours was reported. The informations given to the tourists during these tours are often limited to anecdotes from local fishermen (Mhenni, 2005).

The objectives for the development of dolphin-watching in Tunisia are:

- To ensure the conservation of targeted populations by these activities;
- To minimise the impact of activities on the marine environment;
- To assess the impacts of dolphin-watching tours on dolphin populations and on their habitat, conjointly with the development of the activities;
- To provide a sustainable source of income to the coastal populations;
- To value the presence of dolphins by giving them an economic value;
- To improve the image that Tunisian fishermen have of dolphins.

## **6.4 Establishment and impacts**

### **6.4.1 Socio-economical development**

Ecotourism activities must respond to a range of criteria established by the International Ecotourism Society, in order to ensure the local development through the creation of jobs for the local population, the share of benefits with the communities, and the solicitude of their agreement to develop tourism activities. If these conditions are united, ecotourism can become an economic strength and a source of income for the communities.

Cetacean-watchers predominantly come from abroad. In Tunisia, tourists are mostly Europeans. According to recent publications on the commercial cetacean-watching, the demand of Europeans for cetacean-watching tours is increasing. The number of whale-watchers increased by 8.8% between 1991 and 1994, in Europe. Similarly, the total income from these activities increased from US\$ 5 690 000 in 1991 to US\$ 21 985 000 in 1994, in this region (Hoyt, 1995). Therefore, dolphin-watching can represent an important source of currency for local communities.

The development of dolphin-watching activities is an alternative to the common use of marine resources. In 1993, the International Whaling Commission (IWC) recognised the economic potential of the commercial cetacean-watching and encourages this type of exploitation of dolphins and whales in a eco-development spirit.

### **6.4.2 Interactions fishermen/dolphins**

Dolphin-watching development in Tunisia aims at guaranteeing the conservation of dolphins, but also the commercial survival of fishermen. Observations of bottlenose dolphins are recurrent in the region of the Gulf of Gabès, at the south of the parallel 35° N, which corresponds to the main fishing area in Tunisia. Bottlenose dolphins often interact with fisheries activities. Consequently, professional fishermen have a negative perception of the cetaceans. They blame them for damaging their equipment, diminishing their production, and increasing the time dedicated to the reparation of the nets. In purse-seine fisheries, dolphins are often trapped by the purse-seines as they search for sardines, sardinelles and anchovies, and they escape by tearing the nets. They also target demersal species trapped in coastal fisheries gears (nets and fixed fisheries). Dolphin predation on the nets could be amplified by the impoverishment of halieutic resources and stock collapses (Naceur *et al.*, 2004). The overexploitation of several benthic species has already been reached in some areas in southern Tunisia (Jarboui *et al.*, 2001).

The damages caused by dolphins may jeopardize the economic survival of traditional fishermen with low incomes. The implication of communities in the development of dolphin-watching will be associated with an additional income, and thus a compensation of the damages caused by the dolphins. Thus, in Japan, cetacean-watching now provides economic benefits and additional income in fishing communities (Hoyt, 2001). The commercial exploitation of cetaceans, regulated by appropriate measures to ensure the sustainability of the activities and the protection of the targeted populations, will add make the presence of the cetaceans along the coasts commercially valuable. As a reinforcement method, the use of a generator of repulsive sounds, the "dolphin tub" of which the efficiency has been proved, will contribute to reducing the interactions between the nets and the cetaceans, by repulsing cetaceans from the fisheries areas (ACCOBAMS, 2004).

### 6.4.3 Conservation

The popularity of cetacean-watching does not only have socio-economic benefits. The ecotourism approach implies a sustainable use of the landscapes and species. These must respect the equilibrium of the ecosystems, limit the ecological print and justify the conservation and protection of species and ecosystems targeted by these commercial activities. It represents a sustainable strategy for use of the national resources susceptible to generate political and economic background, as well as scientific research for the establishment of conservation programs (Agardy, 1997). In that regard, the local industry actively benefits the species in both short- and long-terms. Thus, the establishment of sanctuaries is often the result of the development of cetacean-watching activities (Robbins and Mattila, 2000).

The Tunisian Minister of Tourism, Mr. Tijani Haddad, declared that ecotourism represents a very powerful mean to value biodiversity. In Tunisia, the « Ministère de l'Environnement et de l'Aménagement du Territoire » (MEAT) manages different organisations in the field of biodiversity: the « Agence de Protection et de l'aménagement du Littoral » (APAL), the « Agence Nationale pour la Protection de l'Environnement » (ANPE) and the « Centre International de Technologie de l'Environnement » (CITET). Tunisia also has a regional centre of activities for specially protected areas (CAR/SPA). Finally, various non-governmental organisations monitor Tunisian biodiversity, and for example carry out ornithological monitoring or wetland rehabilitations. Governmental organisations actively collaborate with scientific organisations, such as the ISTM, the INAT and University institutions (The Faculties of Sciences of Tunis, Sfax and Bizerte). These partnerships contribute to the development of scientific studies and to the conservation of biodiversity. The Sea Observatory of the Institut National des Sciences et Technologies de la Mer (ISTM) was created to collect data and manage sensitive, coastal areas or wetlands in collaboration with the INAT and University institutions. Within the ACCOBAMS, conferences are organised to raise consciousness among scientists, professional fishermen, students and teachers of the fisheries industry on the preservation of the marine environment and the conservation of threatened aquatic species.

### 6.3.4 Scientific research

Commercial whale-watching operators perform regular excursions into cetacean habitats and therefore provide excellent platforms to collect data, which carefully applied, are a valuable resource to the scientific community (Robbins et Matilla, 2000; Rose, 1996). These informations will contribute to increase the knowledge on the abundance, distribution and movements of dolphin populations.

Little data is available on the abundance and distribution of common cetaceans in Tunisia (Naceur *et al.*, 2004). Since 2001, the ISTM and the Centre of Research on Cetaceans (CRC-Marineland of Antibes, France) carry out the monitoring of coastal populations of cetaceans in Tunisia to identify and assess their abundance and their distribution in deepness (ACCOBAMS, 2004). The increase of dolphin-watching platforms will consequently create a multiplication of monitoring opportunities at sea, and will then allow the collection of valuable data on the coastal populations of cetaceans. Scientific research based on the photo-identification of local dolphins can also be established, by producing a catalogue with individual ID from dorsal fin shape, and individual markings of all the dolphins spotted.

### 6.3.5 Education

The observation of wild cetaceans in their environment has a strong potential for education (Rose, 1996). By observing the marine mammals in their environment, whale-watchers increase their knowledge on cetaceans and awareness on the necessity of their conservation (IFAW *et al.*, 1995). Other benefits include community profit by education gain for local schools and colleges, added with a sense of pride for the communities involved. Media attention to whale conservation sites exposes the activity, internationally broadcasting a positive and peaceful image (Buglass, 1995). Naturalists on board and research centres dedicated to whales and dolphins represent excellent means to educate the public in conservation efforts. "Whale Alive", a non-governmental organisation offers training programs for whale-watching guides and multi-media materials advertising the activity to a large audience. Lectures and a gathering for land-based dolphin-watching can also be offered during the summer season, giving background knowledge on the species and the areas.

Dolphin-watching activities in Tunisia currently lack this essential educational component. The development of dolphin-watching activities must catch up in the field of education by training specialised guides and introducing them on board of the dolphin-watching tours. Dolphin-watching tour-operators must imperatively play an active educational role and complete the observations of cetaceans by explications on the biology, ecology, behaviour of the observed species, and also on their ecosystems and conservation. Sociological studies can be conducted in the future to assess the social and educational impacts of dolphin-watching activities along Tunisian coasts.

### 6.3.6 Regulations

The future of ecotourism depends on the assurance of an adequate conservation and management of the resources (Goodwin, 1996). Indeed, cetacean-watching activities can be responsible for short and long-term adverse effects on the targeted populations, if they are not regulated (IFAW *et al.*, 1995; IWC, 1997; Trites *et al.*, 2000). The fast development of cetacean-watching generates alteration of the species environment from anthropogenic sources, like increasing shipping, harassment, pollution, disturbance and acoustic contamination. Disturbance is defined as any "activity which causes behavioural and/or physiological changes in an animal" (ANZECC, 2000).

Reactions to disturbance are species specific and may vary (Woods-Ballard; 2000). Habituation has been observed and studied in cetaceans and sensitisation after harassment was also demonstrated (Richardson and Würsig, 1997). Short-term impacts include specific changes in behavioural and/or physiological patterns, including a modification in swimming direction or speed, changes in respiration rate and patterns with increased time spent underwater, attempts to leave the area, hasty dives, disruption of feeding, nursing, mating, reproductive and social activities, changes in acoustic behaviour and particular display, (Lien *et al.*, 1992), tail slashes (CMC *et al.*, 1988; ANZECC, 2000), and physical injury generated by the collisions with boats (CMC *et al.*, 1988; IFAW *et al.*, 1995). Serious long-term impacts are suspected and include the abandonment of preferred critical breeding or feeding grounds (Green, 1990), changes in distribution patterns, stress and increased mortality (ANZECC 2000; CMC *et al.*, 1988; IFAW *et al.*, 1995).

Consequently, the commercial observation of cetaceans is an activity that requires a strict control through the establishment of specific regulations according to the sites and species targeted. Guidelines and educational supports were established in some regions so as to minimise the impact of cetacean-watching on the populations (Carlson, 2000). Management priorities for the regulations of whale-watching activities and subsequent potential harassment are based on studies assessing the long-term impacts of human activity on cetacean populations (CMC *et al.*, 1988). The scientific committee of the IWC underlined the necessity of controlling the activities of cetacean-watching, in order to guarantee a sustainable development and expansion of the activities, without damaging the cetacean populations, the individuals or their environment, or without threatening the survival or the execution of the ecological and vital functions of the targeted populations. In 1997, the Commission adopted general principles to regulate the observation of cetaceans (cf. Annex).

Regulations aim at reducing the impact of the dolphin-watching boats and the acoustic emissions, and at preventing the disturbance of the animals. When followed strictly, their application guarantee the maintenance of normal behaviour, displayed by unchanged respiration and activity rates, determined harassment indicators (CMC, 1988). A lack of enforcement or restrictions of guidelines result in aggressive and close approaches of vessels, caused by either inefficiencies or absence of educational programs and enforcement of regulations (CMC, 1988). Regulations prohibit and penalise human behaviour likely to interrupt the natural behaviour of the animals, like harassment, chase, alteration of the trajectory and the swim with the cetaceans. Harassment is defined as “any act of pursuit, torment, or annoyance which:

- has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or
- has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioural patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding or sheltering (Level B harassment.)” (Spradlin *et al.*, 2001).

The IWC Principles for cetacean-watching guidelines will be useful tools to elaborate local and national legislations in Tunisia. It will be necessary to establish a Charter of guidelines specific to Tunisia, based on the IWC recommendations. The compulsory adhesion to this national Charter by tour-operators will standardize the existing and future dolphin-watching activities. Sanctions to apply in case of violation of the guidelines of the Charter should also be defined and applied by Tunisian laws.

To conclude, the development of dolphin-watching activities in Tunisia will follow the principle of precaution. The development of tours will compulsorily be monitored by scientific studies that will assess the impact of the activities on the populations and their environment (Cf. Annex). These investigations will give bases to regulate the activity and adapt the guidelines accordingly at any time, in order to guarantee that the activities do not constitute a threat for the resource.

## CONCLUSIONS

**The projects of dolphinarium establishments at Hammamet and La Goulette within tourist resorts must be rejected, and the interdiction of maintaining dolphins in captivity reaffirmed in Tunisia. This decision is backed by scientific studies and observations that prove the incompatibility of the species for confinement in dolphinarium and their consequences:**

- **Specific characteristics incompatible with life in captivity**  
Bottlenose dolphins are self-conscious predators that dedicate a large proportion of their activities swimming over long distances in search of preys. The social organisation of the species is based on the interaction of mobile groups.
- **Suffering of captive dolphins**  
Perinatal mortality, immunodeficiency, chronic stress, reproductive dysfunctions, abnormal behaviour, aggressiveness, depression and a range of organic pathologies are recurrent in captive dolphins.
- **Basic requirements not respected in tanks**  
Reduced home-ranges, artificial social groupings, food based on dead fish, human contact, stress and noise do not respond to the ecological, ethological and biological requirements of the species.
- **Ethically controversial dolphinariums**  
Commercial, scientific and educational benefits do not justify the capture of new wild dolphins, the suffering of captive dolphins, and the opening of new dolphinariums. Scientific studies on captive dolphins are limited; no study confirms the educational value of dolphin shows and income can be generated through an ethical use of dolphins via a controlled dolphin-watching.
- **Dolphins do not enjoy performing shows**  
Dolphins perform their exercises to obtain food rewards.
- **Anthropomorphic shows with a low educational content**  
Clown performances give an erroneous image of the cetacean, do not transmit the respect due to the marine world, desensitise the public on the suffering linked to the privation of freedom, and do not inform the audience about the environmental and anthropogenic factors threatening wild populations.
- **Captive breeding does not contribute to the conservation of the species**  
The opening of new dolphinariums stimulate the capture of wild specimens. The reproduction of captive cetaceans is problematic and conservation programs for threatened cetaceans have failed. Only the adequate management and the preservation of their natural habitat will ensure the survival of populations of wild cetaceans.

**The commercial and ethical exploitation of dolphins, as halieutic resources, must exclusively lie on the development of responsible commercial observation of wild dolphins in their natural habitat. The development of dolphin-watching in Tunisia must follow the series of ecotourism criteria and the recommendations of observations of cetaceans defined by the International Whaling Commission. The expansion of sustainable dolphin-watching activities in Tunisia will favourably contribute to the socio-economic, educational and scientific development of the communities and to the pacification of the fishermen/dolphin relationship.**

## RECOMMENDATIONS

### Hammamet and La Goulette dolphinarium projects:

- To create an official commission composed of national, international experts, the Tunisian ACCOBAMS focus and local interventionists in charge of assessing the case of dolphins in captivity;
- To establish a national legislation that bans the establishment of dolphinariums;
- To prohibit dolphin breeding and the import of wild caught and captivity-born dolphins for exhibition, commercial, scientific, and conservation purposes;
- To study alternatives to captivity and plan an autonomous exhibition or a simulation system, as an alternative to the maintenance of dolphins in captivity.
- To privilege the development of sustainable commercial observations of dolphin populations along Tunisian coasts;

### Dolphin-watching in Tunisia:

- To produce a Charter that establishes guidelines to regulate dolphin-watching operations;
- To organise conferences and training workshops for existent and future tour-operators, naturalist guides, and professional fishermen on the guidelines of the Charter, the biology, ecology, and behaviour of the species, possible impacts of dolphin-watching and manifestations of stress, harassment and disturbance in wild cetaceans;
- To impose the adhesion of the Charter to tour-operators operating or wishing to operate dolphin-watching activities;
- To implement trained naturalist guides to educate tourists on dolphin-watching tours;
- To organise conferences and exhibitions to raise awareness for the preservation of the local marine biodiversity and for the sustainable and responsible use of wild cetaceans;
- To promote responsible dolphin-watching tour-operators through advertising campaigns, and broadcast their data to tourism editions at national and international levels;
- To use ferries and boats of dolphin-watching tour operators as scientific platforms;
- To create a research, information and exhibition centre.
- To carry out ecological studies on the local dolphin populations, including photo-identification, as well as an impact study of commercial dolphin-watching on the targeted cetacean populations;
- To participate in international seminars and symposiums on the management of commercial cetacean-watching activities.

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## ANNEX

### General Principles for whale-watching, IWC, 1997

#### **(1) Manage the development of whale-watching to minimise the risk of adverse impacts:**

- i. implement as appropriate measures to regulate platform<sup>1</sup> numbers and size, activity, frequency and length of exposure in encounters with individuals and groups of whales;
  - management measures may include closed seasons or areas where required to provide additional protection;
  - ideally, undertake an early assessment of the numbers, distribution and other characteristics of the target population/s in an area;
- ii. monitor the effectiveness of management provisions and modify them as required to accommodate new information;
- iii. where new whale-watching operations are evolving, start cautiously, moderating activity until sufficient information is available on which to base any further development;
- iv. implement scientific research and population monitoring and collection of information on operations, target cetaceans and possible impacts, including those on the acoustic environment, as an early and integral component of management;
- v. develop training programs for operators and crew on the biology and behaviour of target species, whale-watching operations, and the management provisions in effect;
- vi. encourage the provision of accurate and informative material to whale-watchers, to:
  - develop an informed and supportive public;
  - encourage development of realistic expectations of encounters and avoid disappointment.

#### **(2) Design, maintain and operate platforms to minimize the risk of adverse effects on cetaceans, including disturbance from noise:**

- i. vessels, engines and other equipment should be designed, maintained, and operated during whale-watching, to reduce as far as practicable adverse impacts on the target species and their environment;
- ii. cetacean species may respond differently to low and high frequency sounds, relative sound intensity or rapid changes in sound;
  - vessel operators should be aware of the acoustic characteristics of the target species and of their vessel under operating conditions; particularly of the need to reduce as far as possible production of potentially disturbing sound;
- iii. vessel design and operation should minimise the risk of injury to cetaceans should contact occur; for example, shrouding of propellers can reduce both noise and risk of injury;
- iv. operators should be able to keep track of whales during an encounter.

#### **(3) Allow the cetaceans to control the nature and duration of 'interactions':**

- i. operators should have a sound understanding of the behaviour of the cetaceans and be aware of behavioural changes which may indicate disturbance;
- ii. in approaching or accompanying cetaceans, maximum platform speed should be determined relative to that of the cetacean, and should not exceed it once on station;

- iii. use appropriate angles and distances of approach; species may react differently, and most existing guidelines preclude head-on approaches;
- iv. friendly whale behaviour should be welcomed, but not cultivated; do not instigate direct contact with a platform;
- v. avoid sudden changes in speed, direction or noise;
- vi. do not alter platform speed or direction to counteract avoidance behaviour by cetaceans;
- vii. do not pursue<sup>2</sup>, head off, or encircle cetaceans or cause groups to separate; approaches to mother/calf pairs and solitary calves and juveniles should be undertaken with special
- viii. approaches to mother/calf pairs and solitary calves and juveniles should be undertaken with special care;
  - there may be an increased risk of disturbance to these animals, or risk of injury if vessels are approached by calves;
- ix. cetaceans should be able to detect a platform at all times;
  - while quiet operations are desirable, attempts to eliminate all noise may result in cetaceans being startled by a platform which has approached undetected;
  - rough seas may elevate background noise to levels at which vessels are less detectable.

<sup>1</sup> Any vessel (with or without engine), aircraft or person in the water.

<sup>2</sup> Chase (as opposed to follow), causing the whale to change its course or speed

