The Performing Orca
-Why The Show Must Stop

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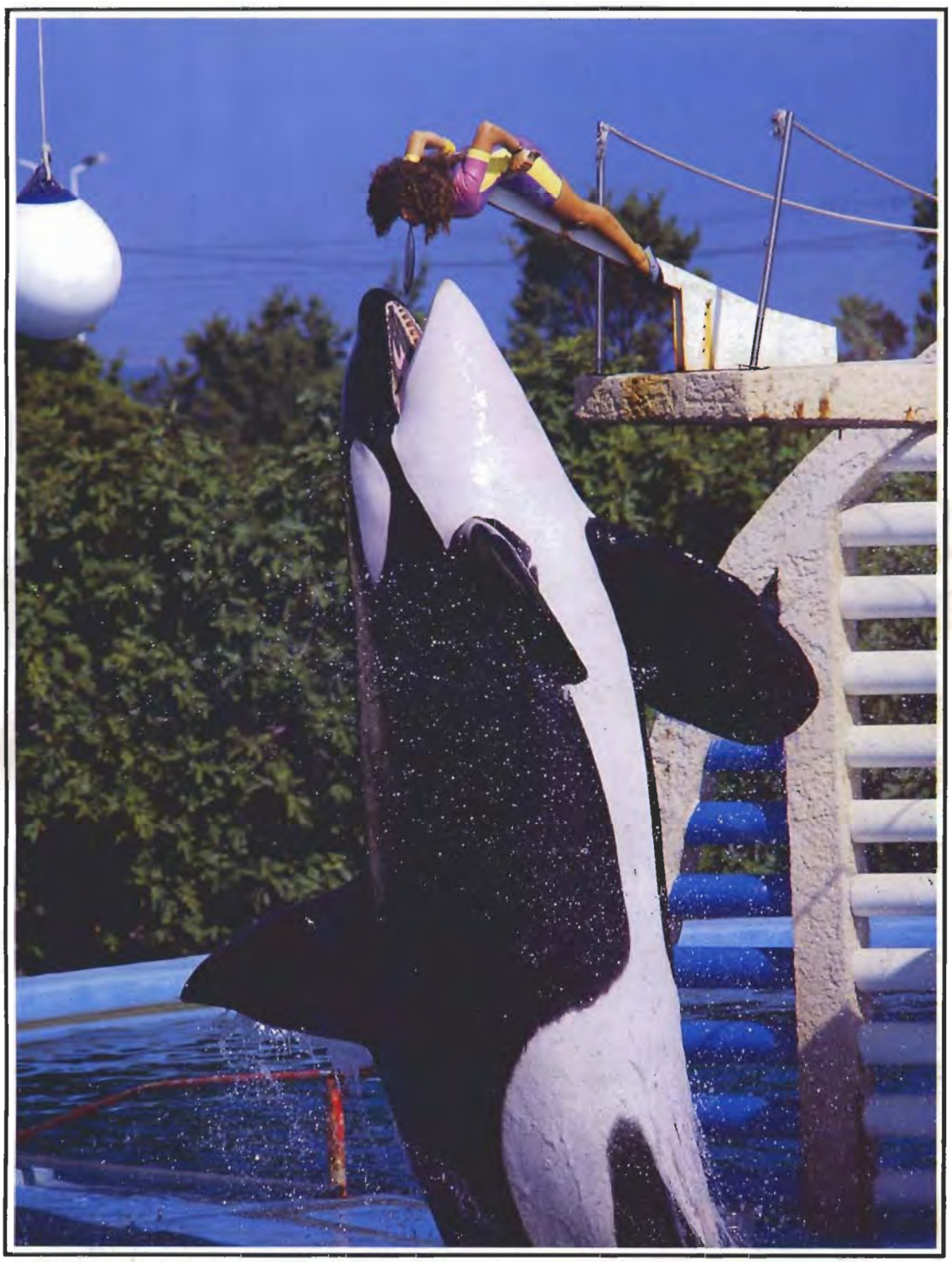
By Erich Hoyt



An Investigative Report Commissioned by the
Whale and Dolphin Conservation Society

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Overview

The Performing Orca – why the show must stop, a report on captive orcas, or killer whales (*Orcinus orca*), has been almost a year in the making. The Whale and Dolphin Conservation Society sponsored this investigation of captive orcas with an open mind, as there has been considerable confusion over the so-called facts routinely tossed around and argued over by polarized pro and con advocates. We have visited most of the 17 marine parks around the world that keep orcas. This includes parks in the United States, Canada, Japan, Mexico, Argentina and France, where we examined the conditions under which orcas are kept. We have visited the site of most orca captures, Iceland, and have talked to many people there including the Minister of Environment, credited with making the final decision to deny orca capture permits in 1991. We have talked at length with marine park owners, curators and other management, as well as directors of non-profit societies that operate other marine parks. We have talked to orca trainers who have been candid with us. We have interviewed the top orca scientists in the world – some affiliated with marine parks, others independent.[1]

We investigated the following aspects: the educational value of keeping orcas; the value of scientific studies supported and funded by marine parks – both in captivity and in the wild; the captive breeding of orcas; life at sea compared to life in captivity; the world orca trade; the standards and regulations for capture and display in various countries; training programmes and dangers to trainers; conditions in captivity such as water quality, pool size and design and the impact of such conditions on the social behaviour of orcas; and the overall health of captive orcas including a discussion of the causes of death.

The result is the report you hold in your hands. All the background details and sources are contained herein, but our most important findings are summarized below.

- For few species, besides orca, is there documentation of such intense, long-term social bonds. Among the resident whales of Vancouver Island, male orcas born in the early 1970s are still, 20 years later, travelling beside their mothers. They live in close-knit pods – extended families of typically 10 or 15 individuals. Yet more than a third of the aquariums and marine parks in the world that keep orcas – 6 of 17 – have only one orca. In fact, about half of all establishments were single-orca parks until Sea World's acquisitions of orcas over the past few years for their breeding programme. Keeping an orca alone is inexcusable.

- At the same time, most single orca marine parks are not set up to handle more than one animal as large as an orca, if that. And some of the larger aquariums keep too many orcas in too confined a space or separate them in small holding pools. In general, the parks have not changed much in the past ten years. Orcas are still kept in bare, featureless tanks, miniscule compared to the area of habitat they use in the wild. It is ironic when some of these establishments are surrounded by acres and

acres of space in theme parks which include large areas devoted to boating, joy rides, and so forth.

- Orcas from different pods, indeed different oceans, are routinely mixed and matched – a fact of life at Sea World where the orcas are constantly moved between the four parks and calves are separated from their mothers at under five years of age. Violent aggression between orcas – never seen in the wild in thousands of encounters over 20 years – is difficult to document in captivity, though trainers have told us that aggression is pronounced among certain captive orcas. A couple years ago, at Sea World San Diego, a female (mother) orca called Kandu, died from injuries after aggressively charging another female, Corky. It is impossible to establish the precise cause or causes, but this aggression may be due to some aspect of their abnormal life in captivity, perhaps partly a lack of space and privacy.

- Management at Sea World and other aquariums (with at least two exceptions, Marine World Africa USA and the Vancouver Public Aquarium) refuse to accept the scientific findings in the natural habitat – that orca males live an average of 29.2 years and females 50.2 years. (The reference is Peter Olesiuk, Michael Bigg and Graeme Ellis, 1990 and this IWC paper uses life history tables, a standard method which has been applied to many other animal populations.) There has not been enough time for orcas in aquariums to reach the average figure for females. So it is difficult to compare captive and wild orcas on this matter, yet one thing is clear: Only three orcas remain alive from those captured by aquariums during the first 15 years of captivity, from 1961 to 1975, inclusive. In all, 48 have precise capture and death dates; approximate ages can be determined from their size at capture. Only one – Orky – achieved even the average age found in the wild. Most others fell far short.

- Sea World has had considerable success in the captive breeding of orcas – six successful births (from 11 known pregnancies) in six years. However, most of the parents of the young orcas at Sea World have died within a relatively short time after fathering or mothering calves. The oldest calf is only six years old, but about half the mothers and all but one of the fathers have died. Surely part of a successful programme is maintaining the health of the parents as well. These were not old animals by standards in the wild; they were still breeding when they died. A couple were pregnant, the fetuses turning up in the necropsy.

- When it comes to promoting zoos and marine parks, the phrase "captive breeding" has an almost charismatic charm. Every zoo and marine park basks in the reflected glory of the very few institutions that actually do the work. The Sea World orca breeding programme is only seven years old and calf survival is impressive to date, but the efforts of marine parks do not compare with what the finest zoos have accomplished which has included re-releasing of endangered species. Indeed, Sea World's definition of "captive breeding" is not the same as that used by the IUCN and other world conservation bodies. It is not sufficient merely that births in captivity occur, but that both birth and survival rates be high enough for continuation of the captive population. In that case, it is not necessary to obtain more animals from the wild or from other aquariums. A captive breeding programme is incomplete without a reintroduction component, according to the IUCN Species Survival Commission. Sea World has never attempted to release an orca, and has no plan to do so. No orca, once captured and sent to a marine park, has ever left captivity alive.

- There is a tremendous turnover in trainers. According to a 1985 survey in the International Marine Animal Trainers Association (IMATA) newsletter *Soundings*,

only about half the marine parks asked for previous experience when they hired a trainer and barely more than half even specified that they preferred a high school diploma. The typical trainer stays in the field little more than three years; the pay is low. There is some evidence that experienced trainers at certain marine parks are let go in preference to inexperienced and less expensive labour. The frequent changes and lack of formal education and experience among trainers "could have adverse effects on the animals," according to one report. The often heralded "relationship" between the animal and the trainer is something of a myth – in view of the turnover and workload of most trainers and the incredibly repetitive nature of the shows. But, most important: training orcas using the in-the-water stunts and riding on the animals can be highly dangerous.

- There is some controversy over methods of training orcas. Sea World's aggressive, and at times experimental, approaches have seemed innovative. But there have been dozens of accidents and near deaths of trainers. Three trainers injured in the late 1980s sued Sea World but settled out of court for undisclosed sums. In February 1991, a 20-year-old female trainer at Sealand of the Pacific (Victoria, BC, Canada) was killed by three orcas. Judging from the number of "accidents" and other incidents with orcas at every marine park, it could easily have happened anywhere.

  What went wrong? Was the training programme at fault? Were the trainers inexperienced? Had the orcas become bored and the behaviour distorted, unpredictable and dangerous after long periods in captivity? Is in-the-water work with orcas simply too risky? None of these explanations can be said to be the sole cause, but taken together, they probably explain most of what has occurred.

- The science carried on at marine parks has been minimal. The scientific programmes of most marine parks are used as arguments to support keeping orcas and other dolphins, but the portion of the budget devoted to science is very small in view of the size of the operating budgets and the profits. One non-profit park did open its annual report, showing the figure for support of all science – in house and in the wild – at 1 percent per year. In general, marine parks do not measure up to the best zoos or environmental groups in terms of supporting or conducting science. Even basic record-keeping has been neglected, though this situation has improved because of NMFS efforts to implement standardization. Yet, as David E. Bain at Marine World Foundation has pointed out, there is still much room for improvement.

- There is a definite trend over the past decade or more toward concentration in the marine park industry, at least as far as keeping orcas is concerned. Fewer marine parks are exhibiting more orcas. Yet marine parks in other parts of the world have continued to be a force in the industry. They have taken "surplus" orcas which the Icelandic captors have sold to them at cut-rates when prime buyers could not be found. These surplus orcas often eventually end up in US marine parks, especially Sea World. Many of these small parks, as well as the holding pools in Iceland where orcas are kept sometimes several months before shipment, have only primitive accommodation; animals are kept alone or in crowded conditions. But the major marine park owners and curators seem reluctant to criticize these marginal parks, or to help to improve them or close them down. In fact, it seems to be in the interest of Sea World and other parks to keep them open as additional sources for orcas which are more and more difficult to import directly from the wild. Animals have then been purchased outright or imported on "breeding loan," which means that in the future, the second calf and perhaps the parent, if breeding is successful, may be sent back to the original park.

- There are great differences of opinion over the quality and extent of education at marine parks. In recent years, Sea World, in particular, has invested in a school programme for children which it considers "educational". These children, who are, after all, future customers of Sea World, are led through at the rate of 50,000 a month total at all four parks, and they do get a more informative version of the Shamu Show. But the "Shamu" caricature of orca, the sea panda that loves to be kissed and mischievously splashes you, the animal that never dies, is always front and centre, the star of the show. Shamu, though a profitable corporate symbol, has nothing to do with education. Sea World publishes and sells "educational" brochures and booklets in their gift shops but for the most part they cannot avoid mentioning and marketing Shamu. In terms of education, it is misleading. It is as though teachers gave pupils a background in the behaviour and ecology of water birds by telling them about Donald Duck. And what is the "message" given to children when they see animals performing for our amusement? While the message of domination over the Earth is consistent with human practice for thousands of years, many thoughtful people today question whether this view is appropriate in light of world-wide efforts to reverse the toll of 1,000 or more species extinctions per year and to help wildlife survive into the next century.

In view of these and other points detailed and documented herein, we believe that orcas are particularly unsuited for life in captivity and that the captivity of orcas should be phased out. Instead, we believe that the future of marine parks lies in pursuing exciting alternatives to the display of large dolphins, particularly orcas. The last chapter of the report is devoted to this issue. Freed from the expense and complication of keeping orcas and other large whales, marine parks could look at new and exciting ways of feeding the public's fascination with whales and dolphins *without* sacrificing education *or* imposing on wild individuals.

Parc Oceanique Cousteau in Paris, for example, has a full-size model of a 100-foot-long (30.5 m) pregnant blue whale. The visitor can actually walk inside the giant whale, seeing all its life processes up close, including the developing fetus. We can also envisage live link-ups to wild orca pods – to monitor them as they travel in the wild. Visitors to a marine park could watch the huge pods from remote video cameras on high-definition monitors that receive signals by satellite. The impact of seeing this in "real time" could be powerful. So called "virtual reality" productions are another exciting new possibility. The simulations are, as the name advertises, "virtually real". Anyone will then be able to experience life in an orca pod, to get a taste of life among wild whales at sea. With such possibilities, marine mammal shows which feature performing orcas will seem as passé as those spectacles of the Roman Colosseum. As public attitudes change, we believe that Sea World and other marine parks could make the transition to these new ways of "exhibiting" marine mammals without any loss in admissions.

While this report was being researched and written, Whale and Dolphin Conservation Society (WDCS) Director Sean R. Whyte and long-time orca researcher Paul Spong met with Sea World-Busch Entertainment executives for half a day in September 1991. Whyte and Spong hoped to explore the possibility of working with Sea World on the release of a captive orca named Corky. Corky has spent more than 20 years in captivity and is no longer breeding. But Sea World refused to consider the idea. Sea World's fear of setting a precedent, no matter the situation with the individual orcas under its care, left no possibility of collaborating, at least for now.

WDCS strongly recommends that no further orca captures be allowed. For various reasons, most orcas now in captivity and the captive-born calves will have to remain. But WDCS advocates a careful, gradual release programme in which the few orcas from known pods would be released back into the wild to rejoin their families. These whales,

which could then be monitored through the rest of their lives, would be a powerful legacy for the marine park that released them – a real example of conservation and education in practice.

Introduction

At Sea World parks in California, Florida and Texas and at marine parks in Canada, orcas are successfully breeding. The oldest calf is now six years old. At these and other marine parks around the world, millions of people each year see orcas close-up. They are entertained, and some say they feel enlightened, even inspired.

But at Sea World in San Diego, in 1989, one young mother orca charged into an older female, killing herself. This followed a year of at least a dozen mishaps in which orcas bit, charged and leapt on various trainers during performances, seriously injuring them. Then, in February 1991, at Sealand of the Pacific in Canada, three captive orcas drowned their trainer. Are these unfortunate, unconnected accidents or telling incidents that ought to be investigated? Could these be examples of predatory behaviour – normal in the wild but dangerous in a confined area and when applied to humans? Are these real signs that orcas are unsuited for life in captivity?

No single issue so divides those who work with or are concerned about orcas as the question of whether the species should be kept captive.

Marine mammal veterinarians disagree with field biologists. Ex-orca trainers often turn against their former employers – marine park owners, curators and general managers. And environmentalists, most of whom focus their energies on helping wild whales and dolphins, argue with all of the above.

Some consider the controversy over captive orcas to be only part of the issue of whether whales and dolphins, called *cetaceans*, belong in marine parks, and the even wider matter of whether animals should continue to be kept in zoos, zoological gardens or any other form of captivity. But orcas are in many ways a special case because of their large size and their social and predatory habits.

I will briefly examine this issue in the larger sense of cetaceans in captivity, but I will tell this story, looking at background facts and implications, mainly through the experience of captive orcas.

Orcas have attracted millions of visitors to marine parks each year for the past 25 years. Beginning in an era when orcas were feared, hated and shot on sight, marine parks invited the public to view the "killer" close-up. The world, seduced by the showmen's hype, began to see orca not as a dangerous "killer" but as a playful dolphin willing to do tricks for food and seemingly for fun. Studies of wild orcas followed – some of the first were to help regulate the number of live captures – and this research gave insight into the lives of free, wild orcas and led some to question whether orca captures and the practice of keeping them in marine parks should continue.

After 25 years, with the controversy over captive orcas becoming ever more heated, it is time to re-examine the practice of exhibiting captive orcas, based on how they have

been maintained in captivity as well as what has been learned about the biology and social behaviour of wild orcas. What scientific contributions have marine parks made toward orca studies? Have marine park curators adapted their programmes and facilities to take new knowledge into account? Can the present situation for captive orcas be improved? And how can future marine parks best encourage a keen and compassionate awareness of the natural world in new generations, whose own views about animals continue to change? Indeed, some would answer: by refraining from exhibiting large cetaceans such as orcas – or perhaps keeping only those stranded on beaches or born and raised in marine parks.

Throughout this report, major points will be highlighted with most sources noted in the text. A complete list of sources and notes is presented at the end, along with appendices that give details on orca captures, captive births, and all marine parks that keep orcas. These appendices were prepared especially for this volume as background and to help fill a basic need for more complete records on captive orcas. First, in order to understand what life is like for captive orcas, we must meet the animal in the wild, in its natural home in every ocean of the world.

1. Life at Sea

Through the early morning drizzle, off mountainous Vancouver Island, comes the parade: orcas, *Orcinus orca*, in living, breathing motion. Three abreast, in five subgroups of three to seven each, some 28 orcas crack the surface, exploding in great *kawoofs*! of drifting mist, slicing the sea with wedge- and sickle-shaped dorsal fins. Normally three-mile-per-hour (5 km) travellers, they are in an eight-mile-per-hour (13 km) hurry, smashing their blunt heads against curling whitecaps. Having foraged and fed through most of the night, they are now racing to a favourite feeding spot where salmon gather near the rivermouth before spawning. Watching the orca parade are humans standing on shore. These researchers – in touch with a network of researchers along the coast – have monitored the whales through the night – in the past 24 hours the whales covered about 80 miles (130 km). Now a man tunes into a hydrophone, an underwater microphone suspended offshore, to record the whales in "conversation". Meanwhile, other humans snap photographs with long lenses, to get their "IDs", while still others take notes of the whales' behaviour.

Since 1970, orca research has flourished along the North Pacific coast of the United States and Canada. Before the early 1970s, orcas were mostly feared, shot on sight; they were an unknown quantity. Bringing orcas into marine parks, beginning with "Moby Doll", "Namu" and the original "Shamu," (the last of which is a registered trademark of Sea World, Inc./Anheuser-Busch) helped change the way people thought about the species. In the early 1970s, orca researcher Paul Spong moved his studies from the captive orcas at the Vancouver Public Aquarium to the natural habitat of the British Columbia coast. He, along with Michael A. Bigg and other researchers, soon showed that the species was approachable in the wild. Today, families of orcas are studied in the fjords of Norway and around Iceland, off Alaska, California, México, Argentina and in the Indian Ocean, and to some extent, wherever they are encountered in every ocean of the world. Their arrival is so dramatic – the explosive "kawoofs" and the great line up of dorsal fins – that most marine mammal scientists start taking notes in a hurried hand, or drop their notepads altogether.

Part of that keen interest, of course, is orca's reputation as a predator that will eat almost anything that lives in the sea. Orca eating habits vary widely depending on where they live. Many seem to prefer fish if available in sufficient quantity, while others are opportunistic predators, pursuing larger marine mammals ranging from seals to other whales. Much of their daily routine is directed towards hunting and feeding. In captivity, a mature male orca eats about 175 pounds (79 kilograms) of dead fish a day; a wild orca – having to chase and seize live prey on long foraging journeys – may well eat even more.[2]

Orca's diet is the badge of a capable, fearsome predator, the trait that gave the animal its name and reputation. But the essence of orca, that which defines its life in the sea, is its life as a social mammal. Perhaps because orcas are so good at hunting, they are

able to spend hours at a time every day playing, resting, and socializing. By the late 1980s, after almost two decades of watching wild orcas, scientists had begun to unravel the fascinating, complex family life of the pod. It is a story of animals living together unlike any other that science has yet encountered. These field notes are from the late 1980s:

> In the sea of black fins are Stubbs' pod and Top Notch's pod, which the scientists call, respectively, A1 pod and A5 pod. Sharky, Scar and Saddle, and their calves, young and old, and, in some cases, a few "grand calves". Lying at the surface, A1 is a large orca pod with its 15 members, including seven adult males, five adult females, plus three juveniles and calves. A5 pod has only two adult males among its 13 members, plus four adult females and seven juveniles including one young calf. These two pods are related to each other, though not as closely as within their own pod. Those most closely related travel beside each other in a "subpod" based around their mother.
>
> One subpod is led by Scar (A9), born in about 1932, with her big boy Top Notch. Top Notch was born in about 1958 and is a mature male in his 30s. Yet, along with his younger brother – Scar's other son born in 1976-77 – they keep close to their mother even now. Another subpod is led by Saddle (A14), born about 1950, whose daughter Sharky (A25), born in 1971-72, had her first calf in 1986. All in a row, three whales lift their heads above the surface to look around. Then they start leaping and thrashing their tails. Twenty minutes later, the playing is finished and all the whales are back together and resume travelling.

These intimate life histories are the findings of 20 years of research on the resident whales of Vancouver Island, off the northwest coast of the United States and Canada. Beginning work in 1971, Michael A. Bigg devised a method of identifying orcas. He would photograph their dorsal fins and analyze the nicks and other marks as well as the overall shape of the dorsal fin and the greyish saddle patch located just behind it on the whale's back. He found that no two orcas were alike. Many could be identified on sight, and others by easy comparison back in the lab. Working with Ian B. MacAskie and later, Graeme Ellis, John K.B. Ford, and Kenneth C. Balcomb, III, Bigg assembled, piece-by-piece, the stories of these whale lives from thousands of photographs taken year after year. The photographs revealed who travelled with whom – the year-in year-out associations, and through them, the genealogy of the pods and the approximate age of each whale.[3]

A surprising key to the genealogies, however, has come through studies of orca sounds. In the late 1970s, John K.B. Ford discovered that each orca pod has its own dialect. Although pods may share some "calls", at least some are unique to each pod. By recording and studying the sounds made by each pod, and comparing how many are shared, the common ancestry can be inferred.[4]

Orca dialects have also provided insights into orca social behaviour. Dialects are found in few animals. Some bird species have dialects common to their residence in a particular part of the world, but only orcas and humans have dialects among animals that may live in the same area. It is not known whether orcas have a formal language, but they certainly communicate and their sounds are also a useful way for an orca to keep track of its pod, to recognize its mother and close relatives. Orca pods will sometimes travel for a few hours alongside pods in their area or "community" with whom they share some sounds, forming "superpods" of up to 150 animals. Yet, they will also interact with whales in their community with different sounds.

The long-lived, apparently permanent relationships found in each resident orca pod off Vancouver Island, and each pod's relationship within its community, paint a picture of what may be the ultimate social mammal. Addressing the Third International Orca Symposium in 1990, only a few months before he died, Mike Bigg pointed to the unique features of orcas: their dialects, their long-lived bonds and lack of dispersal, and the sharing of the same geographic area by different "races" of the same species, residents and transients, that do not associate. "There are fundamental features of the biology of this whale that are not found in other vertebrates. In other words, the currently accepted biological principles of vertebrates are going to have to be expanded to take into account the unique features of killer whale biology."[5]

On another occasion, late at night after most of a day spent with the whales of the A5 pod, he had tried to describe what it must be like to be *in* a resident orca pod. "It's like some exclusive life-time club in which everyone gets along or at least knows his place. There is plenty of good food and time for play and if you're a young killer whale," he added, "you're going to be spending 15 years or so learning the ropes: the dialects, how and where to hunt, how to nurse and care for the young, the ins and outs of killer whale society, this great tradition." It was the sort of pleasant and joyful speculation that only a senior scientist is permitted – the just reward for thousands of hours sifting through data or waiting in the rain for whales to show. It rang true.

> After travelling some 50 miles (80 km) in a day, having eaten well and played hard, the two resident pods split up. The A1 pod pushes on but the A5 pod is ready for sleep. Like everything else orcas do, sleeping is often done together. The whales are almost close enough to touch. Lying at the surface, they spout slowly, their long black torsos bobbing at the surface like logs afloat. They take three to four breaths, almost synchronized, the blows backlit in the afternoon sun, then dip below for three minutes, resurfacing perhaps 100 yards away (100 m). For an hour, as the whales zigzag back and forth across the bay, the researchers marvel at this fierce, powerful animal in repose, and leave the A5 pod in peace.

To compare an orca's life in the wild with that in captivity, we will follow the life of one of the young females in the A5 pod, Corky, who was captured at Pender Harbour, British Columbia in 1969. She has lived a very different life from the rest of her pod.

2. Corky's Life

Slowly, the young adult female circles the pool. She swims round and round and round, shallow-diving, limited to brief speed bursts, her movements defined by the concrete all around her and the men and women, her trainers. They will tell her what they want and reward her for her obedience with dead fish for which she must do nothing except perform a few routine actions and then open her mouth. There are other orcas in the tank, but they are not from her pod, and they make sounds, foreign dialects from oceans half a world away from her home waters of the Pacific Northwest. And then there are the shouts and screams of thousands of people daily that fill the stadium around the big tank for each show. Hour upon hour, day after day, year in and year out, she has lived this way and it has come to be her life.

Corky has been in captivity for more than 20 years, first at Marineland of the Pacific, near Los Angeles, and now at Sea World, San Diego. Her long-time companion there, Orky, also came from the A5 pod. Orky always seemed to show protectiveness toward Corky. When Sea World management closed down Marineland in 1987, they trucked Corky and Orky down the road to Sea World, San Diego. Eighteen months later, Orky died. They had grown up together; their A5 pod is thought to have had about 19 members before it was captured twice in British Columbia in April 1968 and December 1969. Altogether, twelve pod members were sent to marine parks in France, Canada, and the United States, including Orky and Corky and seven others to two parks in California. The remainder of the pod (about seven whales), escaped or was let go then and form the older members of the A5 pod today.[6]

Orky and Corky were immature when they were captured in 1968 and 1969. Orky was about age ten and Corky was about age five. Originally, there were three other animals from the A5 pod that came to Marineland from the 1968-69 captures. All three died between 1970-1972, partly casualties of the early years of keeping orcas captive. Corky herself had arrived from Canada with a wound in her back from a rifle slug which was removed by marine mammal veterinarian Lanny H. Cornell. The dream of Marineland's owners and orca trainers was that Orky and Corky would mate when they matured in the late 1970s, just as they might have done had they remained in the wild. They did mate. But the first orca to be born alive in an marine park, in February 1977, a 450-pound male, survived only 16 days. Over the next decade, Corky had at least five more pregnancies, including two miscarriages, one of which reached full-term, and three live births, but none survived longer than 46 days. After the second orca to be born had died after 11 days, then Marineland curator Brad F. Andrews, now Sea World's Vice President of Zoological Operations, said that the feeling was that Corky, a young female when she was captured in 1969, had never learned how to nurse. "Corky didn't seem committed to keeping the youngster alive." Marineland staff intervened with several of the calves, taking them away from Corky to try to feed them, but could not save them. (*See* Captive Breeding, p 56.) In the wild, an orca mother probably learns to nurse and take care of a calf by watching other mothers in the pod. Following a birth, a mother

receives help from other pod members, and the calf is well cared for during its first hours.[7]

> The caged female continues to trace the edges of the pool. She cannot dive deep. She cannot rub on the pebble beaches – as she once did so long ago, off northern Vancouver Island. The pool is concrete. She cannot race ahead in a straight line, porpoising at the surface. She would crash into the side. She cannot hunt with her pod. Her food is caught for her and served dead. She cannot rest with her pod. The last member of her pod to live with her was Orky. Orky accompanied her to Sea World in San Diego in 1987 and promptly sired two calves with younger Atlantic Ocean females, not of the A5 pod. Both calves survived and live today at Sea World. But Orky has died. In July 1988 Orky began losing weight and by September he had lost 4,000 pounds, a third of his weight. Only three days after the second calf was born in September 1988, Orky surrendered. Today, Corky shares the pool with the Shamus and Kandus of Sea World – all Icelandic orcas from different families, very different backgrounds, different dialects. She has learned some of the Icelandic dialect, she performs in the shows, but for her – unable to mother a calf and now, no longer ovulating – the "show" seems almost over.

Many millions of people have met Corky during her years at Marineland and now at Sea World. Corky has been their close-up introduction to orcas, to animals, to the sea itself. She has aroused in many a sentiment of sympathy toward animals and contributed to an awareness of the environment and the need for conservation. Captive orcas can be "ambassadors from their species," as Vancouver Public Aquarium director Murray A. Newman put it many years ago. But others, such as orca researcher Paul Spong, point out that a mandatory diplomatic career might as well be slavery, and anyway hasn't she served long enough?

In 1991, Sea World was approached by Spong and Sean R. Whyte, Director of the Whale and Dolphin Conservation Society: Corky *could* be returned to her pod, they argued. In conversation with Sea World executives, they pointed out that this would be a gesture of goodwill toward orcas and a powerful lesson to teach the millions of school children who visit Sea World. Sea World has the chance to return to nature a token of what it has obtained, that which has been the source of its success and wealth. It could be a superb public relations opportunity. And it is also of scientific interest as researchers could study the whale as it reacclimated to life in the wild. Sea World could educate people and make the news with an exciting and entertaining project. At all the Sea World parks, visitors could be kept up-to-date with Corky sightings in the wild and news of how she was doing. Best of all, Corky, after all her setbacks as a potential mother and her 22 years in captivity, would have another chance to swim free.

Sea World looked at the proposal. Of course, the decision would be made by Busch Entertainment Corporation, part of Anheuser-Busch, the big brewer that, with the Sea World purchase in 1989, had overnight become the second largest owner of amusement parks and attractions in the United States. Whyte and Spong repeatedly recommended that Sea World-Busch Entertainment appoint independent experts to review the proposal, but the corporation refused. In fact, many independent and prominent scientists who have worked with orcas in the wild and in captivity support the feasibility of returning Corky to the wild. The move would arguably be good for Corky, but would it be good for business? Would it set a precedent and lead to pressure to release other orcas? Did it make good business sense to collaborate with an environmental group? Would Sea World part with a member of a species that was becoming so difficult to catch, buy, and import, even if her breeding career were over? Speculation about the proposal ran hot and cold. Sea World said they were considering it. But the decision, in

a tersely worded letter in May 1991, and confirmed in meetings with Sea World executives, was quite simply "no".[8]

Unless Sea World changes its tune, Corky will spend the rest of her life in captivity.

3. The World Orca Trade

The wind is up, the sea slopping over the boat, when orcas are sighted. The race is on. Yet the "contest" is one-sided. Trying to catch a several-ton, fearless animal – one that could outrun or easily dive to avoid the fastest ships, and one that could jump over or break through an encircling net – simply requires a knowledge of orca's "weak points".

First, there is the family instinct, living in their tight family groups called pods. If one whale is captured, others will often hang around to give support. This allows the collector to make a selection.

Second, orcas are curious predators by nature and at times so eager for food, that caution is abandoned. Orcas will sometimes swim up to fishing boats as the nets close, to take any spillage. In Icelandic waters, as well as off the Northwest Coast of North America, the two main areas where orcas have been captured, they have sometimes been caught in seine or gill nets by accident.

Third, once captured, most orcas respect nets. Although they could break through or easily jump over most nets, they rarely attempt escape. Some may be aware of the dangers of nets and know not to approach too close to the mesh.

Orca capture methods have changed somewhat since the capture of Corky and the others in the late 1960s. The sharp learning curve occurred after the first whales were caught in 1961 and 1964. In those early years, several orcas died accidentally in the nets after becoming entangled, and at least one died after being tranquilized with a dart. In a 1962 attempted capture, Marineland collectors shot a mature male and female orca, killing the female, after the boat's propeller became entangled in a line attached to a hoopnet that had snared the female. The whales "attacked" the boat which made the collectors fear for their lives and bring out the guns. The first collectors to "perfect" a successful catching method, by the late 1960s, were Ted Griffin and Don Goldsberry. Goldsberry continued to catch orcas in Puget Sound in the 1970s, becoming Sea World's director of collecting and moving on to Iceland by 1976. As recently as July 1987, on an orca import permit application, Goldsberry was listed as "Corporate Director of Collecting", although Sea World of Texas's George J. Becker, Jr., refused to acknowledge that Goldsberry still worked for the corporation.

Trying to catch orcas, captors have used harpoons, hoop nets, gill and purse seine nets. In 1962, Marineland (California) collectors hoop-netted an orca, but the line got caught in the propeller. Some of the Japanese captures of the 1970s and 1980s, in which orcas were actually harpooned, were similarly inept; two died within the year and a third survived two years. For the most part since the 1960s, two main methods have been employed. The first, used primarily in British Columbia and Washington, involves waiting to ambush whales as they swim into a narrow, shallow water inlet, then stringing a net across the mouth, entrapping the entire pod. Individual animals can then be selected, often by corralling them in separate enclosures. If the orcas will not swim

into an inlet or bay, some captors, notably Don Goldsberry, have used explosives known as seal bombs to drive the whales in.

The other main method – begun in Washington State and later taken to Iceland where orcas must be caught in the open sea far from land – requires that one or more whales be encircled with a purse seine net. This is the most popular method and the one that is still used today. Working with Don Goldsberry of Sea World and Jón Gunnarsson of Sædyrasafnid Aquarium in Iceland, W.H. Dudok van Heel from Dolfinarium Harderwijk in Holland helped adapt this method to Iceland's often rough open waters. He describes two techniques for distracting the orcas long enough to get the purse seine around them.

One is to follow a herring fisherman and then surround the whales as they gather to take the fish that spill out as the net is lifted aboard. The main requirement is precise timing: to close the net around the whales just as the herring purse-seiner steams away. The other technique is to purchase a load of 700 to 900 pounds (roughly 300 to 400 kg) of fresh herring and dump it in front of an approaching pod. As the whales swim in for food, the seine net is set around the whales.

Once captured, the orcas usually swim round and round, checking out the boundaries. As the net is drawn tighter, they will often lie at the surface, stationed along the float line that supports the net, facing out to sea. They become docile, accepting their fate. Only a few orcas have ever escaped, usually older animals that seem to know fishing nets and break through them.

Orca captures have mainly occurred in two areas of the world, and by only a few collectors (*See* Live Orca Captures, p 89). Of 127 captured and sent to marine parks, 56 came from the British Columbia-Washington State population and 55 from around Iceland – a total of 87 percent from these two major areas.[9]

In each area, the characteristic pattern was an early period when captures were under few or no regulations and the orcas were accidentally captured by fishermen or by those with little or no experience with orcas. Within a few years, the field narrowed to two collectors or collecting teams in British Columbia, one in Washington State and two in Iceland. All had collecting experience, and brought along marine mammal veterinarians to examine the whales after capture. Some were owners or collectors for a marine park and others had close links to one or more parks that would buy any whales they captured.

The captures of the BC-Washington population ended in the mid 1970s. As local orca numbers (which collectors had estimated in the thousands), turned out to be only about 300 based on photo-ID studies, people began to question seriously the capture of orcas. In the southern community of orcas, where 45 were captured – cutting the population to about 70 percent of its peak size – it has yet to recover to pre-collection levels. The northern community, less exploited except for the A5 pod, has almost returned to its original numbers. But public sentiment has become the main factor restricting further captures in British Columbia and Washington. In February 1976, Sea World collector Don Goldsberry captured six orcas in Budd Inlet, deep inside Puget Sound. He was accused of violating the terms of his permit. This time, he was seen using seal bombs and buzzing aircraft to herd the whales and drive them into his nets. He was sued by the State of Washington. Eventually, the matter was settled when the state agreed to drop charges if Goldsberry and Sea World let the whales go and agreed never again to catch whales in Puget Sound.

In British Columbia, the last capture was in 1975. A large segment of the public, as well as local environmental groups in British Columbia, as in Washington, remain strongly opposed to more captures. Even though permits may be requested, it seems unlikely that any more orca captures will occur. Bob Wright, of Sealand (Victoria, BC), obtained a permit in 1982 to capture more orcas but was "harrassed" on land and at sea by demonstrators seeking to prevent the captures. He finally gave up and purchased three orcas from Iceland.

After the Washington-BC orca captures ended, Sea World (the main player and driver of the world orca trade, which has exhibited some 36 orcas, nearly a quarter of all those exhibited world-wide), explored the possibility of capturing orcas in Antarctica and Alaska. Antarctica presented difficult logistics because of its remote locale. Alaska proved to have an orca population too close – geographically and emotionally – to residents and environmental groups who did not want local wildlife to be removed. Sea World did obtain a permit in 1983 to capture 100 Alaskan orcas, 90 of which were to be temporary capture for study and 10 to be sent to Sea World marine parks, but the company was forced to leave Alaska empty-handed. In a three-year court battle, the permit was legally challenged, lost, appealed and lost again; but again, the key was overwhelming public sentiment against taking orcas.[10]

Between 1976 and 1989, Iceland has proved the best source for Sea World and other marine parks wanting to capture or buy new orcas. At first, the captures were welcomed by Iceland. Between 1955 and 1972, Norwegian whalers took about 300 orcas around Iceland and an undetermined number of others were killed in supposed conflicts with Icelandic herring fishermen. Exporting orcas to marine parks seemed a way to keep the fishermen happy as well as a great money-making business, but it has not proved so, at least not for the Icelandic captors, partly because of the uncertainty of the market fueled by the difficulty of obtaining orca import permits in the United States. It has proved easier for US marine parks such as Sea World to import orcas on "breeding loan" from other establishments. In that case no payment is involved. But sometimes Sea World has paid other marine parks many times the initial cost price for an orca that is partly trained and adjusted to captivity.

As subsequent details of the Icelandic captures have come to light – orcas kept in poor holding tanks and some dying while awaiting shipment from Iceland, plus the lack of definitive population estimates – opposition has mounted. Population studies have been carried on for several years, with more than 200 photo-identified by Iceland's Marine Research Institute as of August 1991, but the research is incomplete. Shipboard surveys by Sigurjónsson and Gunnlaugsson in 1987 produced estimates of 6,618 orcas (95 percent lower confidence limit of 3,850) around Iceland and the Faroe Islands. In any case, the Icelandic Minister of Fisheries has restricted the permits to ten or fewer per year in every year but one. Total removals have averaged less than four per year – probably too few to endanger the population. Perhaps in the next decade or two, if detailed photographic identification studies can be continued off Iceland, researchers will learn exactly how many whales there are, whether the same pods have repeatedly been captured and whether certain pods have been captured to excess, decreasing their breeding – and survival – potential.[11]

As of January 1992, the future of the Icelandic captures was uncertain. In 1989, Sean R. Whyte and the Whale and Dolphin Conservation Society (UK) began an intensive effort to stop the orca captures, meeting with various government ministers in Iceland. This effort was supported by numerous conservation and environmental groups around the world. In Iceland itself, Magnus Skarphedinsson and several others have been instrumental in creating public awareness of the captures and sympathy for the orcas. In 1990 and 1991, Helgi Jónasson of the Fauna Company, who along with Jón Gunnarsson

has conducted all the orca captures since 1978, applied for orca permits but the Minister of Fisheries denied them.

Live orcas and other small cetaceans have also been offered for sale in Japan. Certain collectors working with the Japanese have defended the capturing of cetaceans there for the same reasons as for Iceland – that the animals are being killed anyway and that local respect for live whales and dolphins may well result. But California marine mammal veterinarian and dolphin collector Jay C. Sweeney, filmed in Japan overseeing dolphin captures, seemed uncomfortable working around the Japanese fishermen and tried to deny he worked *with* them. The workers were fishermen who practice "oikomi-ryo", the drive fishery that has killed thousands of small whales and dolphins over the years at Taiji and Iki Island. Environmental groups have questioned the integrity of marine parks buying cetaceans from a country that engages in the killing of small whales and dolphins along its coast and continues to fight the world-wide moratorium against whaling. For at least some species, the captures of small whales and dolphins in Japan have been accomplished in a much more casual fashion, with mortalities during and soon after capture. Of course, the dolphins, pilot whales and false killer whales (another species in the same family as orcas) captured alive and sent to Japanese marine parks or exported world-wide, would have been sent to the fish market for slaughter.

The number of orca captures in Japan stands at thirteen, and no marine park outside of Japan has purchased orcas there. And Kamogawa Sea World, the main longstanding marine park to exhibit orcas in Japan, has usually turned to North America or Iceland for their orcas, although it would be cheaper to buy locally, and easier, without import permits or long-distance transport. Recently even Shirahama World Safari, which had bought four orcas from Taiji fishermen, two of which died within two months of capture, decided to buy Icelandic orcas in the spring of 1990 – despite the cost of flying the whales 7,500 miles (12,000 km) to Japan. The better marine parks do not want to be associated with the Japanese captures, partly because of the inexperience of the captors with live animals, but perhaps also, because of the international stigma attached to the slaughters in the annual drive fishery.[12]

The marine mammal trade has been carried on by relatively few individuals, although it is not restricted to those with prior experience. Off Iceland, in the early 1970s, W.H. Dudok van Heel tells of herring fishermen who had caught an orca in their net and attempted to take the animal on board alive. The fishermen, ignorant of the methods for capturing orcas that had been worked out in the North Pacific, lifted the whale by the tailstock using the ship's derrick. When the ship rocked in the seas, the animal became a huge pendulum which smashed with resounding smacks into the ship's side "to what must have been a horrible death" in Dudok van Heel's words. Yet marine mammal collectors, like many fishermen, are reluctant to report mortalities in principle – especially when they occur far from shore with no independent observers aboard. Examining the known statistics, we find relatively few accidental orca deaths – 11 in all reported since 1961. The last deaths in the records were in 1970 at Penn Cove, Washington, during a Goldsberry-Griffin capture and these were revealed only much later when four carcasses washed ashore. In Iceland, as in BC-Washington, we are supposed to continue to trust what is reported. It would be better if impartial observers could be stationed on board collecting ships, as is now done on some US commercial fishing boats that have had problems with incidental killing of marine mammals in seine or gill nets. Failing to report and tabulate whales injured or killed during captures makes a mockery of any attempt to manage the captures scientifically. However, due to the high profile of orca captures and the scientific interest of Iceland's Marine Research Institute, additional mortalities to those reported are probably few in number.[13]

A final aspect of capturing orcas – one that is rarely considered – is the effect of capture on those animals left in the pod. If the pod is small (fewer than six animals), as in the transient pods of the North Pacific, then capture of even one individual may affect the pod's ability to survive. In March 1970, Charlie Chin's (M) pod, a potentially productive transient pod with five members, including four females, was captured in a bay on southern Vancouver Island. The entire pod was lined up to be sent to various marine parks. Two were transported soon after capture to Sealand in Victoria, whose owner, Bob Wright, had made the capture. The other three remained in the holding pens, refusing to eat for more than 70 days. After one female died of malnutrition, and was quietly disposed of at sea, the remaining two, Charlie Chin and another female, began to eat and were then sold to a Texas marine park. One night, however, before they could be transported, they were released without Sealand's permission. Since 1970, the pod has gained two calves, only one of which remains with the pod today. Part of a transient pod's strategy for survival, unlike the resident-type pods, may be leaving the pod to join another transient pod. They do travel together sometimes in transient superpods. Still, when Charlie Chin and the female end their breeding years, their pod may die out.[14]

No orca captures are known to have eliminated a pod, although a number of subpods, composed of a mother, her sons and daughters and grandcalves have been wiped out. These subpods are often fairly independent, travelling apart from their pods for extended periods, and may be in the process of forming new pods. And there may be other implications in which survival is reduced for those left. Research in the Northwest US and Canada suggests that orca males sometimes die soon after their mothers die. To be sure, males have a much shorter life span than females. But it may mean that the capture of mothers, even if past breeding age, contributes to the premature death of their male progeny.[15]

Most of the whales captured, however, were younger, or male, orcas. In general, aquarium captures alone would not seem to have a great impact on pod survival, but no pod has yet been studied before, during and after capture to assess the immediate and long-lasting effects of removing some of them. Minimal data are available from Iceland on the pods captured there. Off British Columbia, those pods known to have been captured have survived and some pods have already returned to pre-capture levels. However, all three pods from the southern community and the A5 pod in the northern community are still short of original numbers. In 1987, in the southern community, there were 84 orcas – still 12 animals fewer than at its peak. At current birth rates, it could be the mid-1990s before their numbers return.

Although not endangered, orcas are not especially numerous. They are found in every ocean of the world. But feeding at the top of the food chain, their numbers are low compared to many other dolphin and baleen whale species, and the rate of increase for one population, the population growth rate, was only 2.92 percent a year. Even considering the locally intensive captures of the 1960s and 1970s off southern Vancouver Island, the captures cannot be said to have damaged that population's prospects for survival. Yet, good management dictates caution and limits the number that can be removed from any population to a very few.[16]

4. Transport and the transition to captivity

Following capture, both orca and collector face difficult problems. A major challenge for collectors is transport of the several-ton creature over thousands of miles, usually by air, to a strange, new environment. In the early years, captors drew on their experience with bottlenose dolphins but, at up to several times the weight of dolphins, orcas required modified techniques. As always, it was trial and error.

In 1976 and 1977, W.H. Dudok van Heel, an experienced dolphin collector, worked with Sea World's Goldsberry and Jón Gunnarsson, on several Icelandic orca captures. He describes the delicate selection process, after a pod or part of a pod is captured. "Experience is needed to select the animals at sea," he writes. "The information from blood checks, etc. can only be acquired later, and access to a laboratory in far away places is not always easy, if not impossible. For training purposes, the adolescent or young adult is usually the best choice. However, if one wants to establish a breeding group, much older animals are needed, for example, females 8 to 10 years old and bulls 12 to 14 years old or older....It is my experience as well as that of others (Dr. J. Geraci and Dr. J. White, personal communication) that nervousness, leading to panic and death, may occur in young male bottlenose dolphins, although not in young females or older animals. The mortality in captivity has been highest in the larger orcas. Our transport methods have improved since the early days, yet shipping a large animal leads to more risks in the long run. So when it comes to selection, I am strongly in favour of taking young animals. In Icelandic waters, orcas are weaned at approximately 250 to 260 cm in length. An animal of 270 cm is definitely taking fish. Such an animal does not weigh more than 300 kg and is in fact just a large dolphin to handle."[17]

Dudok van Heel believes that the transport of all dolphins, including orcas, should be restricted as much as possible. Yet: "Transport properly arranged and attended by experienced personnel, especially with animals accustomed to captivity, presents relatively little stress. Ideally, one should bring the animals directly into the final establishment, but this is only possible for establishments with catching grounds at their doorstep. Next best is to bring them straight into good holding facilities where they can be properly looked after for six months or so, whilst they acclimatize completely to captivity before going on a long-distance transport to new surroundings and new food once more."

However, such holding facilities have sometimes been substandard, or so makeshift as to risk the lives of the orcas entrapped. In British Columbia-Washington, and, more recently, in Iceland, outdoor holding pens, usually a net strung across the mouth of a narrow bay or harbour, have been used with mixed results. During capture, or soon afterwards, orcas became entangled in the nets and died in 1970 in Penn Cove. The animals, captured by Goldsberry and Griffin, were secretly disposed of. A few weeks later, three of the four animals, their bellies slit and chains and anchors tied to their tails, washed ashore. That same year, in British Columbia, a pod of orcas was kept for several months outside of Victoria at Pedder Bay. Two whales were taken for marine parks,

including a rare part-albino orca. That nervous animal, after almost suffocating when it became entangled in the nets, had to be cut out by divers. In Iceland, a small exposed concrete pool has been used since 1976 to house many of the orcas caught by Icelandic fishermen for world aquariums and marine parks. In November 1978, International Animal Exchange (a broker for zoo animals based in Ferndale, Michigan, USA) ordered five Icelandic orcas, planning to ship them to Japan, but had difficulty arranging transport. As a cold winter came on, the whales were stuck at Sædyrasafnid. In the middle of January, the marine park had pumping trouble, the pool filled with snow during a fierce storm, and the orcas, unable to submerge properly, got frostbite on exposed skin areas. Two died. The other three received medical treatment and were improving, but with more cold weather and delay in arranging transportation, aquarium director Jón Gunnarsson decided to set them free.[18]

Transportation over long distances presents different and greater problems than over the shorthaul. Dudok van Heel recalls that the sling was introduced mainly to meet the requirements for transport by air. "It has been used successfully, but also with sad losses on long distance transport, for years. The longest journey I have carried out using this method was that with an orca in August 1968. It lasted 68 hours, 33 hours more than anticipated because of a mistake on the part of the contracting major airline. Nevertheless the whale survived, started to eat normally after 24 hours and, although untrained at the time of arrival, performed a few tricks in his first show five days later." Three months later, this young male orca, having survived transport from the North Pacific to Holland, died.

Dudok van Heel explains that his use of the sling as the "sole means of support during transport was dictated by the fare structure: the cost of dolphin transport was then calculated by weight. From about 1975 onwards, airlines began to charge on the basis of volume." This led Dudok van Heel to return to his old method of transporting dolphins and orcas in water. The method was far better for the animals; they were less prone to problems, and it was easier for the attendants.

A special steel tubular frame, designed by Don Goldsberry, was used for the larger animals. For a 15-foot (4.5-m) orca the box needs to be at least four feet (125 cm) high. The water should bear at least two-thirds of the animal's weight. The fact that the animals almost float eases the stress considerably. Nevertheless the larger animals can overheat, even in a cold climate such as Iceland in winter. Dudok van Heel's group used 110 to 220 pounds (50 to 100 kg) of crushed ice over the flukes and in the holes beside the flippers.

The after-effects of this transport system are minimal – according to Dudok van Heel. "After a journey of 15 to 20 hours, the animals normally swim away as if they had only had a medical check. After a long transport of 20 hours or more they are not stiff, but we walk them around and support them, as they look a bit dazed or are perhaps tired. A normal watch of at least 12 hours with a frogman at hand is recommended after a long-distance trip."[19]

Dudok van Heel is the orca captor to have written most recently and in detail about transport methods. Like most orca captors, he was something of a law unto himself. But unfortunately, with no independent texts for comparison, it is difficult to assess critically his methods – or those of other captors.[20]

Although several orcas have died within months of long-distance transport, particularly in the 1960s and 1970s, it is difficult to prove that excessive stress during transport is the cause. There are no records to show how much stress occurs during capture, transport and initial captivity. Yet stress may have been directly, mainly or

partly responsible for premature deaths (*See* Health of Captive Orcas, p 49). Trainers believe that air transport contributed to the stillbirths of two pregnant females moved during their pregnancies from Pender Harbour, British Columbia, in 1968, to Marine World Africa USA, San Francisco; one of the mothers died in the stillbirth. But, again, no *proof* that air travel was a contributing factor. Of 139 orcas taken from the wild for marine parks, most have flown at least once. Some 73, more than half, have taken at least one 2,000-mile (3,200 km) journey, and 18 have taken two or more long journeys, usually upon being resold to a second marine park. Nootka, kept over 20 years in captivity, lived in five different marine parks, logging 8,000 air miles (12,900 km). But King, captured in Iceland in 1979, travelled 12,000 miles (19,300 km) over three continents from Iceland to central Europe to North America to Japan. He had only brief stops at four different marine parks during the less than four years he survived in captivity. He died in November 1983 in Japan of pneumonia. Perhaps some animals withstand the stress of long-distance transport better than others.

Sea World's policy of shifting its orcas as needed for breeding and to stock its seasonal park in Aurora, Ohio, has been criticized. Some orcas are shifted as often as twice a year. Sea World parks are located in San Diego, California; San Antonio, Texas; Orlando, Florida; and Aurora, Ohio (summer only), which are 1,000 to 2,500 miles (1,600 to 4,000 km) away from each other. But there are no studies to determine whether the moving affects longevity.

In the early years of keeping orcas captive, animal transport was a matter of expediency including cost, and the best guess of how to get the orca there alive. Today, guidelines set by IATA (International Air Transport Association) and CITES cover all types of animal transport by air, and there are some national guidelines as well.

The most important requirement is that the captures and transfers between marine parks and from capture site to marine park be done by professionals with attending orca veterinarians and using the best equipment and techniques. Transporting an orca has become an almost routine practice in the past two decades. The million-dollar investment in the individual animal dictates that great care be taken. Yet the questions of whether orcas suffer too much stress during transport and what is the long-term effect of such stress, are still unknown. Do marine parks really want to know the answers to these questions? The answers might bring more regulations; they might also lead to measures that could cut down on stress and increase the survival rate of captive orcas.

5. Standards and Regulations for Capture and Display

The regulations for catching and keeping cetaceans such as orcas vary widely, depending on national and sometimes state or provincial legislation. The most detailed laws and standards have been developed in the United States where 40 percent of the total of about 150 orcas captured for (or born in) marine parks have been held. The Marine Mammal Protection Act (MMPA) applies to US citizens in US waters and on the high seas. As well, animals captured under the MMPA remain under US law even when exported to other countries. This provision may have some teeth with bottlenose dolphins sent overseas, but no orcas alive today were captured in US waters under the MMPA.

The early orca captures in the 1960s, off British Columbia, Washington State, and California were completely unregulated. Anyone who wanted to capture orcas could try his hand. Between 1962 and 1970, nine different teams (including fishermen who made accidental catches) captured one or more orcas on behalf of or for sale to marine parks. In these unregulated operations, several animals died during capture – suffocated in nets or disabled by tranquilizer darts. Reports in British Columbia and Washington State newspapers described the captures, pointing out the accidental deaths and the distant destinations of the captured whales. Residents, who had long come to enjoy the orcas as a dramatic part of the local fauna, pressed for protective legislation. In 1970, Canadian laws were passed to control harrassment, capture and killing of orcas, allowing only restricted permits to Canadian captors. In August of that year, Goldsberry and Griffin, working in Washington State, captured the entire Washington-southern Vancouver Island resident orca population – some 80 orcas – in their nets at one time. Four youngsters were accidentally killed. The following year, 1971, Washington State passed laws to regulate orca captures, requiring permits and, to ensure humane handling, the presence of state officials after capture.

In 1972, when the Marine Mammal Protection Act was passed in the United States, federal protection was extended to orcas. Since then, a number of other countries have instituted laws or guidelines for capturing and keeping orcas. As with any regulations, follow-up to ensure compliance is crucial. In the United States, government agencies are heavily lobbied and this process is mainly responsible for conservation laws such as the MMPA being interpreted and enforced and gradually made more effective. Some marine park owners and curators would say *too* effective, meaning too restrictive.

The International Whaling Commission (IWC) Sub-Committee on Small Cetaceans has also examined populations of small cetaceans involved in "live-capture fisheries", as the captures for marine parks are termed. In 1986, the sub-committee focussed on orcas: "Considering the relatively low levels at which killer whales have been exploited world-wide, the species cannot be considered endangered. However, to the extent that stocks are localized and isolated, any exploitation of them can be expected to have long-term impacts on population size and structure." This is what had begun to happen in the southern community of orcas off Vancouver Island and in Puget Sound before the

captures ended, and could be happening in Iceland as well. "Mindful of the probability that populations in a given geographical area consist of localized stocks, the sub-committee recommends that any planned live-captures by the USA, Iceland, Japan or elsewhere be preceded by an assessment of size and composition of the population to be affected." The sub-committee suggested as a guideline that not more than two percent of a population be taken annually until information from solid scientific research could be obtained. However, since 1986, such percentage guidelines have become controversial, with attempts to use them sometimes being no more than an excuse to avoid the costly investigations and monitoring required for good management. The IWC sub-committee now considers percentage guidelines an undesireable over-simplicity. It depends on the health of a population, and which individuals are taken, as to whether *any* percentage can be safely removed.[21]

United States

Three main laws govern the capture and keeping of orcas and other cetaceans in marine parks. The MMPA prohibits the taking of any marine mammal in US waters or by US citizens worldwide except by special permit – for scientific work, public display, and accidental captures or entanglements during commercial fishing. "Taking" is defined as "to hunt, capture, kill, or harass," or *attempting* to do any of these things. The "exemption" process for marine parks requires that a permit application be made to the National Marine Fisheries Service (NMFS).

The application must state the species, the number of animals to be taken, the method of capture, the names and qualifications of the personnel doing the capture, and information on the impact the capture might have on the wild population.

The application is then sent for comment to the Marine Mammal Commission, an independent US agency with a scientific committee that advises the NMFS and other agencies on marine mammals. At the same time, it is also published in the US federal register and the public is invited to submit comments.

After a period of, typically, four to five months, NMFS makes a decision on the application, taking into account the review and public comments and how well the permit complies with MMPA regulations.

After a marine park or independent collector has taken a cetacean captive, the Animal Welfare Act comes into play, authorizing the Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) to regulate the handling, care, treatment and transport of animals. APHIS sets standards for transport methods, minimum pool size, and water quality in marine parks – mostly physical conditions. Government veterinarians conduct inspections of the parks.

The third law in effect is the National Environmental Policy Act, called NEPA, which charges the federal government with the responsibility to do a detailed study of the environmental impact of any major federal action. Recently, due to lawsuits from environmental groups, captures of cetaceans have been included. Preparing an Environmental Impact Statement (EIS) on a capture must take into account any fishing conflicts, food supply, habitat conditions – all the factors that affect the status of the species. The research to prepare an EIS could hold up a decision on a permit by six months to several years.

The battleground of the controversy for and against catching and keeping marine mammals captive has largely been fought on the definitions, interpretations, and enforcement of these laws. Marine parks – declaring their views in the IMATA

newsletter, *Soundings*, and in a series of articles published in 1990 in the Mystic Marinelife Aquarium publication *Seaword* – complain that it has become very difficult to obtain marine mammals and that the paperwork and legal complications are expensive and time-consuming. They argue that the MMPA, though worded as a conservation act, is overly protectionist, banning all taking of marine mammals and then only allowing it in some cases by special permit. They feel that supplying the needs of marine parks represents only a small portion of the total capture of marine mammals by permit, yet undue emphasis is placed on their activities by some environmental groups. Between 1975 and 1990, fewer than 100 marine mammals of all species were taken each year for public display by US parks and zoos. Of these, 17 percent were stranded animals. At the same time American tuna fishermen alone were authorized to kill some 20,500 dolphins each year, many more times the number of animals being taken for display.[22]

Environmental groups that oppose keeping animals captive, on the other hand, maintain that certain provisions of the MMPA and the AWA have not been enforced and that the marine parks have been less than forthright and co-operative. US laws permit citizens to sue their government and, because the government was taken to court, NMFS and APHIS have been told how to interpret certain provisions and ordered to enforce them. For example, NMFS is now forced to analyze the laws of countries exporting whales, to satisfy the requirement that regulations comparable to those in the United States are in force. NMFS is also now required to ensure that the populations of those animals to be caught will not be harmed as a result of capture. As part of this process to define and refine the law, the MMPA has been amended four times since it was passed in 1972, most recently in 1988. In addition, over the past several years, NMFS has undertaken an extensive review of its permit procedures in the face of determined lobbying by both marine parks and environmental groups. New draft regulations will soon be published for comment and eventually have the force of law. As well, the Department of Agriculture is being forced by other government agencies including NMFS to review Animal Welfare Act enforcement which is criticized by environmental groups. Part of the push has come from the influential Marine Mammal Commission. Marine parks, led by the Mystic Marine Aquarium, have criticized the role of the Marine Mammal Commission in reviewing captivity permits, contending that the commission should only address the "ecological impact of the proposed taking and nothing else" and that permit review relating to marine park inspections or park design is the responsibility of APHIS. In the *Seaword* articles, Mystic Marine Aquarium charged the Marine Mammal Commission and National Marine Fisheries Service with crippling the industry by making it so difficult, time-consuming, and at times impossible to obtain permits for what they consider an insignificant number of animals.

In practice, the Marine Mammal Commission, with its "interagency inspection teams" to supplement APHIS inspectors and advisors, has sought to improve the quality of the inspections. The Marine Mammal Commission, as a scientific and advisory body and an independent agency, is in a unique position to provide a competent checking system on the whole process of giving marine mammal permits. In its often perceptive comments and detailed recommendations, concern for the animals' welfare appears paramount. In a survey of US marine parks, Karen L. Steuer of the Center for Coastal Studies, Provincetown, Massachusetts, USA, defended the Marine Mammal Commission. She wrote that single agency reviews "particularly in light of the apparent APHIS inspection problems...are simply not adequate. Given that this industry is supported in large part by public funding, and is based on animals protected by federal legislation, NMFS 'management' of captive marine mammals and the attendant ability to conduct independent review should be welcome."[23]

Certain standards for US marine parks may also be encouraged through membership in the American Association of Zoological Parks and Aquariums (AAZPA).

This non-government, non-profit organization is, by its own description, "dedicated to the advancement of zoological parks and aquariums for conservation, education, scientific studies and recreation".

As with other professional associations, AAZPA accreditation involves evaluation by representatives from zoos and aquariums, certifying that others among their number meet minimum acceptable professional standards. Benefits of being accredited, which costs $600 to $1200 US for the inspection and annual dues of $500 to $6,000 US based on size of operating budget, are, according to the organization: better access to surplus animals from other AAZPA-accredited facilities and better results when submitting applications for federal permits to collect, import or export animals. AAZPA mainly serves the interests of the better zoos and marine parks – some 158 in total around the United States (plus a few in Canada). But there are an estimated 1,400 US petting zoos and parks, roadside menageries and travelling shows – none of which are members. The smaller zoos and other establishments rarely wish to join AAZPA.

But how valuable are such "within-the-industry" evaluations in terms of regulations? AAZPA's real impact on standards is debatable. AAZPA primarily serves its members, not an inquiring public who might want to see the inspection reports or find out which institutions have applied and failed.

Canada

Canada's Cetacean Protection Regulations, formulated in 1982 under the Fisheries Act of Canada, allow the Minister of Fisheries and Oceans to issue licenses "to hunt cetaceans...for the purposes of scientific research or education," marine park display having been interpreted as education. Since 1975, white whales, or belugas, have been the main species caught alive in Canadian waters and shipped to world marine parks, mostly in the United States. The last orca captured in Canada, in 1977, ended thirteen years of orca captures, in which 25 were sent to marine parks. Thirteen of these eventually ended up in the United States, and one each was sent to Japan, Holland or France (via the UK) Nine stayed in Canada.

In the mid-1970s, there was widespread public criticism of selling Canadian wildlife outside the country for profit, especially the dramatic orcas, which number only about 300 around Vancouver Island. Since 1975, Canadian policy has been that permits to capture orcas would only be given to established Canadian collectors to replace orcas that die in Canadian marine parks. A 1977 capture was a special case of a young orca calf found alone that would have died without attention. Called "Miracle", it was taken by Bob Wright, owner of Sealand, and died there in January 1982.[24]

In 1982, Wright obtained a permit to replace Miracle and Haida who also died that year, but Greenpeace and other environmental groups blocked the capture. Sealand finally gave up and purchased three young orcas from Iceland in October 1982 and another in November 1983. Since then, the Vancouver Public Aquarium and Marineland of Ontario have purchased additional orcas from Iceland. New orca capture permits could be requested, but coastal British Columbia orcas are well known and followed by researchers and whale watchers who are protective of these whales. Further orca captures in Canada are unlikely.

For the three Canadian marine parks that exhibit orcas, there remain today no national standards or regulations in federal laws. Only if the federal government issues a capture permit to a specific marine park, such as for white whales, will it send a veterinarian to judge the suitability of the establishment and require a later necropsy when that animal dies. Marine parks are subject, however, to provincial or municipal

regulations and requirements. The Canadian Association of Zoological Parks and Aquariums (CAZPA), a professional organization modelled on the AAZPA in the United States, recently tried to establish national standards for marine parks, but decided instead to judge facilities on a case-by-case basis. This group now has a programme in which an in-house panel judges the facility before awarding accreditation. One of the three Canadian marine parks exhibiting orcas – the Vancouver Public Aquarium – has applied for and received accreditation; Sealand (Victoria, BC) and Marineland (Niagara Falls, Ontario) have not applied.

Canadian environmental groups, at a symposium organized by the Canadian Federation of Humane Societies in April 1990, complained about the lack of acceptable, national standards. Angus Matthews, then general manager of Marineland, who attended the symposium, felt there was some regulation through the US MMPA which applies to some of the marine park animals such as bottlenose dolphins captured in US waters, as well as through the CAZPA programme. Neither of these specifically addresses the concerns regarding orcas in captivity. Matthews acknowledged that the regulations or standards could be improved. Former Sealand trainer Eric L. Walters, now a graduate student in biology at the University of Victoria (Victoria, BC, Canada), has been critical of the absence of standards or regulations such as those in effect in the United States or the United Kingdom. In a letter to the British Columbia Veterinary Medical Association (BCVMA), later made public, he complained about conditions such as poor water quality, poor training programmes and other procedures at Sealand that he labelled unacceptable. He offered to assist agencies in drafting regulations and standards.[25]

Regarding imports and exports of orcas, Canada and Japan have dominated the traffic in the past decade. From 1979 to 1991, the United States allowed only four orcas into the country, all of which were transfers from other marine parks in Brazil, the Netherlands, Canada, and the UK; there were no direct imports from Iceland. In the same period, Japan imported 10 and took 11 from their own waters, while Canada imported 17 orcas directly from Iceland, keeping 12 animals and shipping five on to marine parks in Japan, Mexico, including one to the United States. Besides Japan and Canada, the Netherlands and the UK have also been used as "stopovers" for orcas in transit, with collectors and buyers taking advantage of import-export laws less stringent than the United States. In the case of three orcas sent to the UK, however, none of the three lived long enough for re-export.[26]

Canada's Department of Fisheries and Oceans has been criticized – as having a "cozy" relationship with industry – by environmental groups which maintain that public "resources" such as orcas must be protected. The policy regarding permits is to keep the information confidential between the applicant and the Canadian government, so little is publicly known about capture sites and exact destinations of captured animals until after the event, if then. The Department of Fisheries and Oceans does not request data on orcas in captivity, so there is no equivalent to the Marine Mammal Inventory Reports in the United States. The best public information on Canadian orcas or marine parks often comes from the US records for those few animals that have a US connection. In Canada, unlike the United States, there is no Freedom of Information Act.[27]

Iceland

In 1975, Iceland's Ministry of Fisheries initiated a permit system to control the capture of orcas. Permit holders – almost all from Iceland – must follow certain basic procedures while catching and handling the animals and the "State Veterinarian" is supposed to oversee the operation. Since 1975, an average of less than four orcas has been caught per

year; the maximum was ten in 1978. Permits have been issued, a year at a time, for four animals a year since 1986.

The Ministry initially kept quiet about the orca captures. The first government reports of orca captures were published as part of the progress report from Iceland in the 1984 IWC Reports. These covered the year 1982, the eighth season of catching. Complete catch data on the orcas was not released until 1988, as part of a Sea World-sponsored research project and paper co-authored by Jóhann Sigurjónsson and Stephen Leatherwood. No orca deaths during capture were reported during the licensed period of captures, since 1975. In this same paper, however, reports of poor holding facilities at Sædyrasafnid (Hafnarfjord Marine Zoo) were confirmed. In February 1979, after three months in the holding tank, two of five young orcas awaiting shipment suffered frostbite and died when the pool filled with snow and the pumps failed. The other three, also suffering, were released and it is not known whether they survived. Yet another orca, caught in November 1984, suffered fatal neck damages in the holding pool (from an undisclosed cause, after waiting there two months.)[28]

Since then, according to Sigurjónsson and Leatherwood, "procedures for collecting, holding and exporting [orcas] have been greatly improved and become all but routine." Iceland's Marine Research Institute conducts research on orcas and is consulted for the captures. The flow of information from Iceland through the institute to the outside world has improved in the past decade, but the capture operation has been mismanaged. The holding pool at Sædyrasafnid now has a roof over it, but the pool is still small and conditions primitive. Some Sea World equipment has been used for captures at least through the late 1980s, and sources have also linked Bob Wright, owner of Sealand as part owner of the operation. North American marine parks want to keep a low profile, and would certainly not become involved in the captures on any official basis. No Icelandic orcas have been approved for direct import to the US for several years. Instead, orcas have been sent to Canada, Japan, France, the Netherlands and the UK – several of which have eventually ended up at US parks, usually Sea World.[29]

As of January 1992, Iceland's Minister of Fisheries had turned down requests for orca permits in 1990 and 1991. The future of the Icelandic captures is uncertain.

United Kingdom

Britain has never had an orca capture industry and, as of January 1992, has no more orcas in captivity. Between 1968 and 1991, orcas captured in the North Pacific and Iceland have travelled to Britain and were exhibited in five establishments. The last orca – a female named Winnie, exhibited alone for some years at Windsor Safari Park – finally left the UK destined for Sea World (Florida) in October 1991.

The Zoo Licensing Act 1981 Standards provides guidelines for facilities keeping wild animals for exhibition in England, Wales and Scotland and covers all aspects of zoo animal care. Local authorities are responsible for implementing the act as specified by the Secretary of State. Implementation varies from place to place and even though initial inspections were thought to deal lightly with establishments, later inspections have been stricter and several zoos have had to close. But the Secretary of State's Standards did not address needs of marine mammal species, such as orcas.

In 1985, the Department of Environment appointed Margaret Klinowska from the University of Cambridge to prepare a report determining whether the education, research and breeding benefits of marine parks in the UK could justify the continued display of whales and dolphins. If the answer was yes, then, taking into account current

practices, laws and the views of industry and environmental groups, she was asked to suggest standards that should be applied to improve existing and proposed facilities.

The detailed report, *A Review of Dolphinaria*, co-authored with Susan Brown and released in July 1986, was critical of Britain's six marine parks displaying whales and dolphins. Yet industry, as well as environmental groups, complained that recommendations went either too far or not far enough. In August 1986, the Department of Environment set up a steering group to review the Klinowska-Brown recommendations, to consider the comments from industry and environmental groups and to define and coordinate an action plan to implement the final recommendations.[30]

The results, published as *Dolphinaria. Report of the Steering Group* in 1988, included a draft list of standards for keeping whales and dolphins in Britain. After further consultation with industry and environmental groups, the revised standards were attached to the Secretary of State's Standards of Modern Zoo Practice, published in summer 1990. The most important standard with regard to orca is that the minimum size of pool for a primary enclosure with up to five orcas should be 12,000 cubic metres (3,232,680 gal), plus 2,500 cubic metres (673,475 gal) for additional animals. The average depth should be 15 metres (about twice the average body length of a mature orca, or 49 ft) but can vary by 20 percent, making an absolute minimum depth for orcas of 12 metres (39 ft).[31]

Some of the provisions that apply to cetaceans in general are that:

- they must be kept in social groups typical of the species,
- the food must be of a standard fit for human consumption and given in sufficient quantities and nutritional value to keep the animals healthy,
- the pools should contain water that is not detrimental to health – maintaining a low coliform bacteria count, a pH between 7.6 and 8.0, and salinity between 1.5 and 3.5 percent,
- the whales must be weighed and measured regularly and the results recorded along with the daily amounts of food to ensure good health and development,
- no single specimens of any species may be kept and incompatible animals should not be kept together,
- handling of animals should be kept to a minimum so as not to cause unnecessary discomfort, stress or harm,
- animals may not be sent to marine parks that do not fully comply with all these standards – unless no other suitable accommodation is available and if current circumstances would be significantly improved.

The authors reported great difficulty in compiling an accurate account of the keeping of whales and dolphins in Britain – despite the basic record-keeping already required in the general Secretary of State's Standards. Therefore, they directed some attention to the importance of marine parks keeping basic standardized records on each whale or dolphin in their care. Some of the filing and publication of records should be through studbooks, while copies of capture and acclimatisation reports and listing documents, when animals are moved, should be filed with the Joint Nature Conservancy Council. Postmortem reports would be filed with the Department of Environment. The Joint Nature Conservancy Council should allow controlled access to records for research,

analysis and reports, and should publish annual reports on animal holdings, but Department of Environment papers are generally kept confidential. As in Canada, but unlike the situation in the United States, people in Britain have difficulty obtaining access to information about animals in captivity, including applications for permits and necropsies, even when papers are filed with the Department of Environment.

Additional recommendations were that "animals should not normally be acquired unless the original capture was known to have been from a properly assessed and managed population." *A Review of Dolphinaria* and *Dolphinaria: Report of the Steering Group* were highly critical of the education and research value of UK marine parks, as well as the lack of captive breeding. Detailed recommendations were made for the DOE to work with other government departments and private organizations as well as the marine parks themselves, to improve these aspects of marine parks.

The UK guidelines are the strictest standards for keeping orcas, with minimum pool sizes four times the size required in the United States. Even Sea World, with the largest orca pools in the world (though critics still say too small), would be unable to comply with minimum UK standards on the the basis of pool depth. Such standards may be contributing to a situation in which no more orcas will be displayed in Britain. However, the UK standards are not laws but guidelines that can be changed by the Secretary of State without reference to Parliament. Nevertheless, establishments in Britain were given until 1993 to make the changes and adopt the standards.

Europe

EC (European Community) regulations are in the works and may have an impact throughout Europe if there are effective provisions for enforcement. There is some evidence that, although UK dolphin pool sizes are still deficient and will need to be improved by 1993, new pools built in Europe since 1986 already exceed the Secretary of State's Standards – so the UK guidelines may be having some effect.

Japan

Japan's marine mammal capture industry is comprised of local fishermen's unions. Japanese marine parks call the local unions and put in their requests, or sometimes the unions contact the parks. During the fishermen's coastal whaling of dolphins and other small cetaceans, in which great herds are driven into coves or onto beaches and killed, a number are set aside and kept alive to fill aquarium orders. Currently, the Japanese Ministry of Agriculture, Forestry & Fisheries has notified the unions that they must apply to the Ministry before capturing any rare or endangered cetaceans. The ministry considers orcas rare in Japanese waters but there have been no recent requests to capture them. There are no national regulations preventing import or export of orcas and other dolphins to world marine parks.

Japan has ratified CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora). Orcas are not considered endangered, but instead are listed on CITES "Appendix II". This means that import-export permits are required. Japan could become a source of orcas for the world's marine parks, if Iceland halts the captures. Or orca captors might look for some country outside of CITES altogether.

Five marine parks in Japan have kept orcas, two on a continuing basis since the 1970s. There are no regulations or industry-wide standards for keeping orcas in marine parks.

International Regulations and Trade

Orcas, since the early days of captivity in the 1960s and 1970s, have been moved about, sold, resold, leased, even borrowed. Some idea of the world-wide orca and other cetacean trade since the 1970s can be gleaned from the Marine Mammal Inventory Reports of the National Marine Fisheries Service (NMFS). These public records – detailing sex, size, age, status, capture date, previous institutions that owned the animal, cause of death and so forth – must be filed by all US marine parks as well as those world-wide institutions that deal with US institutions. The statistics are not always accurate or complete but are an important start in keeping track of animals.[32]

The US regulations, especially the Marine Mammal Protection Act, are a major factor in the international trade of orcas. MMPA's reach extends, in one way or another, to almost every marine park in the world, though there are ways around the regulations. In the past two decades, it has been easier to import orcas to the United States from other marine parks than directly from the wild. This may be one reason why large marine parks like Sea World remain on cordial terms and are willing to do business with second-rate marine parks that keep orcas in comparatively poor conditions.

There is also the suspicion of deal-making to cut the purchase price with the original captor or another marine park. Marine parks may take extra orcas in a package deal, housing them for a time before delivery to "partner" buyers. For some years, Bob Wright of Sealand, undertook orca captures in British Columbia for other marine parks, to lower the cost of obtaining them for Sealand alone. Sea World and Sealand have both had regular contacts with the Icelandic captors and have been rumoured to be financially involved. This help may result in "bargain rates" for new orcas.

With greater restriction on the orca trade, especially in the United States, orcas have been sent on "breeding loan" by a number of institutions including Dolfinarium Harderwijk (Netherlands), Marineland (Niagara Falls, Ontario, Canada), and Windsor Safari Park (England). All went to Sea World, either in California or Florida. In fact, none of the orcas have yet been returned. According to researcher Ron Kastelein at Dolfinarium Harderwijk, "breeding loan" is simply industry jargon which means that the first calf becomes the property of the acquiring institution and the second calf goes to the institution that provided the breeding-age male or female. Technically, the breeding animal remains the property of the first company. In this way, Sea World may or may not have to pay for an orca. Again, there are usually special deals. In exchange for Gudrun, the female orca from Dolfinarium Harderwijk, Sea World sent three false killer whales on breeding loan to the Netherlands. In October 1976, the orca Winston, from Windsor Safari Park (UK), was exchanged for three Sea World dolphins and a pilot whale who later turned out to be too ill to travel. With Winnie, transferred in October 1991, Sea World was said to be willing to pay $1 million US for her first male calf.[33]

6. Training and Training Programmes

As the rock music swells at Sea World and other marine parks, signalling the start of the show, the orcas and dolphins begin racing around their pools, excited, and apparently eager for the action to begin. The music cue is part of each animal's conditioning. They seem eager to perform because they have been trained to associate it with food and other rewards.

Animals as different as dogs, mice, and even pigeons can be trained to do tricks for food or other rewards. These "standard operant conditioning" procedures, as psychologists call them, have been used for many years in circuses and in experimental studies with animals. Food is the main reward given to reinforce a correct response, but for social mammals – animals that seek companionship, such as dogs and dolphins, including orcas – the reward can also be touching, praising or talking to the animal, or inviting it to play. This is especially true of juvenile orcas, aged two and above, considered the most responsive for training.[34]

Many tricks, or "behaviours" – as trainers from Sea World and other marine parks call them – are actions the animals do in the wild, such as tail slapping, flipper waving and jumps or breaches. Through reinforcement, the whales will do such routines on command – usually a hand signal or underwater acoustic signal. A whistle is used to mark, or "bridge", the end of the behaviour and the giving of the reward. The first conditioning that every whale or dolphin receives is learning to accept dead fish. Other behaviours provide captive animals with activities to keep them occupied.

Training has also, in recent years, become an integral part of maintaining health through stress-free medical examinations. In the past, captive animals had to have their pools drained or be forcibly restrained while being examined or given any treatment. Orcas are now trained to swim into shallow areas and present the underside of the tail. When blood or other biological samples must be taken – either routinely or in an emergency – the procedures can be done with reduced stress and less chance of injury to animals and trainers. Other medical procedures include gastroscopy and ultrasound examinations to monitor pregnancies. Orcas have been trained to produce urine and sperm on command, crucial for detecting certain diseases as well as determining sexual hormone levels.[35]

The relationship between each captive cetacean and its trainer is said to be important, more by trainers than park management, although the matter is confused by the hype of the shows and the park's publicity. To be successful, a trainer must remove distractions and establish eye contact with an animal. If the trainer devotes time to working patiently – and playing – with an animal, personal contact can become part of the positive reinforcement. But as much as most trainers would like to spend long days with an animal, few marine parks allow them the time to give individual animals their sole, undivided attention. There are food buckets to prepare for up to eight shows a day with several animals, new behaviours to rehearse, and other chores to be done. The

interest of a captive orca sometimes rises and falls from year to year as new trainers appear and familiar trainers go on to work with other animals, are promoted within the organization, or leave the park entirely. Sometimes the animal's health is compromised. New trainers have different training styles and levels of experience. These abrupt changes sometimes result in unco-operative animals and may be a contributing factor in some of the mishaps in which trainers have been injured. (*See* Dangers to Trainers, p 31.) In part because of these factors, the large marine parks today tend to use a training regime that emphasizes change of routine and trainers.

In Karen Steuer's survey of US marine parks, she reported "industry-wide problems" with trainers, based on her conversations with marine park representatives. "In some institutions, trainers are hired for showmanship rather than educational background, are generally not college graduates, and are rarely conversant with the literature," she wrote. "Considering that trainers are generally the individuals with whom the animals have the most contact, it was believed that frequent changes among training personnel and general lack of formal eduation among trainers could have adverse effects on the animals." *A Review of Dolphinaria* in the UK came to the same conclusions.[36]

A profile of the typical marine mammal trainer was drawn by Timothy J. Sullivan of the Brookfield Zoo in his 1985 survey of more than 20 marine parks in the United States and Canada: "The average marine mammal trainer is about 29...very personable, [with] a neat appearance and a concern for the animals...salary between $11,400 and $24,500 US per year...and will stay in this field for over three years." Sullivan found that from 1980 to 1985, salary levels had increased but had not kept up with the cost of living. In 1985, the lowest salary was $7,000 US, below the poverty level; the highest, for a head trainer in a large marine park, $50,000 US.[37]

The survey also detailed the professional qualifications marine parks expected. Only about half the marine parks asked for previous experience. A little more than half preferred a high school diploma. In terms of turnover, in 1985, half of the marine parks reported that trainers stayed five years or less. Between 1980 and 1985, the length of employment, the level of qualifications, and the average trainer age had increased – all likely to result in improved training programmes. As of 1991, Sea World claims that trainers now stay six years on average. By most standards, however, trainers remain underpaid, raising a question about the type of person attracted to the job.

A former Sea World trainer working in Orlando (Florida) in the mid-1980s, who insisted on anonymity, says there are two kinds of trainers. "Some are the macho type, usually young guys with muscles and a big head." The job brings prestige and notoriety, she says, akin to the "lion tamer" or trapeze artist who flirts with danger; and, certainly, training orcas does carry with it real danger. "The other type of trainer," she said, "simply loves the animals." In some cases, those who take the job because they care a lot for the animals end up leaving for the same reason. She was one of those. Her graduate degree in psychology was more of a problem than a help, she felt, because her superior was a young male with less education who was intimidated and reacted by ignoring her or putting her down. "Some good trainers stay," she said, "I became very attached to the animals but I couldn't reconcile my mixed feelings about the place. Even though Sea World has the biggest and best facilities available for these animals, the pools are just too small and crowded, and I often felt we were asking too much of the animals." Her other criticisms included:

- too many shows, six to eight a day, seven days a week

- exercise routines and other daily regimens imposed by head trainers who don't take the needs of individual whales, or particular situations, into account

- lack of privacy for the animals – too many visitors all the time, nowhere to retreat to. Although Sea World pools are larger than most, and there are additional holding pools, not enough attention is paid to the needs of individual animals.

In addition, the trainers were asked to do "too much too fast" and could be shifted to work with other animals on what seemed a superior's whim. They were sometimes asked to do things for which they were unprepared, such as riding on the whale's head or back.

Biologist Eric L. Walters trained orcas in 1987-1989 at Sealand (Victoria, BC, Canada). He came to the job at age 20 from a local pet hospital, and was asked to do a show the first day, after reading a few pages on training methods. "I was told how to give hand signals five minutes before the show and just...watched the other trainers to see what the hand signal was if I had forgotten." In retrospect, he says, "I do not think that is an acceptable method of training."

Walters has complained about the lack of training and professional development for trainers at Sealand and the effect on the animals as well as the public. Sealand's head trainer, Walters notes, attended school to age 16, had no formal training in biology, "yet frequently makes decisions only a veterinarian is qualified to make." Walters has charged that the head trainer's inexperience has been responsible for the deaths of some seals and sea lions. "Medical decisions should be made [only] after a veterinarian has been contacted." Walters has reported that trainers routinely gave out inaccurate information to the public during the shows. Since he began training orcas in 1987, Walters maintains, Sealand has ignored marine mammal biology and trainers' conferences, including the Third International Orca Symposium, held in 1991 in Victoria, only a few miles from Sealand.[38]

Such reports suggest Sealand has been functioning like a second-class park, or one from the early "learning" era of the 1960s and the 1970s, rather than the 1990s. Most marine parks have active training programmes, and send staff to meetings, particularly the annual International Marine Animal Trainers Association (IMATA) conference. In all, 12 of the 17 marine parks with orcas have trainers that belong to IMATA. (As of 1991, one Sealand trainer had joined IMATA.) At the annual IMATA conference, trainers can trade training techniques – keep up-to-date. This is important because there are few diploma courses or organized programmes to learn how to train animals, much less orcas. Some marine parks have employed consultant psychologists or instructors from time to time. In 1989, Sealand hired a private consultant – former Sea World trainer Bruce Stephens, now a consultant to various marine parks – to evaluate the training programme, instruct trainers and set up a new training regime. After he left, his new techniques and other suggestions were apparently ignored. Eric Walters says management termed the new programme too expensive – they could not "afford" to hire new staff or give the animals more "free time" for training. The schedule of eight shows a day given by a minimum number of trainers – earning Sealand maximum profit – would have to stay.

The Sea World chain – with four large marine parks featuring orcas as the top performers – has the largest staff and some of the highest-paid trainers. Yet even Sea World has some history of hiring young, untrained people at minimum wage. Widely publicized staff firings in Sea World's past and, arguably, the number of trainer mishaps give an indication of the ups and downs of Sea World's training programme. One massive firing in the 1980s was thought by some trainers to be a cost-cutting ploy to

remove long-time staff who had accumulated too many pay increases. Another series of firings, mostly at the senior management level, was due to a declared change in training philosophy after several trainers were injured during performances. In 1987-1988, the trainers known to have suffered injuries were mostly in their 20s with two years or less experience. A few other marine parks, such as Marine World Africa USA and the Vancouver Public Aquarium, have kept the same trainers; currently several have worked at the job for more than ten years. They too have had some trainer mishaps, though not as many and none as serious. (*See* Dangers to Trainers, p 31.)

The work of trainers at marine parks varies. On the one hand, there are the flashy, elaborate show business routines Sea World is famous for in which trainer-ridden orcas perform choreographed acrobatic feats. At the other end of the scale are the comparatively understated swimming and jumping routines at the Vancouver Public Aquarium. Most marine parks feature Sea World style acts with trainers riding the animals. Sea World's intensive training programme has succeeded in getting the orcas to perform complex coordinated swimming, diving and jumping routines – such as a trainer emerging from the water astride an orca's head as it breaches; trainers riding like Roman gladiators, standing on the whales' backs; and a single trainer riding two orcas like water skis.

Environmental groups opposed to keeping orcas captive often criticize the crass and corny aspects of Sea World shows and question the educational content. The Vancouver Public Aquarium "show" of recent years, in contrast, is presented as a "day in the life." The whales mimic the behaviour of wild orcas minus the glitzy song and dance routines of Sea World.

Yet the differences between the behaviours of the whales at the various marine parks are minimal; the whales jump, tail lob, swim on their bellies or backs, wave their flippers or flukes, and squeal. The behaviours are only dressed up to look different, with different commentary. The main qualitative difference is perhaps the riding of the animals. The necessary training, especially with several orcas and trainers in the water at the same time, is far more demanding and relies on precise orchestration of all the whales and trainers involved. But, is it education or entertainment? What is the impact of the performances on the public? (*See* Educational Value of Marine Parks, p 60.) In this section, we are concerned with the impact on the orcas, and the question is: Should captive orcas be trained at all?

One perspective is offered by Professor Hal Markowitz of the Department of Biological Sciences, San Francisco State University, in his chapter in the *CRC Handbook of Marine Mammal Medicine* (Dierauf, L.A., ed., 1990). Asked in a seminar whether he preferred "to see marine mammals displayed in contemporary museum-aquarium fashion or in aquatic park style, including the performance of trained acts," he said "neither." But of the two, he chose marine parks – to the dismay of friends working in zoos or aquariums. They criticized his promotion of "wanton exploitation of animals in Barnum and Bailey tradition." But, he told them, "'I know of no marine mammals kept in captivity in natural conditions.' There is inherent contradiction in using the term 'natural' to refer to captive circumstances. In nature ('the wild'), mammals respond to endlessly varying stimuli and learn about contingencies between their responses and their well-being. In captivity we may make wonderful museum facades to give visitors the impression that animals live in environments resembling their natural habitats, but what about the motivating forces which give each creature its special behavioural qualities? Where is the pride that comes from mastering elements of their environment?...from learning to obtain and not become food?...from having mates, offspring, and other conspecifics observe their skill? In captivity, we commonly maintain mammals in circumstances that provide little or no opportunity to exercise and hone

appropriate behavioural skills...We can do a much better job of developing naturalistic...captive habitats [but] if the only choices available were to place a mammal in a situation where nothing it did really mattered, or one in which the contingencies were contrived (and often admittedly silly or demeaning to wonderful animals), the answer seems clear: Animals should live in an environment in which behaviours do lead to reliable rewards."[39]

7. Dangers to Trainers

"Aggression expressed by killer whales toward their trainers is a matter of grave concern," writes veterinarian Jay C. Sweeney in the *CRC Handbook of Marine Mammal Medicine*. "Aggressive manifestations toward trainers have included butting, biting, grabbing, dunking, and holding trainers on the bottom of pools and preventing their escape. Several situations have resulted in potentially life-threatening incidents. In a few cases, we can attribute this behaviour to disease or to the presence of frustrating or confusing situations, but in other cases, there have been no clear causal factors....It is generally agreed that careful behavioural conditioning is effective in eliminating aggression from marine mammals. Such conditioning is a complicated matter and requires very careful consideration by behaviourists of substantial experience."[40]

But even without aggression, injuries from "accidents" are an occupational hazard of routine stunts. Bruce Stephens, former director of animal behaviour for Sea World in San Diego and now a consultant to marine parks, says orcas have hurt him dozens of times but he still doesn't hesitate to jump into the water. "Any person who has trained these animals has been thumped, bumped, bruised, bitten and otherwise abused over the course of time," he told Nancy Cleeland of *The San Diego Union* in December 1987. "It happens to everyone." He said that "you have to appreciate the potential for danger" but the record has "really been quite good for orcas – especially when you consider that about 40 people a year are killed in accidents with elephants." Stephens did not mention that many more elephants than orcas are kept in some form of captivity, and more people have close access to elephants because they are land animals. An orca cannot escape its pool and go on the rampage.[41]

But is the kind of orca training programme important? What is a good programme? Sea World and certain other parks have long emphasized the number of behaviours you can train a whale to do. The splashier, acrobatic routines earn the most applause. Graeme Ellis, a former orca trainer at Sealand and the Vancouver Public Aquarium and an orca researcher who has collaborated on the pioneer study of wild orcas with Michael Bigg and others, says the measures of a good training programme are safety for the trainers, as well as keeping the orcas mentally healthy and interested.

Ellis believes the length of time a whale lives in captivity depends not only on the animal's age at capture and his personality but also on the trainer. "You have to be able to challenge them, to know how their minds work," he told me. "It's not how many tricks you can train them to do in two months; it's how long you can maintain a whale's sanity. They're curious enough and interested enough that they won't be driven neurotic in a year but it's difficult, because the novelty wears off. We seem to have a limited imagination when it comes to keeping these animals from becoming bored or neurotic."[42]

Other trainers and marine park curators disagree, claiming that with good training, health care, food and companionship, most orcas can remain well-adjusted to captivity

for life. At Sea World, the ability of some orcas to breed in recent years – six successful births at three of the Sea World parks in six years (1985-91) – is put forward as proof of their adjustment. However, as of January 1992, although six calves have survived, three of the four fathers and two of the five mothers have died. Two other females died following (but apparently unrelated to) miscarriages. (*See* Captive Breeding, p 56.)

In the mid-1980s – about the time of the first births – David Butcher took over supervision of all trainers at the Sea World parks, pushing a controversial new orca training programme. Butcher – with trainer Bruce Stephens who left Sea World in 1985 – had already begun to emphasize human interaction as a reward for the whales, using an intentionally random system. Butcher pushed the programme further. Five types of training sessions known as PLESR (pronounced pleasure) were defined: *p*lay, in which anything goes; *l*earning, when new behaviours are taught; *e*xercise; *s*ocialization, in which animals interact with several trainers to simulate a pod; and *r*elationship, when the animal and trainer spend time one-on-one to strengthen their bond. Sessions were scheduled at random, and Butcher kept a weekly log of all sessions between whales and trainers; if any patterns emerged, they were eliminated. If a whale misbehaved, Butcher and the other trainers retaliated by staring at it – a two-second slap of boredom, according to Butcher. Or did it communicate hostility? To further avoid predictability, no one animal could play the lead all the time; all got to play the role of the featured "Shamu".

It sounded like a promising idea to some, potentially dangerous to others. To its proponents, it was a way to alleviate the whales' and the trainers' boredom, to keep interest, as well as performance, high. This approach, soon dubbed the "Sea World Method," was adopted to some extent by other parks. But, along with the intended unpredictability of the training programme came a spate of accidents that eventually brought the whole programme into question. In March 1987, at Sea World in San Diego, Jonathan Smith, 21, was in the water performing with the orcas before several thousand cheering spectators crowded into Shamu Stadium. A six-ton orca suddenly grabbed him in its teeth, dove to the bottom of the tank, then carried him bleeding to the surface and spat him out. Smith gallantly waved to the crowd – which he attributed to his training as a Sea World performer – when a second orca slammed into him. He continued to pretend he was unhurt as the whales repeatedly dragged him 32 feet (9.8 m) to the bottom of the pool, as if trying to drown him. He was cut all around the torso, had a ruptured kidney and a six-inch (15-cm) laceration on his liver, yet he managed to escape and get out of the pool.

Did the whales have it in for him? Smith had spent only a few months with orcas, but had worked the seal and otter show for a year. Mild-mannered, he described the job as "learn-as-you-go." He must have wondered what he did wrong. Clad in his seal-like wetsuit, did he somehow trigger a hunting response? The whales' behaviour resembled typical seal-killing behaviour in some parts of the world. But there was no definite explanation.

Three months later, in June, Joanne Webber, 28 and a trainer for five years, had a three-ton orca, Kandu, land on her during rehearsal. She fractured a bone in her neck and has suffered permanent loss of head movement. In other incidents, Chris Barlow was rammed during a show and Mark McHugh was bitten on the hand while feeding a whale. That was only the beginning.

In August, the "accident" rate escalated. About a dozen accidents later, on November 21, 1987, Orky the mature five-ton male came crashing down on 26-year old John Sillick during a show in San Diego. At the time Sillick was riding on the back of a female orca. It was a crushing blow. Sillick almost died. He had severe fractures to both

his hips, his pelvis, ribs and legs. After six operations in fourteen months, according to Sillick's lawyer, he was "reconstructed" with some three pounds (1.4 kg) of pins, plates and screws, including a permanent plate inserted in his pelvis and all his thoracic vertebrae permanently fused. He can walk today but his activity is limited.

After Sillick's injury, changes were finally made at Sea World. Sea World's owner, Harcourt Brace Jovanovich (HBJ), the book publisher, stepped in with chairman William Jovanovich calling the shots. The trainers were told to stop riding the whales, to stay out of the water with them, and to go back to the old training methods. Chief trainer Butcher was dismissed along with long-time zoological director and veterinarian Lanny H. Cornell and Sea World San Diego president Jan Schultz.

Various reasons are given for the accidents, but none can be fully explained. Some could have been simple miscalculations on the part of the whales, or missed signs. There might also have been poor signals from inexperienced trainers. The Orky incident with John Sillick did not surprise trainers who knew Orky, his history and his recent circumstances. Captured in April 1968, Orky had grown up with Corky at Marineland of the Pacific near Los Angeles, California. Soon after becoming mature, in 1978, he pinned trainer Jill Stratton on the bottom of the pool, nearly drowning her. "After that," said long-time Marineland head-trainer Tim Desmond, "we didn't regularly do water work with him because we didn't feel it was safe." On January 20-21, 1987, three weeks after Sea World owner HBJ bought Marineland, and promised not to move the orcas, Orky and Corky were trucked to San Diego, to join several other orcas. The new situation – new breeding age females and much breeding activity – altered the social interactions of all the whales. But probably more important, Orky was being asked to perform according to the Sea World method with several trainers in the water. For Orky it had all happened almost overnight. Some Sea World trainers contend management was in too big a hurry to break in Orky. Did Orky have trouble making the transition? It is difficult to determine, but Robert K. Gault, Jr., then Sea World's president, admitted to the *New York Times* that they may have over-emphasized the importance of the entertainment, adding: "We did not have enough experienced trainers."[43]

When Butcher had brought in his new methods and tried to standardize training in all four parks, he alienated several veteran trainers. In one year, about 35 trainers departed, according to Bud Krames, a senior trainer who left because he didn't agree with the system. New trainers had to be hired. Three of the five trainers in San Diego had three months or less experience working with orcas. Sillick, a veteran by comparison, had less than two years. In the year following the accidents, some of the injured trainers began to blame Sea World for not warning them about the "dangerous propensities of killer whales" as one lawsuit put it. Jonathan Smith's lawyer charged that Sea World and HBJ "negligently and carelessly owned, maintained, trained, inspected, controlled, supervised, located, transported and placed" the orcas, thereby exposing Smith to serious injury. Sillick and Weber also filed lawsuits. All three were later settled out of court with gag orders imposed. Following the terms of their deals with Sea World, the laywers have refused to reveal any more than the basic details of their clients' cases. This means that no one can know any findings behind these cases; no one can learn or benefit from the thousands of pages of prepared evidence.

After Butcher left, Sea World revamped the training programme. Under new chief trainer Michael Scarpuzzi, they returned to a simple, consistent approach of rewarding each behaviour. Instead of going into the water, trainers began directing the whales from the deck with hand or underwater acoustic signals. But less than half a year later, they were back in the water. This time the animals were being taught to focus their attention on the main trainer on stage, ignoring trainers in the water. All of it was conveniently just in time to celebrate Sea World's 25th anniversary with a new orca show. The show

must go on! Only time will tell if the current training programme proves safer than those of the past.

Since the first orcas were kept captive in the 1960s, there have been numerous "accidents" with trainers, most of which were covered up. Those that have come to light were mostly revealed by disenchanted trainers or members of the public who witnessed the accidents during a show. Marine park public affairs directors always played down such incidents, calling them bizarre accidents, and in some cases denied they had occurred. In recent years, with the proliferation of cheap video cameras, a number of incidents have been recorded. They range from bitings and collisions to near drownings when whales have held trainers underwater. Many of these dangerous incidents happened when the trainers were riding whales around the pool. Some former trainers such as Graeme Ellis believe that orcas, in general, do not like to be ridden. "They may tolerate it when they're young or new to captivity," says Ellis, "but later, it can lead to problems." Yet most marine parks still feature trainers riding orcas during the shows. Only Sealand and the Vancouver Public Aquarium in Canada, Miami Seaquarium in the USA, Marineland in France and Taiji in Japan *no longer allow* trainers to ride the whales. In recent years, fewer trainer accidents are known to have occurred at these establishments compared to parks that feature in-the-water work. Yet, there have been some injuries and the most serious incident of all occurred at Sealand.[44]

On February 20, 1991, University of Victoria marine biology student and part-time trainer Keltie Byrne, 20, slipped and fell into the orca pool at Sealand of the Pacific. She had just finished a show with the three orcas. Since Sealand trainers stay out of the water, she was not wearing a wetsuit. One whale took her in its mouth and began dragging her around the pool, mostly underwater. A champion swimmer who had competed at the international level, she was no match for three huge orcas determined to keep her in the pool. At one point she reached the side and tried to climb out but, as horrified visitors watched from the sidelines, the whales pulled her screaming back into the pool.

"I just heard her scream my name," said trainer Karen McGee, 25, and then I saw she was in the pool with the whales. "I threw the life-ring out to her. She was trying to grab the ring, but the whale, basically, wouldn't let her. To them it was a play session, and she was in the water." McGee and other Sealand staff tried to distract the whales by throwing them fish, banging on the water with steel buckets and giving them hand and voice commands. Nothing worked. Byrne came up screaming one more time and then, as the whale swam round and round the pool with Byrne in its mouth, she finally drowned. It was several hours before her body could be recovered.

She had ten tooth marks on her body, the largest on her left thigh, but was otherwise untouched. The whales had stripped her clothes off. "It was just a tragic accident," Sealand manager Alejandro Bolz told newspaper reporters. "I just cannot explain it."

In May 1989, 21 months before the fatal incident, Sealand trainer Eric Walters told me he had quit the park because of differences of opinion over management. He felt Sealand was understaffed and unsafe. He complained to Sealand management before he left, but nothing was done. In April 1990, ten months before Keltie Byrne was killed, Walters wrote a detailed letter stating his concerns to the Canadian Federation of Humane Societies on the occasion of a national symposium on cetaceans in captivity. "Sealand of the Pacific is a dangerous place to work," he wrote. "I feel that sooner or later someone is going to get seriously hurt." His words were prophetic.[45]

Walters cited problems with a training programme in which trainers were not allowed to enter the water with the whales. Since the whales were not used to having

anyone in the pool, anything that fell in became very interesting. Yet the reaction of the Sealand whales in the Byrne case, Walters believes, may have been in part due to food and sensory deprivation.

Walters reports that some marine mammals including seals, sea lions and orcas were kept in a permanently "hungry" state at Sealand or deprived of food if they did not perform or co-operate. In an April 1991 letter to the British Columbia Veterinary Medical Association, Walters wrote: "If the killer whales did not enter the module pool [a small, dark, metal holding pool about 20 feet (6 m) deep and 26 feet (8 m) in diameter] at the end of the day to spend the night, we, as trainers, were instructed to withhold their end-of-the-day allotted food. This was usually at least 25 to 35 percent of their daily food intake."

While in the module, the three whales, one male and two females, were barely able to turn around, much less escape from each other. They often cut or scratched their skin on the metal sides. Walters told me that he once saw the young male with flukes abraded and bleeding. As well, the orcas sometimes fought and suffered other injuries. Walters, now a biologist who has spent many hours observing wild orcas, said that the injuries were more severe than the usual rakes and scratches which result from orca play in the wild. On one occasion, the female, Nootka, was fighting with the others and crashed into the module, striking her head on the metal side. Her head was bleeding and blood came out of her blowhole.[46]

According to Paul Spong, who has followed the case closely, the sensory deprivation imposed by 14 1/2 hours a day in tiny, dark quarters contributed to the mental state of the orcas that led to Byrne's death, as well as to several earlier incidents at Sealand. In one, trainer Henriette Huber was scratching Nootka's tongue when the whale bit her on the hand and pulled her into the pool. In another case, head trainer Steve Huxter was trying to retrieve a camera from a whale's mouth when the whale pulled him in, grabbed his leg and started to take him under. In both cases, Walters managed to rescue the trainers.

Food deprivation at marine parks is not generally discussed – even within the industry. Most marine parks build show times around feeding periods, and feed the animals after the show no matter how they perform. Food deprivation is officially considered antiquated by senior trainers, curators and other staff. It is generally accepted that a good trainer does not use, or need to use, deprivation. As well, some such as Sonny Allen, director of marine mammal training at Marine World Africa USA, have advised against deprivation because it "can work adversely down the road." He told the 1989 International Marine Animal Trainers Association annual conference, "what happens, we've found, is that it leads to aggression."[47]

Yet certain trainers do at times withhold some food if an animal refuses to perform. A former Sea World trainer who requested anonymity told me that whales or dolphins that would not perform were sometimes denied food during or immediately after the shows. They would only be given their "base" including vitamins – about 2/3 of their daily food allotment. "Usually the whales would start performing when they realized they weren't going to get fed," she added.

But Paul Nachtigall of the US Naval Ocean Systems Center, found that food deprivation did not enhance learning in bottlenose dolphins, and that hungry animals were even less interested in co-operating.

Some of these ideas and theories were discussed at a public inquest in the Byrne case, in Victoria, in May 1991. Sealand was criticized for poor safety and emergency

features and for the practice of confining the whales at night in the holding tank. But there was no outright criticism of food deprivation. The inquest resulted in a list of twenty recommendations for preventing a reccurrence of tragedy. Sealand was told to refrain from keeping whales penned up in the holding tank unless it was necessary for veterinary or husbandry purposes. (Part of the reason for locking them up was that Sealand has only a gate separating the orcas from the open sea, and Sealand's owner apparently feared the whales would escape or be let go.) The jury recommended that Canada's Department of Fisheries and Oceans develop a marine mammal policy to ensure the health and welfare of captive whales and to make scientifically-based inspections and assessments of each aquarium twice a year. To date, no government action has been taken. But, following Byrne's death and fearing that they would be closed down permanently, Sealand management began instituting safety measures such as installing railings around the pool and placing air tanks and scuba gear nearby. Head trainer Steve Huxter started using a long handled brush and roller to give the whales more contact. As well, Huxter worked with the three orcas on "desensitization training" so the whales would ignore a new object in the pool. There was no plan to train the whales to accept trainers in the water, to institute an in-the-water programme – the suggestion of some trainers.

But it was all too late for Keltie Byrne. Her parents have decided so far not to sue Sealand, preferring to put the tragedy behind them. The jury at the public inquest was unable to agree on the real cause of Byrne's death, beyond drowning. Why did orcas, which had never killed a trainer in marine parks or in the wild despite thousands of encounters, suddenly kill a human? Was it "an accident waiting to happen," if not at Sealand, then at Sea World or almost any park, especially one where basic safety procedures are overlooked? Was it the inevitable result of keeping orcas in captivity, a situation in which behaviour is shaped by young human trainers and influenced, even distorted, by the physical and social conditions imposed by life in a small enclosure, with the day-in day-out demand to perform and to live in close proximity with humans and animals that they would never socialize with in the wild? Or, was the bizarre behaviour the specific result of the routinely imposed sensory deprivation when the Sealand orcas were confined in the tiny metal module?

The jury did not stop Sealand's orca shows, but the city in which Sealand is based has indicated that Sealand's lease may not be renewed. In September 1991, Sealand owner Bob Wright put the three orcas up for sale. But what marine park wants to take three orcas that killed their trainer? Even before Sealand announced the whales were for sale, Sea World was preparing an application to NMFS to import them.

8. Conditions in Captivity

What are good or acceptable conditions for captive orcas? One might argue that conditions should allow the whales to be healthy and well-adjusted and should meet their short-term needs (food, space, companionship), as well as long term needs (breeding). But is this enough? What are optimal conditions? If the question is extended to all animals, then the answer might be: Captive animals ought to be kept in conditions that as much as possible replicate those for the species in the wild. Of course, it becomes problematic for the larger social mammals, accustomed to very large ranges and complex social lives. If food is provided for captive animals, as it almost always is, a hunting ground may be unnecessary, but social mammals such as orcas would ideally still have comparable areas as in the wild for play, rest, and socializing. Added to this must be enough space, or space configured in such a way, that orcas can get away from each other if necessary. Most marine parks keep unrelated orcas of different ages, sexes and pods all in the same pool.

For smaller animals, such as certain fish, small reptiles, and invertebrates, the logistics of providing optimal "natural" enclosures are well within the scope of a zoo or marine park. But the difficult logistics of displaying orcas and other large cetaceans in anything approaching natural habitat would be an expensive proposition. Still, enlightened zookeepers are trying to achieve this for land animals. We will consider the possibilities for optimal conditions for orcas later in this section after comparing current standards of water quality, pool size, food, and other aspects at the various marine parks and how they may affect the well-being and long-term health of the whales.

Water quality

A dolphin produces a little over a gallon (4 litres) of urine and three pounds (1.4 kg) of faeces every day. According to Victor Manton, curator at Whipsnade Park in England: "This equals the load put on an equivalent swimming pool filtration system by up to 70 human swimmers." A pair of orcas would be equal to several hundred human swimmers.[48]

Most marine parks that keep whales and dolphins provide a manufactured or "controlled" environment with a filtration and purification system to remove animal wastes, prevent the growth of harmful micro-organisms, provide an environment relatively free of toxic chemicals and maintain a reasonable level of clarity. Some parks use natural sea water in an "open system." Others use an artificial sea-water mix. But most parks simply use a mix of common salt and fresh water – a so-called "closed system." Filters do some of the cleaning. After filtration, various treatments can be used to finish the cleaning and, in some cases, to provide a residual disinfectant "cover" while the water travels around the pool and back to the filters. The preferred chemical treatment is chlorine – administered in solution like domestic bleach or as a gas – because it can provide residual disinfectant cover, as well as make the water clear. If

used with care and competence, chlorine disinfection appears to represent no danger to animals or people, but misuse or accidents can cause problems.

Some controversy has attended the addition of chlorine – so much at times that dolphins have been said to suffer eye irritations. In the United States, government inspections in the early 1980s, as reported in the NMFS files, revealed "high chlorine levels" at Marine Animal Productions (Biloxi, Mississippi) and high coliform bacteria count following the breakdown of recirculation pumps at the Point Defiance Zoo and Aquarium (Washington State). Poor water quality may be symptomatic of larger management problems. But to say that chlorine levels are simply "high" does not explain the problem. To understand the technical dimensions of the problem, it is necessary to describe the reactions of chlorine with water containing organic material such as animal waste. By adding a little chlorine, monochloramines form. These have no smell, are not irritating and have some disinfecting effect. Some establishments go no further in chlorine treatment as long as bacterial levels remain low, although monochloramines can also provide food for the growth of algae in pools.

Adding more chlorine leads to the formation of dichloramines. These are much better disinfectants, but they are irritating and have a disagreeable smell.

Adding still more chlorine produces hypochlorous acid also known as "free residual chlorine." This is the most effective disinfecting chlorine compound. Free residual chlorine is non-toxic, taste- and colour-free, a non-irritant, and it destroys organic material, leaving the water "superclear".

Adding chlorine beyond this point leads to the formation of trichloramines, which are severely irritating and have an extremely disagreeable smell. Marine parks therefore usually aim to keep the chlorine dose levels sufficient to provide all the advantages of "free residual chlorine" without going so far as to provoke trichloramine production. This level should be achieved at not more than 0.5 parts per million (ppm) "combined chlorine" (i.e., the various chloramines present together in one pool.)

It is also necessary to have sufficient water volume per animal so that all these chemical reactions can be completed quickly with plenty of dilution. This is part of the problem with small pools. If the water volume is too small, the organic waste is comparatively concentrated and the chlorine reaction never gets the chance to reach "free residual chlorination". So the animals end up in a nasty soup of various chloramines. If this is a problem, minimal chlorination using monochloramines for disinfection may be the answer, or much more frequent renewal of pool water, or – best of all – a larger pool.

There have been a number of accidents in which chlorine, particularly in gaseous form, has been overused in dolphin pools – to the point of forming trichloramines. Yet these are isolated incidents, not the usual practice. There exists no solid evidence that the typical water quality of marine parks is damaging to cetacean eyes or skin. In fact, pinniped eyes are much more sensitive to chloramines than cetacean eyes and one should watch for any effects on them first.

In an "open system," seawater is continuously discarded and replaced, either through a pump or through tidal action in open sea pens. Establishments with natural lagoons or bays in which to keep dolphins do not need to manufacture a water environment. The main advantage of an open sea pen is that it can provide a roomier natural environment. The downside involves possible intrusion of harmful parasites (bacteria and other pathogens) and the difficulty in maintaining water quality. Chemical pollutants in open systems are not that much of a problem because cetaceans do not drink the water and are given, presumably, healthy fish to eat. Thus, they avoid

ingesting contaminated food – the usual route for undesirable chemicals to enter their bodies in the wild. But regular monitoring of water systems is essential.

One example of an open system with an open sea pen is Sealand of the Pacific in Victoria, British Columbia. Housed in a suburban harbour-marina complex, Sealand's pools are polluted to some extent by sewer run-off, oil and other wastes, according to Eric Walters. Other establishments, such as those located near typical dolphin habitat in the Florida keys, on the other hand, keep dolphins in a much larger sea pen. In the late 1960s and early 1970s, at Pender Harbour and Pedder Bay, near Vancouver, Canada, a number of orcas were kept for several months after capture in netted off areas of a bay or fjord. The water in such natural areas cannot be controlled as easily, but if the netted-off area is located in an area washed by currents and tides, it may permit a larger, more natural enclosure for the animals.

In any case, no one has yet determined the perfect water system for whales and dolphins in captivity. Compared to an open system, the closed system is easier to control and manage on a daily basis but, in part because of poor record-keeping, there is little scientific basis for comparison on this and other aspects. There have been no controlled scientific studies on the long-term effects of chlorine and other water treatment techniques on dolphins (such as ozone and ultraviolet radiation). In terms of salt content, some suggest salinity between 1.5 and 3.5 percent but marine mammal veterinarian Joseph R. Geraci suggests 2.5 to 3.5 percent. In another report, Geraci and New England Aquarium director John H. Prescott stated their belief that the higher salinity (salt) levels are "less stressful behaviourally". Too much salt, however, causes the animals to become dehydrated. But overall, beyond basic considerations, the long term therapeutic or ill effects of high vs. average salt water content and natural vs. manufactured sea water remain speculative.[49]

Pool size

Minimum pool sizes for captive orcas, as prescribed by the laws or guidelines of various countries in recent years, have in practice affected few marine parks. Almost all existing parks that keep orcas meet or exceed the standards. Critics have charged that these regulations have been established arbitrarily in reference to existing facilities and to suit economics within the industry, instead of taking into consideration what might be the animals' real needs or what they enjoy in the wild. Working from existing pool sizes and what they presumed were the needs of cetaceans, those who set the minimum dimensions established an average mature length for each species of whale or dolphin and then offered arbitrary multiples to determine minimum vertical and horizontal pool dimensions and give the animals enough room to turn around.

In the United States, the minimum pool size for two orcas is at least 48 feet long (14.6 m) or twice the average length of a mature animal and 12 feet deep (3.7 m) – only half a mature animal's length. For more than two orcas, pool sizes must increase – with each additional animal entitled to 10,852 cubic feet (304 cu m which holds about 81,900 gal). UK standards follow the US lead with the same horizontal dimensions but with four times the depth to allow for the "three-dimensional requirements of cetacea." The total volume of the pool, thus, is quadrupled. The UK display industry was upset when the pool size standards were published. The UK standards are guidelines, not regulations, and do not have the force of law, but no marine park in the UK can display orcas (or other dolphins) after 1993 if they do not comply.

Aside from the UK's standards, regulations or guidelines for orca pool sizes and water quality do little more than codify existing industry standards. Still, in other ways, they may have some impact. First, if enforced, they will make it more difficult for

marginal marine parks to keep whales and the larger dolphins, and discourage others from even trying. Second, they may restrict even the larger marine parks from long-range stockpiling of orcas and dolphins – keeping too many in one pool or at one establishment.

What *is* a reasonable standard for the ideal pool size for an orca, or, since one should never be kept alone, a family of orcas? What is the optimal size, or at least the "minimum optimal" size? Certainly the whales should be able to swim for some distance, have room to turn around, to dive, to build up speed for breaching, and to have companionship and yet some privacy from other whales and people, as needed.

In Karen Steuer's survey of US marine parks, she found no correlation between pool volume or depth and survival rates. Steuer cited the industry's view that general care and training has more impact on animal welfare than does pool size. "However, it is also possible," she wrote, "that the entire range of pool sizes presently available may be too narrow to judge the potential impact on an animal which, in the wild, may range over hundreds of square miles."[50]

Graeme Ellis has suggested that pool sizes at least be considered in the light of orca's behaviour in the wild. According to the work of Ellis' and his associates Michael Bigg, John Ford and Ken Balcomb, orcas have home ranges of 500 to 900 miles (800 to 1500 km) along the British Columbia and Washington coasts.[51]

An orca pod, on its daily travels during the summer off northern Vancouver Island, might range 35 to 50 miles (56 to 80 km) per day, although 100 miles (160 km) or more is possible. Routinely, they dive to depths of 100 to 200 feet (30.5 to 61 m). The deepest recorded orca dive is 3,378 feet (1,029 m) off the west coast of Vancouver Island – an animal that was found entangled in submarine cable. Even if the whales travelled in a straight line in tight pod formation perhaps 325 feet across (100 m), and using the minimum depth (100 ft or 30.5 m) and number of miles per day (35 miles or 56 km), I calculate that the minimum volume of water traversed on such a 24-hour trek (325 ft x 100 ft x 35 miles x 5,280 ft per mile) would be 6,006,000,000 cubic feet containing 45,302,778,000 gallons (168,168,000 cu m). This is more than 9,000 times larger than the sum of the interconnecting Sea World orca pools at Shamu Stadium in San Diego or Orlando. In fact, in daily life in the wild, a pod of orcas alternates tightly grouped travel with spread-out foraging sessions in which different subpods will travel across a broad front – one to three miles wide (1.6-4.8 km). The maximum volume of water needed for a pod of wild orcas would therefore be much, much more.[52]

Some may argue that such comparison is invalid because orcas do not need to travel and forage in captivity. Others may contend that captive cetaceans should be encouraged to hunt and be given live food – one possibility suggested later (*See* "Food and feeding behaviour," p 42). If such suggestions are taken seriously, however, marine parks will need to be radically expanded. Yet, even if travelling and foraging are not considered, a useful point of comparison might be made, based on the areas used in the wild for resting, playing and rubbing. In 1973, I watched an orca pod off Vancouver Island rest for four hours, zigzagging across an area greater than one square mile (2.6 sq km). For shorter resting periods, the area would be less, and the whales might be diving only 50 to 100 feet (15 to 30 m) deep during such periods. Playing behaviour sometimes features orcas swimming just below the surface for hundreds of yards to pick up speed to execute dazzling leaps clear of the water. Even rubbing on pebble beaches, a common behaviour of whales off northern Vancouver Island, takes up more space than is found in marine park pools. The smallest rubbing beach is at least 100 feet wide (30 m) and extends several hundred feet out from shore. The water around the beach is shallow, but the depth ranges from a few inches to much more than the depth of a typical whale pool.

The Vancouver Aquarium has tried to reproduce a rubbing beach in their recent expansion from a standard 1972-vintage oval pool of 484,000 gallons (1,797 cu m) to 1 million gallons (3,700 cu m). The new pool has three main areas with a number of passageways and "escape" areas. But Paul Spong calls the aquarium rubbing beach an unconvincing facade and notes that it is still small compared to rubbing habitat in the wild, as well as to Sea World's up to 4.6-million-gallon interconnecting orca pools (17,106 cu m).

Perhaps the best comparative example of a natural area for wild orcas to play, rest, rub and socialize is in and around Robson Bight, considered the centre of the core area for the orcas found in the waters off northern Vancouver Island. Robson Bight is a bay almost two miles wide (3.2 km) that extends 3/4 of a mile (1.2 km) out from shore. It is fairly shallow around the rivermouth and estuary but drops off quickly to more than 100 fathoms (600 ft or about 200 m). The whales make extensive use of the bight, especially in the summer, a given pod often visiting two or three times a day and sometimes staying for hours. The resident whales play, rub and rest in and around the bight, and occasionally take salmon near the rivermouth.

The volume of Robson Bight, using a conservative, mean depth of only 100 feet (30 m), is more than 4,000,000,000 cubic feet containing more than 30,000,000,000 gallons (112 million cu m). Although a rough estimate only, this does give an idea of scale. The scale of what an orca pod on the north coast of Vancouver Island requires for the bulk of its playing, rubbing and resting behaviour is about 2/3 of that required for a minimum day's travelling and foraging – still 6,000 times larger than Sea World's interconnecting orca pools. Robson Bight still has far more space than could ever be economically provided in captivity. Of course, the bight could easily accommodate three or four times the number of orcas usually found in a marine park, but the volume occupied per orca would still be much, much larger.

Marine park curators of orca collections dismiss the issue of pool size since no pool can approach the amount of space orcas use in the wild. I have made the comparisons here not to suggest that marine parks should be building pools 6,000 to 9,000 times larger but, rather, to show the extent of the adjustment orcas must make when they enter captivity and to question the practice of keeping them in *any* size pool.

In summer 1991, rumours circulated about a Sea World plan to import several more orcas – rumours largely confirmed by later Sea World permit applications to import four orcas from Canada. This was before Sea World had received approval to import Winnie, the last remaining captive orca in the UK, despite objections from many environmental groups. Yet even some people within the Sea World organization were upset by the planned acquisitions and the main objection seemed to be pool size. Even though Sea World's 4.6 and 4.3 million-gallon (17,106 and 15,861 cu m) interconnecting pools in Orlando and San Diego are the largest for orcas anywhere, Sea World keeps more orcas in each pool than other establishments. And the pools at Sea World of Texas and Ohio are somewhat smaller – about 4.1 million gallons (15,241 cu m) for all pools in Texas and 839,048 gallons (3,115 cu m) in Ohio.

According to a July 18, 1991 letter from a long-time Sea World employee who wishes to remain anonymous, "The new owners of the Sea World parks [Anheuser-Busch] don't really seem to care about the real needs of the animals they already have. They have refused to listen to the people that really know what is needed to properly care for the animals and have denied request after request to improve or expand the existing facilities. The killer whales need more space, more pools and better medical attention and medical facilities. They need them now before they try to bring in all of these other whales. There just isn't enough room for all of the large adult killer whales. The only

male killer whale we have is in the Texas park (Kotar). The animal doesn't do well there, he beats his head on the gates and walls. It's a lousy design and doesn't provide enough space for such a big animal. The animal departments have wanted to move this animal to one of the other parks where the pools are bigger, but we were all told that August Busch doesn't want him moved and that the animal people don't know what they are talking about...I have been working for Sea World for many years, but I have never seen such a group of owners with an attitude like this. They give the impression that if an animal dies, don't worry about it – we will find some place to buy more. The kind of pressure August Busch puts on the parks for the shows and the animals is tough. When they buy and import the killer whales from Victoria, England and Mexico and put them into this kind of pressure situation, someone else is going to get injured or killed."

Food and Feeding Behaviour

In the wild, orcas have perhaps the most varied diet of any marine animal. Some appear to specialize, becoming fish-eaters or predators of marine mammals (seals and dolphins), but the food range within each category can vary widely from day to day and season to season, according to availability. Captive orcas, by comparison, have a diet restricted to only a few fish species, usually herring or some other small schooling fish, although pink salmon is part of the food served at Sea World. Determining factors are cost, ease of handling (frozen fish is usually easier), and availability in large quantities. The fish, of course, is dead – and orcas must first be trained to accept dead food. Some orcas seem to have a problem learning to eat herring because of its small size, particularly if they are used to salmon or large mammal prey.

In the 1960s and early 1970s, several orcas would not eat following capture and there were three transients captured by Bob Wright of Sealand that went two and a half months with little or no food. One whale died before veterinarians eventually stepped in and gave the orcas Vitamin B12 injections to stimulate their appetites. These whales were badly dehydrated. Like other whales and dolphins, orcas obtain their water from the food they eat.

In captivity, a typical adult male eats about 175 pounds (79 kg) of fish a day, while adult females eat 140 pounds (63 kg) and newly weaned orcas 35 pounds (16 kg). While at Marineland in the late 1980s, Orky, however, ate about 235 pounds (106 kg) a day. All captive orcas are given vitamins to supplement their food, partly because Vitamin B1 is lost during the freezing process and other vitamins and minerals are lost when fish are cut. No one knows how much orcas need to eat in the wild. They are certainly more active; orca researcher David E. Bain at Marine World Africa USA has found that captive orcas have lower respiration rates and a lower overall activity level. Wild orcas, needing to travel and hunt and chase their food, may well eat more, but the amounts probably vary. Some days they may catch and eat less than on other days, so they may need to carry around extra fat.[53]

Marine park PR spokesmen, as well as curators and directors, sometimes defend their captivity of animals by saying regular meals are provided as well as relief from the uncertainty of life in the wild. The other side, as captivity critics lament, is the fact that an animal whose life and stock in trade is hunting is denied a chance to use its skills. Prof. Hal Markowitz suggests that zoos and marine parks "design environments more like the wild, in which the animals have proportionately more control of the timing of their activities." He gives an example of an environment designed for otters. The otters could hunt for live prey above a water fall, behind a tree stump or in an open area above a pond. Under such circumstances, all the otters actively hunted for prey hundreds of times each day. One advantage, besides the opportunity for natural activity, was that

their hunting behaviour revealed the state of their health. A reluctance to hunt was immediately apparent.[54]

Live food has been tried with orcas on a limited basis at several marine parks – the old Seattle Marine Aquarium, Vancouver Public Aquarium, Sealand of the Pacific, and a few others, mainly in the 1960s and early 1970s when recently captured orcas refused to take dead food. In these cases, the animals were ill-adjusted or sick and the live food was an attempt to get the animals to eat anything. Thus the idea can hardly be said to have been given a real test.

Certain marine park managers and curators cite the possible health problems of live food, as well as the logistics of buying and keeping it. But the main obstacle is that most marine parks today use chlorine which kills fish very fast. Only open systems with natural sea water or biological filters are currently set up to conduct the experiment. Also, to allow for orca hunting behaviour, pool sizes might have to be increased and pool configurations rethought. Markowitz suggests that "in environments spacious enough to provide a true microcosm of nature, live food should be introduced, even though it may increase the probability of occasional illness as compared with eating properly frozen and handled fish. The increased vigor seen in animals such as otters, pinnipeds and many cetaceans when they chase and consume live prey provides evidence of a richness of life that must be weighed more heavily than a minor increase in health hazards."

"The initial cost of providing live prey may be considerably more," he says, "but effects on long-term budgets may be reduced by carefully planning breeding facilities for prey species. In the ideal case, integrated environments with balanced proportions of predator and prey species may be possible. One brief study suggests that stocks of live fish maintained under proper conditions may be at least as safe as those that are ordinarily taken from freezers."[55]

Pool design and ambient noise

Prof. Hal Whitehead's paper to the Canadian Federation of Humane Societies' meeting on captive cetaceans in April 1990 compared the experience of a "high[ly] acoustic cetacean, like a white whale or orca, living in a tank with acoustically reflective walls, to that of a visually oriented animal, like a human, living captive in a small room covered with mirrors on all walls and the floor. The experience," suggested Whitehead, "is likely to be profoundly disturbing, especially over the long term."[56]

Whitehead, from Dalhousie University in Canada, is an authority on sperm, humpback and other whales. He based his comments on conversations with marine mammal bioacoustics researchers such as Christopher W. Clark from the Bioacoustics Research Program at Cornell Laboratory of Ornithology.

Marine park owners and curators disagree with Whitehead and Clark, insisting there is no long-term effect of captivity on orca sound production. But what is in fact known? Are marine parks well designed for sonic creatures? Do they vocalize less, even to the point of turning stony silent? It seems logical that there be fewer sounds in captivity with fewer animals than in a wild pod, and perhaps fewer reasons to vocalize.

John K.B. Ford, curator of marine mammals at the Vancouver Public Aquarium and the researcher who first identified orca dialects in the wild, believes "there is a misconception among many that whales spend their lives chattering but become mute in captivity." Ford's field studies indicate that "the frequency of occurrence of vocalization in wild groups varies widely with group size, behavioural context, and the type of whale

(i.e., resident versus transient). My observations of the aquarium's killer whales is that their vocal activity is very comparable to that of wild groups of residents, both in terms of amount of vocalization and variety of call types. In fact, they are typically more vocal than comparably sized subgroups when travelling apart from the remainder of their pod, which many do for weeks or months at a time. My studies here and others by David Bain and Alexandra Morton [conducted at Marine World Africa USA, Marineland of the Pacific and Sea World, San Diego] indicate that the call types used are essentially the same as the captive whales' natal pod, and the contexts in which they are used are also similar to that in the wild."[57]

But Paul Spong, who as part of his research on wild orcas has assembled one of the most extensive libraries of wild orca sounds going back to 1970, questions how the contexts in which the call types are used could be similar to those in the wild.[58]

"The quality and requirements of life are very different in captive and ocean environments," says Spong. "Certainly orcas vocalize in tanks, but whatever the purpose is, it can't possibly be for the same reasons that orcas vocalize in real life. Even if orca calls only represent the 'I'm here' sort of information, making them in a tiny concrete tank in which one's companions are always there would be a totally meaningless exercise. If there is more meaning to the calls than that (and I presume there is) the comparison becomes even more ridiculous. Maybe the calls that orcas make in tanks are a form of exercise, as pathetic and pitiable as the shows, but nonetheless something to keep the blood flowing, maybe even to keep the memory of home going."

Another charge sometimes made is that orcas rarely use their echolocation in captivity. Ford says that it is "a misconception that [orcas and dolphins] are constantly producing echolocation clicks both in the wild and in captivity, and that in confined spaces they are bombarded with echoes. In reality, odontocetes [including orcas and dolphins] are very adaptable animals and have a number of senses upon which to obtain information about their surroundings, such as sight, sonar, passive listening, and touch. It seems that echolocation is used when it is needed, [but] when vision can be employed, echolocation becomes secondary. For example, dolphins living in clear oceanic conditions produce clicks for navigation far less often than river dolphins living in turbid waters. My observations of [wild] killer whales suggest a similar trend. Groups foraging in waters with poor visibility or at night appear to produce clicks more regularly than during the day in clear water. As the water in the aquarium's facility is very clear, the animals seldom use sonar. However, they will inspect new objects placed in their midst using sonar, just as wild individuals will do. I do not believe the acoustic dynamics of the pool affects their sonar abilities in any significant way. In summary, even if certain pool surfaces do create significant click reverberation, it may be largely irrelevant as the animals may simply choose not to use echolocation as they have no need to do so."

Regarding sensitivity to ambient noise levels, Ford points out that some wild orca habitats are noisy during the summer salmon fishing operations, such as in Johnstone Strait, off northern Vancouver Island. "It seems intuitively that a noisy sounding environment must bother the whales, but they keep coming back every year, they exchange calls just as often as when it's quiet, and their behaviour seems unchanged by varying levels of noise. However, we are basing our assessment on what we hear with our ears, which function very differently than whale ears. Mechanical noise from boats or pumps tends to be relatively low (<10 kHz), while killer whale hearing is best at frequencies about 20-30 kHz (recent studies by David Bain). Perhaps our perception of...noise is far different than that of the whales."[59]

Regarding the impact of boat noise on vocal behaviour, Paul Spong again disagrees: "Loud noise from a tug, for example, reduces and often eliminates calling altogether.

Calls drop off as boats approach, pick up again when they've gone, but often not to the pre-noise level."[60]

In any case, for the orcas that come to Johnstone Strait, the noisiest period of the year, the fishing season is fairly short, though commercial shipping continues year-round. As well, wild whales, unlike captives, have the option of leaving a "noisy area." Indeed, for whatever reason, several times every day, the Johnstone Strait orcas do move in and out of the strait, encountering a wide variety of acoustic conditions.

Like Ford and Spong, Christopher Clark has studied the sounds of several species of whales in the wild and in the lab. As an independent researcher, Clark has thought a great deal about acoustic conditions in marine parks and aquariums. He says flatly, "There have been no systematic, quantitative studies on the impact of ambient noise levels on captive orcas, belugas [white whales], or bottlenose dolphins." He does cite "one account of dolphins and belugas becoming very lethargic in an aquarium which was later diagnosed as having very high ambient levels." When the levels were decreased, the animals became more active, but were still affected. "To quantify such effects, you would need both control and experimental groups, as well as observers experienced with captive animals. The noise levels are no problem. Behaviourally, you could monitor acoustic activity, swimming activity, trainer impressions. Physiologically, you could monitor such things as corticosteroids in the blood. Perhaps one way would be to insonify an area of the pool and document how the animals utilized the space before, during and after noise exposure."[61]

Ford is less eager to say there is a problem that needs to be studied. "Still, I do believe that steps should be taken by aquaria to minimize noise levels," he says, "if only to err on the side of conservatism in the absence of data and to satisfy our human perception of what must be acoustically comfortable for the animals."

At the renovated Vancouver Aquarium, Ford says, the background noise levels are "as quiet or quieter than average conditions in Johnstone Strait. Noise reduction mechanisms were incorporated into the design of the new pool, such as mounting pumps on rubber pads and decoupling pipes from direct attachment to the pool." As well, the new orca pool "features a varied contour and is divided into three separate pools of different shapes and sizes." It was not designed to improve the acoustics but, according to Ford, the "reflections would tend to become randomized." Yet he says that "some noise standards would be useful, as enclosed pools can potentially be noisy places." But Ford doesn't know what they should be.

In Clark's view, no marine park pool has yet been designed with cetacean acoustics in mind. Working with underwater acoustician William Ellison, Clark has been doing some preliminary thinking about what "bioacoustic standards should include:

1) a minimum acceptable level of acoustic reflectivity off the surfaces, acoustic absorption at 30 percent, or higher,

2) maximum acceptable ambient spectrum levels that are at least no greater than average natural ambient levels in the ocean,

3) a requirement of no parallel surfaces. This cuts down on standing waves; hot spots and dead spots in the tank. In fact, surfaces should not ever be flat but should be acoustically heterogeneous. (Aquariums hate this one because their pools are harder to clean if the walls are not nice and smooth!)

4) Methods to determine standards should take into account the hearing sensitivity thresholds for the different species, always erring on the side of caution in favor of the animal."

The first step, says Clark, is to "sample a variety of captive facilities and simply describe the acoustical properties of the tanks. This way we'll have something by which to make more reasonable statements about improvements." Clark says that there is not much interest in architectural acoustics for humans, much less marine park environments, so captive cetaceans may face a long wait.[62]

The Social Situation

In the wild, orcas live close together, especially considering the great expanses they roam. They swim side by side, roll against each other, nudge and rub. They spend part of each day, sometimes several days, spread out, especially during feeding periods. But even here they are still "en famille", in subpods of two to six individuals. The resident-type orcas, as found around Vancouver Island are the most social, living in pods of from six or seven animals to fifty or more. They also socialize in "superpods" – but only within their "communities" of up to 190 individual whales – when two or more pods meet up and play, rest and travel together for hours, even days. Some superpods include six or more pods and more than 100 whales. Each pod contains subpods based around a mother and her progeny. Bigg, Ellis, Ford and Balcomb believe that when a subpod gets big enough – over several generations – it may break off from the old pod and eventually form a new pod. New pod formation may take anywhere from decades to hundreds of years. Researchers have noted that after two decades, some pods off Vancouver Island, Canada, may be in the process of forming new pods. These new pods will perhaps start off with about six to ten individuals. But they still remain tightly bonded to their community and travel often with those formerly most closely related.

There are no complete pods exhibited in captivity. At most two or three members of a subpod have been exhibited together such as Orky, Corky, Patches and another unnamed whale from the A5 pod. Patches and the other whale died a couple years after capture. In most cases, orcas from different pods and different communities have been exhibited together, and at Sea World, the associations change frequently, as the whales are moved between the four parks. Yet at six of seventeen marine parks – more than a third of those that keep orcas – one orca is exhibited alone. Some have the company of bottlenose dolphins or seals, and of course their trainers, but it is not enough. At no marine park is the social situation comparable to that in the wild, but it is particularly indefensible to keep a social animal isolated from its own kind.

The crucial aspect of conditions in a marine park – the essence of a "well cared for environment" – is that the animals "have each other to keep themselves company," says Kenneth S. Norris, who has studied dolphin societies in the wild and in captivity. "That's the most important thing to a dolphin. It's not whether they ever opt for tank walls, or whatever. It's whether they have other dolphins for society, because that's what they have in the ocean. It's not the same as living on land, where you may have a burrow here and go around the mountain over there. It's your buddies that count. It's the society that counts. I think that if the exhibitors understand this,...a change...will happen. We'll care more about their social requirements than we do now."[63]

Norris – former professor of natural history at the University of California (Santa Cruz) and the first curator at Marineland of the Pacific (California) – was talking about his experience with very social spinner dolphins, but orcas are, like spinners, in the family of oceanic dolphins and similarly social. His remarks are certainly relevant to orcas.

Are orcas able to form good relationships in a marine park? Of course, marine parks must provide large enough quarters for the orcas, and must attend to sexes and ages and sometimes cater to or work around orcas that seem to have dominant personalities. Experience has shown that there are animals that do not get along well in captivity. The option then is to transfer them to another park, the option open to Sea World, or sell or trade them on breeding loan – or keep the offending animal in a backpen, which has been done in the past, especially with mature males. Sometimes, incompatible orcas are exhibited together – and in some cases, such as at Sea World in San Diego, tragedy results. In 1989, the orca Kandu V, mother of the third Baby Shamu, rammed adult female Corky with such force that Kandu injured herself and died from a massive haemorrhage triggered by an upper jaw fracture.[64]

Sea World boasted that with its breeding programme it would be forming "new pods" in captivity. Compared to the wild, where orca pods are formed along family lines, Sea World's "new pods" are forced associations. From a breeding point of view, the whales are mating at Sea World. In the wild, although nothing is known for certain, orcas may well mate outside their pods but it is unlikely to be outside of their communities, the superpods they travel around with. But the Sea World matings have occurred between orcas from different oceans. In future, now that all the North Pacific orcas at Sea World have died (except Corky who has passed breeding age), the matings will be all among Icelandic orcas, but no one knows if these are within the same community. In any case, the concept of new pods at Sea World is ridiculous. How *can* new pods form when the babies are taken away from their mothers at under five years of age and flown from park to park, and "mixed and matched" as needed to accommodate the summer-only shows in Ohio and other largely commercial decisions?[65]

Learning more about conditions for keeping orcas captive

After 30 years of keeping orcas in captivity – and over 40 years for other dolphins – it is disturbing that there is still almost no scientific basis for determining the best conditions. Margaret Klinowska came to this conclusion in her research to set British guidelines for marine parks. There is anecdotal information, of course, some of it worth consideration. Still, Karen Steuer in her survey of US marine parks cautions against over-interpreting the comparative survival rates, partly because of the incomplete data on captive orcas, and suggests that comparing different conditions reveals little difference in survival rates from one marine park to another.[66]

Strongly in favour of the need for real study is Prof. Michael K. Stoskopf, Head of the Department of Companion Animal and Special Species Medicine at the College of Veterinary Medicine of North Carolina State University, one of the few investigators to study captive conditions formally. He contends it is only possible to determine minimal or optimal conditions such as pool size or configuration, amount of ambient noise, light intensity and the many other factors with "considerable careful investigation in controlled settings. While it remains only my opinion, I believe it would be supported by scientific investigation that these factors play a role in the success of a facility. [Yet] what appears intuitive or basically obvious, sometimes, is not. Without a complete understanding of the animal that you are trying to provide for, it is sometimes possible to make things worse – or create new problems – even with the best of intentions."[67]

Stoskopf blames the lack of studies on the non-existence of research funds – a problem also raised by researchers in the UK and Canada. "There have been graduate students who would have liked to tackle such a task," says Stoskopf, but "it has not been possible to support them."

Logically, support would come from the display industry. But will marine parks support – or even permit – research that might scientifically compare one park to another and establish better minimal or optimal conditions, especially with the potential cost of making changes?

In Hal Markowitz's view, "If progressive veterinarians and administrators wish to provide homes in which captive animals will be truly well, the animals must be provided some significant behavioural freedoms." That, to Markowitz, means giving the animals some control within their own environments and adapting staff schedules to the animals' behaviour rather than vice-versa. Markowitz knows there are difficulties, but he believes that, if zoos and aquariums are to have a future, "we need to provide, as much as possible, the sources of dignity and rich opportunity that nature provides – in order to learn the most from captive animals."[68]

9. Health of Captive Orcas

How well are orcas cared for in captivity? Good veterinary medical care is, if nothing else, good business: safeguarding a million dollar investment. But there remain many unanswered questions about captive orcas: Do they suffer undue stress? Do they live as long as they might? Does better care enhance longevity? And what is their quality of life?

Orca husbandry has shown great improvement over the past 30 years since orcas were first exhibited in the 1960s. Nothing was known in the early years and the veterinarians, coming mainly from domestic animal veterinary practices, learned as they went along. They soon found demand for their services, with a marine park owner willing to pay well when they accompanied captured orcas to the parks and were able to keep them healthy after arrival. Many of those marine veterinarians who pioneered in the field in the 1960s and 1970s, are still practicing and now co-authoring the first texts in the field. There has been little turnover, unlike the situation with trainers.[69]

Investment in veterinary staff is a useful comparative measure for the health care at a marine park. In this, Sea World excels. Smaller, under-capitalized marine parks, with consulting but not staff veterinarians, do less well. Yet it is difficult to assess the quality of individual veterinary care because marine mammal vets are a small, closed group on the frontier of knowledge in the field, making any checking or policing very difficult.

Orcas and other dolphins have reportedly been maintained on a wide variety of medicines. Former trainer Eric Walters tells of an orca at Sealand kept on high doses of tetracycline (56,000 mg per day) for at least 3 1/2 years. The treatment was started because the whale was anaemic and tetracycline helps keep the red blood cell count high. One of Sealand's consulting vets and the trainers pushed to discontinue the drug, but management insisted. Unfortunately, the data to determine the ultimate outcome and thus the value of treatments, in many cases, does not exist. Better record keeping, and ideally publication of full and accurate treatment records, would help create a statistical base – and help put medical treatment and drug prescription on a more scientific basis.[70]

Maintaining an orca's health starts with a commitment by the marine park to invest the time and money to obtain the best medical care available. As well, management is responsible for many aspects of daily health: from the design of the facilities to determining the food, water conditions, number of shows, etc. Another crucial link is the trainers. They know the whales best. A good training programme is essential to maintaining health. Not only do trainers teach behaviours that can be used to make medical inspections stress-free, but – as veterinarian Jay C. Sweeney has pointed out – the key to early diagnosis of diseases is having the trainer watch for behaviour changes. A common change is loss of appetite and, when this happens, the first response should be to take blood and perform other tests as needed. Yet trainers are generally underpaid and the turnover is high. This may be the weakest link in maintaining the health of captive cetaceans.

Causes of death in captive orcas

Necropsies – animal autopsies – performed on orcas and other dolphins reveal a wide range of diseases and other causes of death. Yet the total number of necropsies is still too limited to draw significant conclusions about causes of captive deaths vs. deaths in the wild. The field of wild animal medicine is new and orca medical practice is even newer. In recent years, veterinary background texts written by teams of authorities are beginning to fill the information vacuum. The work of marine mammal veterinarians like Sam H. Ridgway and a recent volume edited by Leslie A. Dierauf are laudable attempts, but there is still little published on orca veterinary work, other than occasional papers in the small journals, *Aquatic Mammals* and *Zoobiology*, and the IMATA newsletter, *Soundings*.[71]

One paper in *Aquatic Mammals* was published in 1985 by marine mammal veterinarians Andrew G. Greenwood and David C. Taylor. As part of the International Zoo Veterinary Group in the UK, they have worked with most of the orcas in Europe and many of those flown out of Iceland in recent years. They discussed the causes of death of 32 orcas from North American and European marine parks, listing the following common causes: pneumonia (25 percent), systemic mycosis including one case of nocardiosis (22 percent), other bacterial infections (15.6 percent), mediastinal abscess (9.4 percent), and other one-time-only conditions or unknown (28 percent). Thus, half of all these orcas had died of bacterial infections – a similar ratio as for captive dolphins.[72]

Greenwood and Taylor wrote: The "high incidence of systemic mycosis in killer whales is unusual and alarming." There have been solid developments in treatment, but it is apparently difficult to diagnose. They note that "upper respiratory infections with fungi...are common in killer whales and should be aggressively treated" before they spread. "Mycotic infections in cetaceans are uncommon in open air, natural sea water systems and [if] killer whales [were] kept under these conditions [they] may be considered less at risk."

Greenwood and Taylor found that one young orca had died of trauma and a ruptured kidney after fighting with a poolmate at a British marine park in December 1981. In 1989, another orca, Kandu V, died after a fight when she rammed Corky at Sea World, San Diego. According to Greenwood and Taylor, "Clearly, trainers should be aware of the potential risk of serious fighting between incompatible specimens, and facilities should allow for the separation of animals."

Greenwood and Taylor's paper evaluating the causes of orca deaths is all too brief. Part of the problem is that determining the true causes of death can be difficult. The proximal cause – what finally killed the animal – may be pneumonia but that does not tell the whole story. And many orcas died without any cause of death indicated. Overall analysis is difficult because post-mortem reports are unobtainable except for orcas listed in the Marine Mammal Inventory Reports. Even then, some records are incomplete and there is a lack of standardization in record keeping – from country to country and even within the United States. Another problem is that the vets are employed by the marine parks, making independent assessments difficult. The veterinarians who do the necropsies are unlikely to extrapolate publicly on their findings in any way that might implicate the marine park or another veterinarian. In recent years, and especially from 1989 to 1991 with a spate of five orca deaths at the Sea World parks, environmental groups worldwide have complained to the US National Marine Fisheries Service about the questionable reliability of in-house necropsies. Even before the August 1991 death of Kenau, only three months after Kahana died, NMFS asked Sea World, as a special condition attached to the import permit for the orca Winnie, to notify NMFS immediately when a whale dies and to co-operate in making arrangements for a qualified observer to

be present at the necropsy. At the same time, environmental groups have begun to hire independent marine vets to look at necropsy reports. Whether or not they turn up any discrepancies, they may contribute to improvement in the quality of the necropsies.

Orca Survival Rates and Longevity

Comparing the survival rate in captivity and the wild would seem the ultimate indicator of how well captive orcas fare. Orca longevity, both in captivity and in the wild, is widely disputed, with marine parks adopting lower numbers, indicating little difference, and the conservation and animal protection groups taking the estimated maximum longevity in the wild to bolster arguments that captivity cuts short an orca life. Unfortunately, for a number of reasons, accurate comparison is impossible, based on scientific papers published to date. Solid work exists for orcas in the wild, but not in captivity.

In the wild, the detailed orca photo-identification work at the Pacific Biological Station in Canada provides reliable estimates of mean life expectancy and maximum longevity. In a 1990 special report of the International Whaling Commission, scientists Peter F. Olesiuk, Michael A. Bigg and Graeme M. Ellis assessed previous aging methods and gave the best estimates we have to date for how long orcas live in the wild. Females have a mean life expectancy of 50.2 years and maximum longevity of 80 to 90 years. Males have a mean life expectancy of 29.2 years and maximum longevity of about 50 to 60 years.[73]

The strength of this study is that every individual in every pod is identified and monitored from year to year. Thus, real births and deaths can be noted and the percentages figured out and based on actual events. These are numbers sampled from the real world. Because orcas are long-lived animals, it has taken 15 to 20 years for enough of them to die to allow reliable projections. The method of calculating these statistics is similar to the way a life insurance company establishes the probability of survival, setting up life history tables.

Despite this substantial work, Sea World in 1991 continues to maintain that orcas in the wild live variously "30 to 35 years" or "a maximum of 35 years," clearly ignoring the best scientific information available. Instead, they are sticking with the age estimates based on orca teeth, citing older papers – despite the cautions urged in some of these papers that using teeth alone, without calibrating the "growth layer groups" (GLGs) is unreliable, and that it is impossible to estimate ages of more than 20 years old in orcas because the GLGs are too poorly defined to count. In contrast, the Olesiuk, Bigg & Ellis study represents some of the most reliable findings about the longevity of any species of whale or dolphin. It is accepted by scientists who are unopposed to captivity, some of whom work with captive animals, but apparently the figures do not suit Sea World's corporate aims.[74]

The only detailed study to date on captive orca survival was published by Douglas P. DeMaster and Jeannie K. Drevenak in *Marine Mammal Science* in 1988. They investigated several cetacean species using the Marine Mammal Inventory Reports. Including just 40 of the more than 100 orcas kept captive, they found a mean annual survival rate of 0.93 (95 percent confidence interval 0.90-0.96). This means that 93 percent of the orcas alive at the beginning of a year survived the year; the confidence interval indicates that 95 percent of the time, the annual survival rate will fall between 90 and 96 percent. Even using the NMFS records, though somewhat biased for the better marine parks and longer-lived animals, the average survival time for captive orcas was 5.97 years. However, DeMaster and Drevenak caution that these statistics are of no real value in evaluating the husbandry record of marine parks *unless* all the animals used to

estimate this statistic are dead. Otherwise, this method of calculating longevity is sensitive to the recently acquired animals who may live for many more decades. In the DeMaster-Drevenak study, many of the animals were still alive.[75]

Most scientists agree that it is difficult to compare mean ages and maximum longevity in the wild with that in captivity, because not enough time has passed. The first orca capture was in November 1961. As of January 1992, only one captive orca, Orky, survived to the mean age for orcas in the wild. No other males have achieved the mean age of 29.2 years – even though there are a number who could have done so by now, had they survived. But it will be about the year 2020 before females caught in the late 1960s or early 1970s could even have a chance to achieve the mean 50.2 years of the wild.

In addition to the time factor, definitive comparisons between DeMaster and Drevenak's (captivity) study and Olesiuk, Bigg and Ellis' (wild) study are impossible because the calculations have been made in different ways and the results are given differently. As well, the DeMaster-Drevenak study included all births in their overall figure and made no allowance for the fact that survival rates of all animals vary by age. Because the captive population is skewed (that is, not representative of all ages found in the wild), there would be a skewed survival rate in the total captive population. If more captives mature and live on into old age, of course, this may disappear as a factor.

Many more orcas have died since DeMaster and Drevenak published their study in 1988. As of January 1992, only three orcas captured before 1976, all females, remain alive: Corky (at Sea World, San Diego) and Yaka (at Marine World Africa USA), both taken in 1969 from the A5 pod, and Lolita (Miami Seaquarium), captured in August 1970. When these three die, it will be possible to use the first fifteen years of orca captivity statistics to arrive at average ages. 62 orcas were captured from 1961 to 1975 inclusive, 48 of which have precise death dates and for which birth years can be figured out based on size at capture. Preliminary calculations would indicate that even if Corky, Yaka and Lolita live for another ten years to the year 2000, which would break existing records for orcas in captivity by almost a decade, the mean life expectancy of all orcas captured between 1961 and 1975 would still be much lower than the 29.2 for males and the 50.2 for females in the wild.

Although the "best science" to date cannot give us a solid comparison of captive vs. wild longevity, researchers such as DeMaster and Drevenak, David E. Bain of Marine World Africa USA, and Deborah A. Duffield, Portland State University (Oregon, USA), who have worked with the data and published on this topic, have suggested that under the best conditions, orcas can live as long in captivity as in the wild. But many species of animals in zoos typically live *longer* than those in the wild because the "pressures" of life – predation, finding food, etc. – are removed and adequate medical care is provided. That fact forces the question: With such expensive medical care, a controlled environment and regular diet, why are so many captive orcas dying before the mean age in the wild? Perhaps they should be living a great deal longer than wild orcas.[76]

Drooping Fin Syndrome

After a few years in captivity, the tall dorsal fin of the mature male begins to bend to the side, eventually collapsing. The smaller dorsal fins of mature females also usually bend over. Several theories have been advanced for the phenomenon. There is no scientific basis for saying that it is a sign of ill health, yet it cannot be called "normal" – even though, as some marine park curators such as John Ford at the Vancouver Aquarium have pointed out, it does sometimes occur in the wild.

The dorsal fin is mainly connective tissue, containing no bones or muscle. On mature males it grows to about six feet tall (1.8 m) and from the sheer height, combined with gravity and hydrodynamic forces, it sometimes wobbles or begins to lean or curl to one side. But in the wild there are few cases in which the dorsal fin flops over completely as it does in captivity. Of some 300 orcas living off the British Columbia-Washington coast, as of 1986, only two adult males – "I3" (pronounced "eye-three") and "X10" – had dorsal fins similar to those found in captive males. I3, born about 1955, is from I1 ("eye-one") pod. His fin started to fall in the mid 1970s when he was about 20 years old. Several other males and females in that pod have fins that lean slightly to one side or are heavily marked, suggesting the possibility of a genetically weak dorsal fin structure. Little is known about the other male, X10, born about 1972, who has only been seen a few times.[77]

But genetics does not explain the preponderance of fallen dorsal fins in captivity, for the whales come from different pods and even different oceans. Explanations that have been advanced include the idea that the whales are comparatively inactive, unable to travel in a straight line and mainly swim in small counter-clockwise circles. Even though there may be periods every day of swimming across, leaping, and hanging in the water, the repetitive patterns of the circular swimming, combined with hydrodynamic forces and gravity, could cause the dorsal fin to fall.

Marine mammal veterinarian Sam H. Ridgway has noted that eight of ten orcas he observed at Sea World had a left-tilted dorsal fin and swam counter-clockwise. The other two had a right-tilted fin and mainly swam clockwise.[78]

The number of captive orcas that have had severely drooping dorsal fins is, essentially, the number of males kept in captivity for a number of years after reaching maturity – 18. The rest of the captive males were either captured as young animals and did not survive long enough to develop the tall male dorsal fin, or were captured as mature males but survived less than two years. (The mature female dorsal fin, which is only half the size of the males, often bends over, too, but not as much. And some females, such as Corky, have erect dorsal fins despite two decades in captivity.) Thus only two out of a wild population of 300 orcas had severely drooping fins, while many out of a much smaller captive population have had them.

A drooping dorsal fin does not appear to predict an early death. Both Orky and Hyak had limp dorsal fins for most of their more than 20 years in captivity. But to those who know and have seen orcas in the wild, the drooping fin certainly seems a mark of the captive – an orca "tamed".

Stress

Like many other animals, including humans, whales experience stress in their daily lives. The challenge of getting enough to eat, or finding a mate, the sudden loss of a family member, the unpredictable hazards of life in the wild – all these things contribute to stress. There is also the stress of capture, transport and captivity for whales and dolphins. Is such human-caused stress excessively harmful? And is it acceptable? Can we measure it?

Stress in manageable amounts is part of daily life. But excessive stress can lead to ulcers, breakdown of immune systems, even death. "Being able to define and measure marine mammal stress," writes Leslie A. Dierauf, "has taken on new importance by offering a defensible way of assessing animal well being." She lists various environmental changes and conditions which must be considered as "stressors" of marine mammals: separation, social isolation, movement from an established

environment to one with a different social order, poor nutrition, overcrowding, and housing with over-aggressive pen mates or in poorly designed enclosures. Dierauf says that any of these may be perceived as a threat from which the animal cannot escape, and there are, as well, environmental stressors – "noise, excessive light, transportation, and housing conditions." Sometimes animals repeatedly exposed to a stressor adapt to it; if they don't, disease may result.[79]

In 1986, Klinowska and Brown investigated how well dolphins and orcas were being kept at British marine parks. They concluded that, in their view, there was no evidence captives were experiencing undue or unnecessary suffering. This, of course, does not indicate whether high stress levels were part of an animal's background during capture or early captivity or whether such stress might have caused health problems. In the early 1980s, Michael K. Stoskopf, now of North Carolina State University, and Edward F. Gibbons, Jr., from the Audubon Zoological Garden, studied stress in bottlenose dolphins at the National Aquarium (Baltimore, Maryland, USA). In 1981, four dolphins were rushed into performance to be ready for the aquarium's grand opening in August. The four had only a short acclimation period before the crowds arrived. The dolphin Gretal, who died 70 days later suffering from bleeding ulcers and internal abscesses, had been moved to Baltimore against medical advice. The other three dolphins, also suffering from ulcers, were stabilized and flown to an open sea pen in Florida where medication was continued in a non-exhibit, low human impact environment. After three months, they returned to health and were kept in Florida for five more months before flying back to Baltimore in June 1982. The dolphins were healthy and well adapted upon arrival at essentially the same pool they had left eight months earlier. This time, however, Gibbons and Stoskopf were observing and collecting data on visitors, dolphins and conditions at the aquarium, including light and sound intensities. This information was correlated with routine blood and serum chemistry levels taken once a week.[80]

Over the 38 days of the study, the three animals again lost their good health, as seen in a decline in haematocrit, haemoglobin and erythrocyte count and their gastrointestinal problems returned. Light and noise did not appear to be the main reason, as the researchers had suspected. They found that the more people present, and the closer they stood to the pool, the more often the dolphins showed signs of stress – repetitive behaviour such as standing on their tails. Their aversion to spectators led the dolphins to spend 87 percent of their time in pool areas farthest from humans. This was noticeable almost from the start, Stoskopf said, before the medical problems recurred. One way to predict stress problems early, therefore, seems to be abnormal spatial patterning. Stoskopf concluded that there was no part of the pool that allowed the dolphins to get "far enough" away.

As the study ended, the dolphins again were flown to Florida to recuperate. This time the facility was redesigned, says Stoskopf, "at a cost of about $37 million US, [changing] the public distance, sound and light parameters." There have been no follow-up studies, but Stoskopf says "it appears that this investment has improved the situation."[81]

Stress effects can be evaluated by analyzing respiratory rates, pulse rates, and appetite, as well as blood and serum chemistry. "Changes in the 60-minute 'sed rate' [sedimentation rate] provide an early indication of the adaptive or maladaptive response to stressors," writes Dierauf. It "is one of the quickest and least expensive diagnostic tests available to marine mammal veterinarians. Within 24 hours it is possible to reevaluate findings in conjunction with a complete blood count, typical panel of serum chemistries and enzymes and results from bacterial culture of the dolphin's blowhole....Each dolphin has its individual normal range of these values, and importance

is placed on trends away from an animal's normal blood values, behaviours, and microbiological flora."

In 1988, Myrick published physiological data using serum calcium levels on dolphins sampled in a number of situations. Following chase and capture in a tuna seine net, blood samples revealed very low levels of serum calcium, potentially life threatening. Dolphins that had adjusted to captivity, as well as those slowly captured and carefully handled, had serum calcium levels within the normal range. Aggressive captures caused the levels to drop quickly. Unfortunately, it is impossible to be sure of getting blood samples from wild dolphins that are definitely unstressed. But Myrick's levels at least provide a comparative basis for assessing stress levels in particular situations.[82]

Do orcas and dolphins suffer more stress during capture and captivity than in the wild? No one knows. Methods are available to do such research, but right now, we have no comparative numbers to answer the question. We know that some of the events or conditions of capture and captivity can be stressful to a high, even dangerous, degree. Even if stress in the wild is comparable, stresses in captivity are generally under human control, if not human caused, and thus a matter for our concern.

In their National Aquarium study, Gibbons and Stoskopf concluded: "A health care programme should address not only the immediate medical needs of animals, but must also consider environmental and social influences." They pointed to the danger of simply using drugs to improve the symptoms of an illness while the underlying cause of a disease remains. It is crucial to understand underlying environmental and social influences and how they affect health – in order to develop good husbandry.[83]

A number of orcas have died of stress-related illnesses in captivity, and mylanta, the anti-ulcer drug, is still in common use. Examining the known causes of death in captive orcas, stress was a *possible* predisposing factor in 38 of 74 deaths. For orcas and other cetaceans, marine parks have taken steps to minimize stress during the initial period in captivity – often providing a several-month adjustment period away from the public and other animals while learning to take dead food and while beginning training. But stress levels during capture and initial transfers to ships, trucks, planes, etc. are largely unmonitored. No one really knows to what extent an orca suffers stress adjusting from the wild to captivity; no one has attempted to measure it. It might be possible to legislate the taking of serum chemistries for orcas suffering medical, behavioural or other "adjustment" problems in captivity, as well as for orcas during capture and transport. But to make such legislation meaningful, we would still have to decide what are "normal" levels and how much stress is acceptable. Stress cannot be prevented in our own lives, much less in animals but, with or without legislation, we have a responsibility to try to manage the stress for animals under our care.

10. Captive Breeding

Captive breeding of whales and dolphins is not a simple matter. More than one marine park has proudly announced that an animal was pregnant, only to have the animal suffer a miscarriage or stillbirth with the ink barely dry on the press release. Most recently, Marineland Côte D'Azur (France), following a successful dolphin birth, announced the forthcoming births of several more dolphins and an orca just in time for their 20th anniversary celebration. Three dolphins and the orca died at or within a few weeks of birth, all in February and March 1991.

Captive Breeding at Sea World, Inc.

The biggest advance in orca husbandry, since orcas were first brought into captivity, is perhaps the breeding success at Sea World. The history of orcas breeding in captivity is recent, mainly because, through most of the 1960s and 1970s, captive orcas were either immature, kept alone or kept with others of the same sex. The first pair to breed in captivity was Orky and Corky at Marineland of the Pacific (California). In 1977, a 450-pound (200 kg), 7 1/2-foot (228-cm) male calf was born and it survived 16 days. Over the next ten years, Orky and Corky produced four more calves. None survived more than 46 days. Sea World's first baby orca, born September 1985, was a female calf called Kalina, now six years old. There have been seven more births at the various Sea Worlds, and six in all have survived. Two calves born at the Vancouver Aquarium died at less than four months of age. There is also one calf born at Marineland (Niagara Falls, Canada) that has lived two years to date, and two born at Sealand, in late December 1991 and in February 1992, whose fates remain uncertain (*See* Orca Pregnancies and Births in Captivity, p 97).

The Sea World orca breeding programme has been accomplished through three main factors: With the largest facilities, they have enough space to separate pregnant females from adult males, if necessary, and to give the mother and calf some privacy. Second, they have the best funded veterinary programme of any marine park. They test their animals, know when they are fertile and pregnant, and are for the most part prepared when a birth happens. Finally, they have used their training programme in creative ways. The key is training the mother – before the calf arrives – to present her mammaries for nursing. This behaviour had proved a stumbling block for Corky. Perhaps she didn't know how to nurse or – according to Sea World's Brad F. Andrews, then with Marineland of the Pacific (California) – "didn't seem committed to keeping the youngster alive." Even after some training before her fifth birth in July 1985, she was unable to perform in the real situation. And Orky, her mate, refused to have much to do with the new calf. After a month this calf, too, died. Corky has had one pregnancy since, a miscarriage in July 1986. The aborted fetus was found at the bottom of the tank. In 1987 Corky and Orky were moved to Sea World (California) and, though she has been exposed to male company, including Orky, Corky has had no more pregnancies. Instead, she has stopped ovulating. In the wild, a female's calving years, on average, extend from around age 15 to 40 – about 25 years – and each female has an average of five calves.

Born in about 1965 or 1966, Corky would be expected to have calves until about the year 2005. Unfortunately for Sea World, Corky seemed to be one of those few females that end their reproductive years early. But Orky did impregnate several North Atlantic (Icelandic) females after moving to Sea World and before he died in 1988. His calves live on and Corky has become a sort of "auntie" to one of these half-Icelandic, half-British-Columbian calves. This is the calf whose mother, Kandu, died after charging Corky.

Sea World has been criticized for moving pregnant females from one park to another and for taking calves from their mothers at under five years of age. Before age six, Baby Shamu, a.k.a. Kalina, had crisscrossed the United States, visiting all four Sea World parks, one after another. At age five, a wild orca is dependent on its mother, always travels beside her, and would not be mature for another six to ten years. Yet there is no concrete evidence that Sea World's actions have been harmful to the animals. It may or may not be stressful with long-term implications, but Sea World is not doing controlled stress tests. Such moves, however, contradict Sea World's PR boast about creating "new pods" in captivity.

Aside from Corky's failure to reproduce, Sea World's captive breeding programme has been so successful that the corporation now claims to have a better calf survival record than orcas have in the wild. However, the number of newborn calves that die in the wild before they reach six months old, is, in fact, unknown. In their 1990 IWC paper, Peter F. Olesiuk, Michael A. Bigg and Graeme M. Ellis make a rough estimate that 43 percent, almost half, die before age six months, but no confidence limits are given because they are "too large to be of any practical value." Without confidence intervals and a larger sample, no valid comparison can be made between survival in captivity and in the wild. For the record, of 21 orcas born in captivity, 13 died before age six months. Considering only orcas that conceived in captivity and had live births, nine of 17 died before age six months. At the various Sea World parks, the record is indeed better, based on these limited numbers, with only two of eight known to have died as stillbirths or before six months of age. However, the success of captive breeding programmes cannot be completely assessed until miscarriages and stillbirths are reported. And, more important, as of January 1992, although six calves have survived at Sea World since 1985, three of the four fathers have died and two of the five mothers, all while still capable of breeding. Two additional females died following (but apparently unrelated to) miscarriages.[84]

The Background of Captive Breeding

Captive breeding: In the promotion of zoos and marine parks, the phrase has an almost charismatic charm. Every zoo and marine park basks in the reflected glory of the institutions that do the work. If captive breeding is the great hope of vulnerable or endangered species, the PR suggests, and if zoos and marine parks are doing captive breeding, that means that zoos and marine parks are the great hope. But one must ask: What has captive breeding accomplished? How many marine parks are actually doing captive breeding? How significant is it for threatened and endangered species?

Captive breeding – often cited as a key reason for keeping animals in captivity – is an important part of conservation for some species and there have been notable successes at some zoos. About 800 species of mammals are now being bred, some 154 of these endangered species – about half of all mammals thought to be endangered worldwide. These include the one-horned rhinoceros, Pere David's deer, Przewalski's horse, and several tiger species. But just keeping an animal in captivity is hardly conservation. In the artificial conditions of a zoo or marine park, an animal cannot continue its evolutionary path. The true measure of success is returning the animal to the wild. To return an animal, half-way houses or enclosures plus monitoring after release

are needed to ease the adjustment period. Captive birds and mammals, in particular, must abandon their dependence on human caretakers for food, shelter and protection.

A few species have been "reintroduced," such as the red wolf to North Carolina (USA) and the Arabian oryx to reserves in Jordan and Oman. A few other species, such as peregrine falcons, have been captive bred and returned, but not by zoos. After zoos tried and failed, a long-term programme by Cornell University biologists worked, and the falcons have been returned to the wild in solid numbers. Yet these outstanding successes must be viewed in the context of the scope of the problem and the high cost of captive breeding. It cost an estimated $25 million US to save the Arabian oryx. Threatened or endangered animals are often in trouble because they've suffered severe habitat losses. For a large social mammal, the cost of acquiring land can forever consign an endangered species to captive life.[85]

Captive Breeding Needs for Cetaceans

Marine parks have bred some 16 species of marine mammals, including manatees, sea otters, and various seals, sea lions, and dolphins. Captive breeding of dolphins, on one level, would seem as vital for other mammals and birds. The IUCN Red Data Book on *Dolphins, Porpoises and Whales of the World*, compiled by Margaret Klinowska, has summary sections on the status and prospects of captive breeding for each cetacean. In general, baleen whales are too large for captive breeding. The orca, the largest member of the dolphin family, is probably the largest animal that can be bred in captivity. The population numbers of most dolphins are unknown, but several river dolphins and porpoises are listed as threatened or endangered. The World Conservation Union (IUCN) Policy Statement on captive breeding, prepared by the IUCN/SSC (Species Survival Commission) Captive Breeding Specialist Group, recommends that management – to reduce the risk of extinction – requires the establishment of supporting captive populations at an early stage, preferably when the wild population is still in the thousands.[86]

Yet neither orcas nor bottlenose dolphins – the captive-breeding successes that have received most of the attention as well as the veterinary expertise and financial backing – are reduced to levels that would normally justify an early start to captive breeding. And, according to Klinowska, "maintenance of completely self-sustaining captive populations for whales and dolphins has been explored for only a few species. It is not sufficient merely that births in captivity occur, but that both birth and survival rates be high enough for persistence of the captive population." Assessing captive breeding successes in 1991, Deborah A. Duffield and Randall S. Wells noted that even "the predominant species, the bottlenose dolphin, has not yet achieved self-sustaining status." To date, no cetacean species, including orcas and bottlenose dolphins, has yet been captive bred and returned to the wild.[87]

If marine parks really want to help conserve endangered species, they might focus not on orcas and bottlenose dolphins, but on marine mammals listed as endangered or vulnerable to extinction. Leading zoos take such an approach, but one of the few examples for marine parks is with manatees. Sea World, along with Miami Seaquarium, has been authorized by the US Fish and Wildlife Service to rescue, rehabilitate, breed and release manatees. This may be helping conservation of marine mammals in the wild, though much more could be accomplished for vulnerable and endangered cetaceans if the entire approach were focussed on needs of species in trouble, such as the river dolphins and porpoises. Sea World could lend a great deal more of its money and/or veterinary expertise to these more pressing conservation problems.[88]

Captive breeding, for orcas, has been an expensive proposition. Sea World estimates the total value of its orca captive breeding programme at $120-130 million US. This includes start-up costs, facilities, research and annual costs from 1984-1991. But has this money been well spent? Some conservationists questioned the widsom of spending $25 million US to save the Arabian oryx. Sea World might have saved five species at that rate, but instead didn't save anything.[89]

Sea World's definition of "captive breeding," at least for orcas and bottlenose dolphins, is not the same as that used by the IUCN and other world conservation bodies – because the corporation apparently has no intention of re-introducing species to the wild. Among other things, Pacific and Atlantic orcas have been allowed to interbreed without thought of reintroduction. Yet, in principle, Sea World's captive breeding programme will mean little for conservation and the future of orcas without a companion programme to learn how to reintroduce them to the wild. Because orcas live in pods or extended family groups, a number of related orcas of prime ages and in prime condition might need to be released at the same time.

The purpose of the Sea World programme, of course, has been to restock its own parks. With bottlenose dolphins and orcas, captive breeding is already helping to replace animals that die in captivity, but it has some way to go before self-sufficiency is attained.

Sea World has borrowed liberally from the wild to fashion its corporate image and to make its millions. Will it one day return something important by restoring an endangered cetacean to its natural habitat?

11. Educational Value of Marine Parks

At the 1983 Whales Alive conference, held at the New England Aquarium in Boston, W.H. Dudok van Heel, who was a former school teacher and lecturer as well as Dolfinarium Harderwijk's zoological director, tried to assess the educational value of marine parks:

"The zoo, the safari park, the oceanarium, the aquarium and the dolphinarium borrow from nature. This means they all have an obligation not only to look after their charges, but also to assist conservation in the wild by educative programs. In many of these institutions this is understood and often executed with great care and inventiveness. [But] the typical dolphinaria, with few exceptions, sadly fail in this respect."[90]

To what extent are marine parks educational – no matter whether it is called a dolphinarium, aquarium or oceanarium? What do visitors learn? Most are drawn to the performing orcas and dolphins – the stars of the show. It's a great opportunity to teach a rapt audience, but an opportunity that many contend is largely squandered.

Marine parks differ from zoos in that the animals – whales, dolphins and seals – are performers. This, say critics, puts them squarely in the circus tradition. Few marine parks have made more than a pretence at education. In 1989, on the 25th anniversary of Sea World's opening, George Millay, the father of Sea World, said, "Sea World was created strictly as entertainment. We didn't try to wear this false facade of educational significance." Millay thinks that Sea World should stick to pure entertainment. His comments were not appreciated by current Sea World executives who, following 1988 amendments to the Marine Mammal Protection Act requiring public display applicants to offer programmes for education and conservation, are forced to whistle another tune. In the 1990s, even the profit-oriented marine parks have had to think about education. As well, there is a much greater public awareness of the environment.

Today, Sea World flaunts what it considers its educational content, though it has not really changed the bubbly atmosphere of the all-American amusement theme park. There are glossy brochures, special 12-page supplements for children such as "Meet Baby Shamu" and "Animals in Danger" about endangered species (co-sponsored by Pepsi-Cola), and an 18-page "Killer Whale Fact Sheet" (cost $3 US) with only 12 mentions of "Baby Shamu." Sea World is eager to lead school groups through the park even at reduced prices. There is no independent follow-up, however, to determine if children, freed from the classroom, do learn very much as they watch the trainers and orcas run through a modified version of the Shamu show.

Over the past decade, a number of other marine parks world-wide also seem to be jumping on the bandwagon, trying to increase their educational content – from almost nothing, to at least something. In Britain, *A Review of Dolphinaria* was very critical of such efforts, citing "considerable variation in the quantity and quality of educational material

available at dolphinaria." Staff education in biology, ecology and conservation of cetaceans, the report added, "needs urgent attention" and, according to the subsequent *Dolphinaria: Report of the Steering Group*, "establishments will have to greatly increase their contribution to education if applications to display cetacea are to be justified under the 'teaching' criteria of EC Regulation 3626/82."[91]

Many marine parks still make no more than a feeble educational effort, and visitors leave with false or misleading information. If, as psychologists say, the lasting impression of most exhibits and shows is mainly visual, then the images that persist are those of the trainers riding, kissing, hugging, patting and flying off the heads of orcas as trained animals are put through their paces of "the wettest show on Earth". To some, the orca comes off as a cuddly, inflatable caricature, like the lovable toothed monsters of children's books, as emphasized by the kiss awarded in some shows by a trainer or even a young member of the audience. To others, perhaps, the "show business" profile is transparent and the real animal, minus its pod and its habitat, does come through. To some extent, the inference to be drawn depends on the show – as well as on the viewer. Thus, the type and nature of the show must be considered in any discussion of education – as well as school programmes, the impact of professional associations, and marine park philosophies.[92]

School Programmes

During 1990, according to Brad F. Andrews, Sea World's Vice President of Zoological Operations, 600,000 persons participated in education programmes at the four Sea World parks. "Sample programmes have included such subjects as marine mammal adaptations, marine conservation, ocean ecology, marine careers and life in the polar regions." There is also an outreach programme in which Sea World goes into the school with presentations to specific grade levels. But most of the activities are students visiting the park with their school group to see Shamu, the seals, dolphins and other cetaceans performing. The annual cost of all the education programmes for all four parks, according to Andrews, was about $3 million US. No explanations or qualifications were attached to this figure. How much revenue did Sea World make from their educational enterprise? Or was the $3 million a write-off? And was the money well spent? Could a school or field marine lab have made $3 million go further in terms of education?

At a November 1991 public meeting on orcas in captivity, held by the National Marine Fisheries Service in the Washington, DC-area, Sea World's education programme was centre-stage. There were long tables set up beside the door with 22 stacks of Sea World-produced educational materials – not free samples, but show items. In these various letter-size booklets aimed mainly at teachers, Sea World was trying to do its educational duty. The effort was there, but the writing was surprisingly stodgy and the entirely black and white illustrations of marginal quality. It was an exercise in how to make an exciting subject dull. Compared to some of the high quality teacher and student materials available today – the revolution in children's book publishing – Sea World's work seems a token effort. If you want something with visual appeal and production value, you have to buy the souvenir programme, Shamu's star portfolio.

In Japan, Kamogawa Sea World has an "aquarium members club" for children. Director Teruo Tobayama says the club's 500 members meet once a month for biological and conservation instruction featuring direct contact with the animals. There is also some collaboration with schools to arrange study meetings or lectures on request. In 1990, a summer school introduced 300 keen children to regular park activities.[93]

Neither Andrews nor Tobayama would reveal the cost of education as a percentage of their annual operating budget, citing company policy not to discuss these matters

publicly. A 1984 AAZPA workshop, however, revealed that five to ten percent of the annual operating budgets of accredited zoos and marine parks were then allocated to education programmes. Between 1976 and 1984, there was a fifteen-fold increase in education staffs of zoos and aquariums. But these figures do not reveal the quality of the marine park education.[94]

One marine park, eager to report on its education budget and the extent of its programmes was the Vancouver Public Aquarium. Aquarium director Murray A. Newman says that his was the first North American park to establish an education department. Last year, the aquarium invited more than 50,000 schoolchildren for special education programmes in co-operation with Canadian schools. The programmes met one to three times a week for an hour or two and were geared to various grade levels and subject interests. One special programme allowed children to sleep overnight in the underwater observation room. As a non-profit society, the aquarium relies on volunteer guides, some of which work in the education department, but there are also paid, full-time positions. The money spent on education in 1990 was $644,079 Canadian ($564,982 US) – about 11 percent of the annual operating budget. To a non-profit aquarium, school children should be a main rationale for being – education for education's sake; for the corporate marine parks, children are part of the rationale for a business as well as the customers of the future. Either way, school groups help to even out the gate income and the work load at marine parks where peak trade tends to come during the summer and other school holidays. "Education" – or at least bringing in school groups – makes good business sense.

The education materials produced as handouts and for sale by marine parks vary considerably. Most are rather poor in content and quality, but the Vancouver Aquarium's, in recent years, are exceptional. Sea World's educational publications refer to "Shamu", Sea World's performing star, in their 18-page "Killer Whale Fact Sheet" (© 1988 Sea World) as well as in their "Meet Baby Shamu" publication (undated, late 1980s) aimed at grade school children. The association of the Shamu name with performing star is inescapable – especially for school children. The name might attract a youngster's interest, but it ultimately obscures the true nature of the animals. Along with the mostly solid information in these publications are mistruths to push Sea World's agenda. "The best scientific estimates" do *not* "show that orcas live to 30-35" years old. The latest figures show males live to about age 30 on average and females to age 50 on average. To be fair, the Sea World publications were produced before these latest and most definitive longevity figures of Olesiuk, Bigg, and Ellis were published in 1990. However, an earlier Bigg publication provides much more accurate numbers than 30-35 years which, after all, from the ambiguous way it is written, does not make clear whether it refers to mean or maximum longevity. Either way, 30 to 35 years is too low. "Meet Baby Shamu" also pushes the old "gentle giants" conception of whales which has been shown to be false by the social behaviour of humpback whales, among other species. Later, in the same publication, the clarification reads: "These fierce hunters have never been known to attack man" – also untrue, though perhaps comforting to children.[95]

Meanwhile, the more adult-oriented "Killer Whale Fact Sheet" takes the opposite tack of "Meet Baby Shamu" and promotes misconceptions of its own: "Killer whales have attacked boats and bitten scuba divers. A diver in Canada was killed while photographing killer whales in 1986." Yes, there is a single documented case of an orca off the California coast being mouthed by a surfer, and at least one provoked case in which two orcas charged and thumped an orca capture boat. In the latter case, both orcas were fired upon and at least one was killed. But no humans have ever died due to wild orcas, as Sea World implies. The Canadian diver's death happened because of a faulty regulator on a scuba re-breathing unit. In contrast, *captive* orcas have injured a

number of trainers and, since the fact sheet was printed, killed one of them – incidents Sea World will not likely publicize in future publications. (*See* Dangers to Trainers, p 31.)

Impact of Professional Associations

Are there professional associations that might foster and improve the educational aspect? The American Association of Zoological Parks and Aquariums (AAZPA), open only to American and Canadian establishments, does make the promotion of education, conservation, science, and recreation part of its goal, but they do not attempt to set standards for education. In recent years, a major AAZPA focus has been on fighting animal rights groups. At the September 1991 annual conference, "Crisis Management: Case Studies" featured presentations on "Taking Control of the Animal Rights Challenge," "When an animal dies," "Waiting for the vultures," and "A 'lota' do about nothing." Such presentations may be useful to members for public relations but do not really promote education or conservation goals. Only a few marine parks exhibiting orcas belong to the AAZPA – the Vancouver Public Aquarium, the four Sea World parks, and Marine World Africa USA.

More marine parks, however, belong to the International Association of Amusement Parks and Attractions, IAAPA, based in Alexandria, Virginia, USA. These IAAPA members exhibit orcas: the four Sea World parks, Miami Seaquarium (Florida), all in the United States, Adventure World (Japan), Marineland Côte D'Azur (France), and Ocean Park (Hong Kong). Former exhibitors of orcas who are IAAPA members include Enoshima (Japan), Conny-Land (Switzerland), Rioléon Safari (Spain), Six Flags over Texas, and the New York Aquarium.

IAAPA promotes the business interests of its members through trade shows and a directory, but has no educational mandate. One might ask why an "educational-scientific-conservation" institution would belong to the IAAPA, an organization devoted to amusement theme parks, with detailed listings in its directory of mechanical rides, arcades, roller coasters and other attractions. An entry for Adventure World of Japan sets the tone:

"Adventure World is the finest themed park in all of Japan. It has marine shows; Wild Animal Kingdom; Petting Square; an aviary; and an amusement park. Our visitors can communicate with animals by kissing killer whales, riding on sea lions, elephants and horses, shaking hands with sea otters and touching many other animals. Our hope is for human beings, animals and nature to all communicate with each other."

Some marine parks are also listed in the "Funparks Directory: 1990 International Guide to Tourist Attractions, Themed Parks and Fun Parks". Those which have displayed orcas include the four Sea Worlds, Ocean Park (Hong Kong), Marine World Africa USA (California), Miami Seaquarium (Florida), Windsor Safari Park (England), Sealand (Victoria, Canada), and Marineland (Niagara Falls, Canada). Some zoos and museums are also listed. While it is no doubt enterprising to be listed in such a directory, does it contribute to the promotion of science, conservation and education – or perhaps distract from it, even discredit it?

Finally, of special note are two "suppliers" found in directories. Listed as one of AAZPA's "Registered Animal Supplier Members", International Animal Exchange of Ferndale, Michigan, has done limited trading of orcas on the world market since the 1970s. In the late 1980s, it was reportedly trying to get more involved. Marine Animal Productions, Inc., of Gulfport, Mississippi, is listed in the IAAPA directory under "Supplier Profiles". It is a one-stop dolphin service: they capture, train, transport and medically treat dolphins – about 15 percent of all dolphins in captivity in the United

States. They also help design facilities and currently supply contracted dolphin shows to ten facilities. Their comprehensive services are on offer to amusement or theme parks, shopping centres and hotels – any business that might want to exhibit dolphins.

The Killer Whale Show

Part of the educational value of marine parks is revealed in the way the animals are presented to the public. The show or performance is the main way in which the public meets whales and dolphins. These shows – typically scheduled seven days a week and four to eight times a day at most marine parks – owe more to circus traditions than to the university or even grade school classroom. *A Review of Dolphinaria* in Britain criticized the frequent factual errors in the show scripts and suggested that the educational staff, where one exists, should be asked to review scripts before they are used. Additional provisions directed that more attention be paid to selecting and training staff.[96]

In recent years, the educational content at most marine parks has increased and the orca as clown and other caricatures have been toned down. Today, for example, no orcas wear sunglasses and sell used cars on television – as Orky did to earn extra money for his Marineland keepers in the mid-1970s. But Shamu still lives. And for most of the shows, no matter the park, the actual acrobatic routines remain the same. Trainers still fly off the rostrums of breaching orcas, ride their backs like rodeo cowboys, or stand on their backs and hold on to the dorsal fin – the "gladiator position," as it is called.

A comparison of mid-1980s transcripts of killer whale shows from Marineland of the Pacific (California), Sea World (California), the Vancouver Public Aquarium (Canada) and others revealed substantial differences. At the Vancouver Public Aquarium, where trainers do not ride the whales, the commentary included many facts about the orcas. This was also true, but to a lesser extent, at Marineland. Sea World had only three one-sentence facts in one sampled show, commentary mostly drowned out by rock music, clapping and cheering. At all three establishments, however, the emphasis – sometimes subtle, sometimes blatant – was on the "personalities" of the trained animals and the human interaction. Sea World easily wins the prize for corny, cliché-ridden programming, with a rambling, at times vague, yet relentlessly upbeat script based on the theme of "celebration" – a celebration of the relationship between Sea World and Shamu. Indeed, it has been a profitable relationship – for Sea World, Inc.

By summer 1991, the show script at Sea World (California) had changed – at least for orcas. (The corny caricatures of the early years are still to be found in the seal and sea lion shows.) Today's show has facts and some background information about orcas. The music and the stunts with the trainers continue, but the script today is better than, say, an *early* Vancouver Aquarium script. But in Vancouver, too, the script has continued to change. Beginning in 1986, the Vancouver Aquarium's programme, "A day in the life", attempted to give viewers an insight into different things that happen on a typical day of orca life in the wild. It was probably the most educational orca show at any marine park when it was introduced, and there have since been more changes. In 1991, after opening the new, expanded "killer whale habitat", scheduled performances were discontinued – partly a new approach to education and partly because the mature female Bjossa had become increasingly unco-operative. She had lost her calf, at 22 days old, in December 1988. In 1991, after Bjossa had become pregnant again, it was decided the time had come to reduce any possible pressure on her. (Bjossa gave birth on September 30, 1991, but the calf died less than four months later.[97]

Having decided two decades ago not to ride the animals, the Vancouver Aquarium now became the first to eliminate the "show" element – almost. Instead of regular performances, trainers are on hand during the day to demonstrate and interpret a few

behaviours on command at flexible "training sessions." Initial reports indicate reduced visitor traffic, perhaps more due to the recession, yet some visitors said they were happier with the more natural kind of presentation – minus the scheduled routines and the focus on the show. Whether or not this new approach improves the captive lives of the whales, it *has* started to remove the stigma of the circus, which will continue at other marine parks as long as whales are performing stunts on demand – no matter how many facts are put into a show script. (*See* Training and Training Programmes, p 26, especially Hal Markowitz's suggestions.)

The Shamu Lie

One aspect of the "educational" message promoted by Sea World and some other marine parks is what I call the "Shamu Lie". Using the same few names for all of its orcas is a subtle, yet profound, whitewash of the facts. Sea World has perpetuated the Shamu Lie since its founding in the mid-1960s. Even Walt Disney let Bambi die, but at Sea World, Shamu lives forever.

In the early days of Sea World, when orca longevity in captivity was less than it is now, the corporation wanted to ensure continuity – to be able to market the image and spin-off products. It used the same names for all the animals performing before the public – and took out copyrights and trademarks on the names. Besides Shamu, the star of the show, there is Baby Shamu and Kandu. In Sea World's literature, there are references to the "Shamu Family". Of course, it is much like a human family, but nothing like the real extended *wild* orca families, or pods, of up to 50 animals. Listening to the show script, one might assume these animals were the same few that Sea World started with in the late 1960s.

Besides Sea World, a number of other marine parks, such as Marineland (Niagara Falls, Canada), Marineland Côte D'Azur (France), and Kamogawa Sea World (Japan) have used the same names for at least some of their captive orcas. No park does it to the extent of Sea World, Inc. In recent years, Sea World has been forced to file necropsies – thereby admiting that some of their animals do die. Here Sea World often uses numbers, not names, to label each animal. There's no inkling that Shamu herself is involved. *Shamu never dies.*

Marine Park Philosophies

The "purpose" or philosophy of a marine park and how it is set up – as a non-profit society or as a private company or corporation – reveal something about its approach to education. The Vancouver Aquarium, run by a non-profit society, leans more to education; its bookstore has books opposed to, as well as supporting, captivity and museum-quality sculptures, and aquarium displays include excellent exhibits of tropical to temperate marine life, with a spotlight on North American Northwest Coast habitats. The atmosphere is closer to that of a museum or art gallery. It does not feel at all like a theme park and, to some people, the trained orcas, even if they are not performing as at Sea World, still seem out of place.

The main purpose of a marine park like Sea World, on the other hand, is to give good, upbeat entertainment, largely sparing its audience the realities of knowing about the real lives behind the characters, the reality of what life is like in captivity or in the wild, the fact that the environment is in trouble. At Cap'n Kid's World or watching the water ski show with macho men and bikini-clad young women, or around the dolphin petting pool, a Sea World visitor can block unpleasant realities. Anheuser-Busch – through the Busch Entertainment Corporation and Sea World, Inc. – may proclaim corporate policy as promoting education or conservation of the environment, but a

corporate policy that includes education for a profit-oriented theme park is not the same as a non-profit society's specific commitment to the conservation ethic. Of course, some non-profit societies do fail, despite good intentions. And former robber barons and metal magnates (Carnegie, Rockefeller) become great philanthropists. Considering the resources and revenues of Sea World, it is obvious that even a small portion of the profits devoted to education, conservation and research could make a measurable contribution and sometimes much more than a non-profit society. In addition to the $3 million US a year budgeted for education, according to Brad Andrews, Sea World gives $350,000 to $500,000 US a year to Hubbs-Sea World Research Institute. The H-SWRI money is a grant, but it is difficult to put the education budget into perspective without knowing what proportion of Sea World's total operating revenue is spent on education and how the money is spent – things Sea World refuses to reveal.[98]

The educational message that zoos and marine parks need to teach, according to the World Conservation Union (IUCN) policy, is that humans must conserve species and ecosystems. This "mission" would fit with the World Conservation Strategy (1980), as well as *Our Common Future*, a book produced as part of the World Commission on the Environment and Development in 1987. To attempt to assume the role of a conservation institution, a marine park could use the appeal of dolphins and orcas to make people care about the environment, and let them know that marine species and the ocean are in big trouble and that everyone must help. The public relations departments of many marine parks, however, make use of the conservation messages but ignore the obvious implications affecting their own operations.[99]

In 1987, the AAZPA's Public Education Committee commissioned a "National Survey of Conservation Programs" in an effort to help foster their development among member zoos and aquariums. 74 of 134 institutions replied to the survey; about 12 to 15 percent of those responding were marine parks or exhibited dolphins as part of a zoo. Sixteen of them – 22 percent – reported having no education programmes directly targeting conservation issues at all. Of the remainder, a third were one-shot programmes and more than a third of all the programmes came from just ten institutions – 16 percent of the sample. The author of the paper, Barbara A. Birney of the Chicago Zoological Society, concluded: "Close examination of these data reveal a less impressive portrait of conservation education in zoological parks and aquaria than may be desirable." She did find that educators were eager to co-operate with other institutions to develop better programmes of conservation education.[180]

Birney later made a presentation at the 1990 Annual AAZPA conference, showing how to construct questionnaires or surveys at marine parks to determine how visitors respond, what messages they take home. The current information in this area, says Birney, is mostly biased or anecdotal. The kind of information that could be obtained, long overdue, might persuade marine park owners and curators to do some careful thinking. "From psychological tests," wrote Birney, "it is known that messages are most powerfully conveyed...when the visual demonstration is consistent with the auditory message." When the two are inconsistent, comprehension drops and the visual message alone is retained. Because the visual message of a leaping orca is so powerful, conservation messages might best be presented during periods the animals are underwater. "Conservation messages tagged on to the end of a show are not likely to be remembered," writes Birney. "A continuous thread of information that draws connections between conservation problems and animal behaviour is most likely to succeed."[181]

Cetacean shows, Birney points out, can "reinforce the concept of human domination," the inadvertent "education" message that leads some to question the practice of confining large, social marine animals in pools, stripping them of their

families, and asking them to perform for people (*See* The Ethics of Keeping Orcas Captive, p 77). No matter how imaginative the presentation, no matter how solid the educational content, a certain number of viewers will question what they see. They may have gone whale-watching or seen television shows on orcas or read Sea World advertisements inviting them to sit on the back of an orca for an unforgettable ride. The show may prompt them to formulate their own views, and a few of them even linger to question the trainer or other employees. Of course, most marine park employees are prepared for such tricky situations and are coached on how to respond so that a visitor will get the "right" educational experience.[182]

The responses vary from park to park depending on the employee's education, experience, openness and company policy. A few visitors ask difficult questions such as, "Where is that whale that was here last year?" or "Why are the shows all the same, all day long, every time I come here? Don't the whales get bored swimming around the same pool and doing the same tricks?" The answers are not easy – if the employees are to be truthful. Sea World and other parks prepare for inquisitive visitors by issuing directives on how to defuse arguments against captivity. The Sea World employee is coached to speak about orcas, using particular phrases. Next to the lie of the Shamu syndrome, this may be the biggest anti-educational aspect of Sea World. There is a list of "buzz words" to avoid, as well as alternatives to "give guests a better overall impression of Sea World." Instead of "tricks", for example, employees must use the word "behaviour". Sea World orcas do not live in "cages" or "tanks" in "captivity" and were never "captured" from the "wild"; instead, they live in an "enclosure" in a "controlled environment", having been "acquired" from the "natural environment". Language columnist William Safire of the *New York Times* would have a field day with such euphemisms. But sometimes even an old-fashioned euphemism won't do: Sea World employees are counselled that if visitors ask if a particular animal has "passed away", they must simply say "I don't know". [183]

But, most revealing about the Sea World handout to employees, is the order regarding the word "evolution": "Because evolution is a controversial subject theory [sic], use the word 'adapt'." As any first year biology or geology student at university knows, evolution is *not* a theory – though creationists would applaud Sea World. Evolution, as shown in the fossil record, is as near to absolute fact as science can give us. It is on the order of disputing whether the Earth really does orbit the sun. The theory attached to evolution has to do with the *mechanism* for evolution proposed by Charles Darwin. It is called the "theory of natural selection" and it refers to the action of the environment on individuals of a species. Those individuals better suited than others to the environment are better able to survive and reproduce, better able to adapt. This is survival of the fittest. As a word, "adapt" is all right to use – it is not a euphemism as are some of the other "alternatives" – but not because, as Sea World puts it, "evolution is a controversial subject theory"! But there may be a deeper, underlying reason for Sea World's apparent doubts about evolution: when a marine park or zoo – or even a botanical garden – takes a wild species into captivity, it cuts off the natural selection process. Or maybe it comes down to money and the risk of alienating the creationists who are, after all, paying customers, too. It might be argued that educational institutions ought to take this risk.

One problem with giving a straightforward educational message – or telling the truth, actually – is that they might bore their audience. Most marine parks are experienced in the entertainment business, not in education. Even worse, providing a realistic insight into what life is like for wild whales, they might provoke an international crusade against keeping the animals captive.

Prof. Ken Norris, drawing on his background as both dolphin scientist and marine park curator, seems more optimistic about the educational potential of cetacean exhibits. In a 1990 interview in *Soundings*, he gave the audiences, the public, a great deal more credit than Sea World apparently does:

"People understand that we are saving endangered species in the zoos. It's not nearly so obvious for the marine mammals, but I think it may become that way. If it does, then marine mammal exhibits will be treasured places...playing their part in trying to soften the blow of humans upon the wild world. If that happens, then I think things could be a lot easier in the exhibit world for marine mammals. I think we have to get away from the cheap show aspect of it. I don't think we can any longer talk about dolphins in the 'Easter Parade', because the public [has] realized that these animals are very much more than just little puppy dogs out there for the beck and call of humans. People want more, so I think that has to be addressed."[184]

Prof. Heine Hediger, former director of Basel Zoo and Zurich Zoo, warned in the mid-1960s, that the future of zoos and marine parks depends on shaking off the mantle of circuses and becoming good centres for education and science, as well as recreation. In *Man and Animal in the Zoo*, he wrote: "The purely commercial view that wild animals are a business proposition still persists in one form or another in some zoos. This old-fashioned attitude presupposes that animals are a form of merchandise....At one time, in the period of the menageries, amusement parks and so on, it was possible to show zoological curiosities at a profit, but this is no longer possible today. The animal has now lost its role as an article of commerce and has taken on the image of a valuable gift on loan from our vanishing fauna.

"Today the wild animal is considered to have cultural value; it is regarded as part of our heritage, to which the whole of mankind, and particularly future generations, has a legitimate claim. Zoological gardens, to which these living items of culture are entrusted, therefore represent cultural institutions....They are also institutions for popular education and scientific research. The duty to protect these unique cultural items within zoos and outside their confines is inseparably bound up with this concept.... A zoological garden which contributes nothing to the promotion of the important subjects of education, research and conservation is just not a zoo in the modern sense." Many zoos have made strides in these areas, and, more recently, marine parks have made attempts, but marine parks still have a long way to go. It takes more than throwing money at something called "education" to educate people.[185]

The Potential for Education

Many have noted the potential for teaching conservation by using the powerful hook of orcas and dolphins in captivity. In 1986, David E. Bain of the Marine World Foundation and Rachel Smolker from the University of California, Santa Cruz, argued that marine parks should expand their educational activities to alert the public about the vulnerable and endangered dolphins and porpoises as well as those species facing huge losses from commercial fishermen. They suggested that marine parks (1) incorporate in their shows information about incidental kills of small cetaceans, (2) set up information displays and booths, (3) provide such information in programme handouts, and (4) offer facilities for experiments with nets to minimize cetacean entanglement.[186]

In Bain and Smolker's view, such an education programme might help justify keeping dolphins captive. "If oceanaria were responsible for raising public awareness to the extent that public support resulted in the reduction of the incidental catch...by just 15 percent for a single year, more dolphins would be saved than are currently held. Marine parks are in a position to educate the public about these more specific issues."

Involvement in strandings programmes is another way in which marine parks might contribute to educating people about conservation values. In the US and Canada and to some extent in other countries, marine parks assist in rescuing live marine mammals. The Vancouver Aquarium, Sealand and especially the two oldest Sea Worlds in Florida and California are part of regional networks that can be contacted when marine mammals are found alive, though they do not necessarily have primary responsibility for all strandings. (Animals that are already dead are more often the responsibility of museums or university departments that may want to examine the body or collect the skeleton.) A small number of live orcas have been picked up on beaches:[187]

- Sandy, stranded in March 1973 on a Washington State beach, was rescued by Don Goldsberry and cured of an infection, surviving four and a half years at Sea World.

- Two orcas, a male named Milagro and a female named Belén, stranded in August 1985 and January 1988 in San Clemente de Tuyú, Argentina and were taken to Acuario Mundo Marino. Milagro was reportedly forced to strand by a fishing boat. Initially suffering a stomach ulcer and dermatitis, he recovered, then died after 5 1/2 years in captivity. Belén, a suckling calf, was stranded by accident; her pod remained in the same area, vocalizing for two days after the aquarium had taken her captive.

- In August 1977, Sealand was given permission to take a lone, sick, disoriented calf dubbed "Miracle." The youngster lived more than four more years before dying in an accident.

- In August 1970, Don Goldsberry picked up a young female stranded at Port Madison, Washington. Leased to the "Florida Delphin Show" in Munich, Germany, she died a year later.

Many more dolphins, porpoises, seals and sea lions are stranded or orphaned but only a few, relatively, are rescued by marine parks. By 1984, then Sea World veterinarian Lanny H. Cornell said that all their California sea lions were coming from captive bred or rehabilitated beached animals. Sealand (Victoria, Canada) also operated an informal rescue unit to obtain their seals and sea lions – though some former employees maintain that these animals were underfed and poorly cared for. For some marine parks, the stranding programmes are not so much education as high-profile propaganda. (This criticism does not apply to marine parks or other organizations when there is a valid scientific component.) Most single, live-stranded cetaceans are terminal cases and "rescues" may even prolong suffering. And no establishment has the resources to do much for more than a fraction of the animals in a group stranding. Sea World and some other parks participate in these programmes because they earn brownie points from the public, though they have become less enthusiastic about bringing in strange animals off the beaches in recent years, as more has been learned about morbillivirus and other diseases.

And then there is the issue of returning animals to the wild. This is an opportunity for education through a conservation lesson. Yet few of the rescued cetaceans are ever returned to the wild and no orca has ever been returned. In the United States, the Marine Mammal Protection Act requires that steps should be taken to return live stranded marine mammals to their natural environment, if feasible. NMFS is supposed to make the decision as to the feasibility of returning individual animals. While the matter is being considered, the cetacean cannot be trained for public performance or publicly displayed. If display is approved, the animal cannot be moved or sold without NMFS approval. But quite apart from the NMFS policy, which is not always consistent on this matter, the conservation message of returning a cetacean to the wild can be

considerable. Children know conservation is important, but what more powerful lesson than to show them how to put conservation into action by returning something to nature? It would be a noteworthy gesture from marine parks that have earned so much money from cetaceans.[188]

But could the animals survive in the wild after so long in captivity? There are scientists on both sides of the debate. The only way to determine whether an animal can survive and re-adjust is to do a carefully monitored release and follow-up. The New England Aquarium, in 1986-87, rescued three pilot whales from the beach at Cape Cod, Massachusetts. After six months in captivity, these whales, similar in size and sociability to orcas, were tagged with temporary radio transmitters and released on a windy day 60 miles (96 km) off Cape Cod.[189]

The whales rejoined a large group of pilot whales and apparently were accepted. This experiment was a blend of education, science, animal welfare and public relations, and public response to it was enthusiastic. Since 1987, at least two other marine parks have rehabilitated and released stranded cetaceans, including more pilot whales, as well as one species of dolphin. As well, two male "research" dolphins, which Ken Norris released back into the wild in October 1990, have readapted and, in a one-year follow-up study, had integrated into the social structure of their former group.[190]

What does keeping a wild whale or dolphin in an enclosure mean to the child who sees it? What do children really learn from the existing education programmes at marine parks and how does that compare with learning in the classroom and on other field trips? What is the child left with? Is the money for education at marine parks well spent? There are no decisive answers to most of these questions and independent studies are needed.

12. Scientific Work

At the Third International Orca Symposium in Victoria, Canada, in March 1990, Michael A. Bigg, introduced the symposium with a brief survey. He focussed on the extensive photo-identification-based work being done in the wild. Research has been conducted along the west coast of North America from Alaska to Mexico, as well as off Iceland, Norway, Argentina, and the Crozet Islands and Prince Edward Islands, both in the Indian Ocean off South Africa. These in-the-wild studies – part of an exciting revolution in research of wild whales – have concentrated on population biology, social structure, behaviour, acoustics, energetics, diet, and genetics. But Bigg also noted the importance of studying captive orcas "to improve understanding of energetics, body growth, reproduction, genetics, [and] physiology."[191]

Orca Studies in Captivity

Orca studies in captivity, although much fewer than those based in the wild, have included important work:

- Reproductive research at Sea World that has established orca's gestation period at 514.5 days on average – about 17 months. This knowledge, obtained through monitoring hormone levels in urine, provides crucial calculations for wild management and research such as the Olesiuk-Bigg-Ellis paper on the Vancouver Island orcas. Researchers need accurate information about breeding behaviour and the reproductive cycle to make reliable estimates of population dynamics in the wild. The study, by William A. Walker and his colleagues, became possible only when serious efforts were made to breed orcas at Sea World, although rough estimates of orca gestation were being made at Marineland from Corky's pregnancies. It would be impossible to determine the precise gestation period from observations in the wild.[192]

- Orca hearing studies were first conducted on orcas held captive by the US Navy. Recently, John Ford has been doing additional hearing studies at the Vancouver Public Aquarium with the US National Marine Fisheries Service. David E. Bain is also doing work at Marine World Africa USA. Hearing studies could help reveal whether orcas are bothered by man-made sounds in the wild (ship traffic, commercial fishing activity, whale-watching boats) and in captivity (screaming crowds, water pumps, etc.) Preliminary results show that orcas hear best at frequencies somewhat higher than that of shipping traffic or pumps in marine parks. (*See* Conditions in Captivity, p 37.)[193]

- Underwater sound research to analyze orca sounds began in the mid-1960s with Moby Doll at the Vancouver Aquarium. These early studies – by Newman and McGeer, Schevill and Watkins, and Spong and White (on vision as well as sound) – provided basic information. More recent captive studies by Dahlheim and Awbrey, forming part of a master's thesis, suggested that, through computer analysis, the

sounds of captive orcas could be used to tell size and sex of the animal. But this has proved inaccurate, as well as an example of the hazards of researching captive animals: The sounds may vary slightly from individual to individual, but the most significant differences are the dialects, best studied in the wild populations.[194]

John Ford's work with *wild* orcas since the late 1970s led to the understanding of orca dialects. Since then, recordings made at various marine parks have become useful in establishing the previous pod identities of captive North Pacific orcas, based on sound alone, as well as the pre-capture composition of pods. It has also helped prove that the dialects have long-term stability, even though, as in many cases, orcas have remained alone for years or lived only with orcas having different dialects.

- Studies of tooth growth layer groups by Myrick and others may provide a valuable tool for determining the age of an orca by looking at its teeth. First, however, the layers must be calibrated, in part by using captives of known age.[195]

- Genetic studies. In 1988, at the Vancouver Aquarium, the DNA from a skin sample of a newborn calf was compared with DNA from the blood of two possible fathers to determine paternity. These techniques – developed by University of Cambridge scientists are now being used to study various whale species. They could be helpful in captive breeding programmes but are mainly important for understanding wild whale populations – to help determine degree of inbreeding, social structure, and relationship of populations, among other things. Captive animals, an easy source of DNA samples, may help perfect collecting and other techniques.[196]

Other small cetacean studies

There are some captive studies of other cetaceans which have findings relevant to orcas. Bottlenose dolphins, the most studied, have been subjects of excellent scientific work during their much longer period in captivity. A recent Academic Press book *The Bottlenose Dolphin*, edited by Stephen Leatherwood and Randall R. Reeves, is dedicated to David and Melba Caldwell, pioneers of captive dolphin studies. The book contains the substantial results of captive and wild studies. It should be noted, however, that many "captivity" studies on dolphins are not actually done in marine parks. Examining the abstracts of the Eighth Marine Mammal Conference in 1989, Hal Whitehead found that half the dolphin work presented that year came from studies done by the US Navy (on acoustics and physiology) or at the University of Hawaii (as part of Prof. Louis Herman's work on cognition); the remainder, conducted in marine parks, was spread among a number of facilities.[197]

Ken Norris says that captive studies "have let us ask a wide variety of fine-grained questions about how dolphins hear; how they make sounds; how they swim; how they breathe; how their brains work; what kinds of memories they have; how well they can reason; how well they can deal with abstract concepts; how they see; how they taste; about their bodily processes; and it has allowed us to compare their performance to our own in a rather wide and remarkable variety of cognitive functions."[198]

But other research, such as that on natural behaviour – social, hunting and feeding, foraging, and other crucial aspects of a cetacean group's daily life – is difficult or impossible to pursue in marine parks. In *The Porpoise Watcher*, published in 1974, Norris writes:

"In captivity usually two or more species are thrown together into unnatural assemblages that seldom or never exist in nature. Confinement compresses a porpoise's activity, no matter how large the tank. The difference is between forty to sixty miles (64

to 96 km) of daily travel and movement in a tank two hundred feet (60 m) in diameter. The difference is the chance to dive out of sight of the surface – perhaps to over a thousand feet (300 m) for some porpoises – versus perhaps twenty-five feet (7.6 m) in captivity. The difference is a limitless world where aggression and fear can reorder social structure within and between schools and a world where these forces are contained by cement walls. In captivity, shy porpoises can't move far away from aggressive ones. In fact, confinement compresses natural activity so tightly that it may be distorted virtually beyond recognition. The captive porpoise forms unnatural life patterns, like the antelope in the zoo, used to ranging many miles a day, who comes to promenade in a stereotyped figure eight around his cage, until the single track is rutted a foot below the surrounding soil."[199]

Research on orcas in captivity has been confined to only a few animals in a few institutions. This makes the information for an individual orca even more valuable. Yet a great number of opportunities have been and are being wasted for various reasons, chiefly lack of funding, inertia, and reluctance to allow time for the stars of the show to participate in scientific work. Marine park managers are naturally reluctant to allow "invasive" studies which, in any case, are illegal in some countries. But, with the notable exceptions at the beginning of this chapter, most "science" in marine parks is lip service paid to the *idea* of science. Few marine park owners, managers or other admistrators have a background in science and or even scientists on their staff. Those few scientists often have more day-to-day demands on their time than a university lecturer or professor – and may not have full summers free to do research.

Veterinary findings, such as have come from Sea World's programme for captive breeding, have yielded some knowledge about orcas, though most is not scientific research in a strict sense. Such knowledge has benefits which could accrue to wild orcas for rehabilitation of animals that strand alive. At least six orcas have been found stranded alive since orca captures began in the 1960s. All, however, were taken by marine parks and turned into performing animals. Only one, a baby orca called Miracle, was too young to have been returned to the wild.

Research foundations associated with marine parks

A few marine parks have set up separate non-profit research foundations, notably Sea World. The park may not have a large scientific budget itself, but it provides part of a research foundation's funding. As well, the park offers its animals and equipment for certain research projects.

The Hubbs-Sea World Research Institute (or "Hubbs") was established by the founders of the original Sea World park in San Diego in 1963. Originally called the Mission Bay Research Foundation, it was given its present name in 1977 in honour of marine scientists Carl L. and Laura C. Hubbs. Hubbs is located at one corner of the 135-acre (55-hectare) Sea World in San Diego. It currently has a scientific staff of 25. Sea World provides office space and pays basic utilities and taxes. In 1989-90, Hubbs raised $1.6 million US in revenues, 58 percent from contracts and grants from such sources as National Marine Fisheries Service and the National Science Foundation, and 36 percent from private contributions to support a variety of research projects. Donors to the scientific work include corporate sponsors and Sea World itself, which provided $343,423, or 21 percent of all revenues.[200]

Recent studies at Hubbs include work on marine animals in captivity, as well as in the wild, in the areas of conservation, food fish resources, bioacoustics, physiology and population dynamics. There is a wide variety of work going on, some of it in collaboration with students from San Diego State University and University of San

Diego. Three recent studies, partly funded by Sea World, include satellite tracking of marine mammals, vocal behaviour of orca calves, and work on Baikal seals.

As an independent non-profit, Hubbs' scientists mostly work on their own research projects, but, from time to time, several high-profile Hubbs' studies have been driven by Sea World's collecting needs – in particular for orcas. At least a portion of Hubbs' science is more like applications-oriented industry science than the independent science done in the best universities or unaffiliated research institutes. It is perhaps not surprising, since Hubbs' board of directors includes one or more top-level representatives from Sea World-Busch Entertainment Corporation.

Beginning in 1984, orca population research in the wild off Alaska and Iceland, conducted by Stephen Leatherwood and his associates, supported Sea World's planned collecting effort. The photo-identification research was accomplished quickly, using airplane spotters and numerous ships and small craft, and was thus much costlier than similar studies in British Columbia. Many of the best orca researchers in the field, including some who disagree with Sea World's practice of keeping orcas captive, were hired on a free-lance basis for the study and helped ensure its success.

The sudden interest by Hubbs in such intensive fieldwork on orcas, accompanied by an inept public relations effort, was fuelled by Sea World's approved federal permit to catch 100 orcas off the coast of Alaska. According to the permit, ten orcas could be taken for Sea World parks and 90 would be used temporarily for research, then released. Besides the photo-ID studies, the planned research – all part of the permit – included liver biopsies, stomach lavages, and tooth-sampling. But the governor and legislature of Alaska refused to allow the captures to proceed.

Soon after that, in 1987, Hubbs' scientific effort regrouped and moved to the North Atlantic, around Iceland. Sea World, Inc. – working with Dudok van Heel of Dolfinarium Harderwijk and an Icelandic collector who submitted the permits – had already collected nine orcas off Iceland in the late 1970s. Now they wanted more for expanded facilities and a breeding programme. Although Sea World itself had no collecting permits, it funded the Hubbs-Sea World Research Institute to organize scientific meetings and sponsor background studies on North Atlantic and especially Icelandic orcas – partly in an effort to satisfy NMFS regulations that require population estimates before captures. This work culminated in a comprehensive 316-page volume, which included 21 papers and was edited by Hubbs' Stephen Leatherwood and Jóhann Sigurjónsson of Iceland's Marine Research Institute. Hubbs' researchers wrote some of the papers, but most were by established researchers unaffiliated with Hubbs or Sea World who had obtained sponsorship from Sea World, Inc. for their study. Most of the papers were exhaustive literature searches that included whaling logs and other unpublished historical material to help determine the distribution of orcas throughout the North Atlantic. Sea World's contribution (for all investigations including publication) was about $200,000 US over two years. Sea World's motive in commissioning the work was clearly commercial – i.e., they would like to be able to obtain more Icelandic orcas, as needed. Yet the science was conducted in a professional and thorough manner. It may be unreasonable to ask that scientific work at marine parks or at foundations associated with marine parks be entirely free of commercial motives. Like industry researchers, scientists affiliated with marine parks face a credibility problem, however unfair. In general, those whose work will earn the highest peer respect consider themselves scientists first and marine park employees second.

Conferences and other scientific contributions

Another measure of some marine parks' contribution to science – including the Scientific research is a low priority at most marine parks, the orcas little used in research. According to Hal Whitehead, just two papers at the Eight Biennial Conference on the Biology of Marine Mammals (1989) were based on orca studies in captivity: one on heat loss, at the Vancouver Aquarium, and one on progesterone levels, at Sea World – but there were many more studies on wild whales, including orcas. To understand the atmosphere for science at a marine park, look at the leadership. Is it mainly administrators with minimal science background or PhD directors keen to show the way with ideas about interesting problems to be solved? Kamogawa Sea World and the Vancouver Aquarium are two of the few marine parks with administrators who have a scientific background. Other parks may have a curator or research associate with a scientific background. By contrast, Sealand has no scientific leadership or associates and no in-house orca research, at least since the early 1980s, except for allowing a US researcher access to results from orca blood tests. Such a spin-off from veterinary work, while not science in itself, can support scientific inquiry directly and indirectly.[201]

Part of the cost of Sea World's captive breeding programme – estimated at $120 to $130 million US since 1985 – should be considered in an evaluation of their science contribution – even if the main purpose of the programme is to produce more performing "Shamus". As well, the $350,000 to $500,000 US a year that Sea World gives to Hubbs-Sea World Research Institute is a contribution to science. By comparison, the Vancouver Aquarium, although it considers itself a "mini university", only devoted $50,862 US, about 1 percent of its budget in 1990, to science. (This does not include salaries or fixed institutional costs, such as the cost of maintaining the animals and the facilities.) As well, some Vancouver Aquarium and other marine park researchers may participate in orca studies with outside funding and, in some cases, the orcas may be used without cost to the aquarium. Yet the figure seems low. It is revealing that even an institution that considers itself scientifically oriented can afford to spend only a relatively small amount on science. This may be chiefly because marine parks, and especially those with orcas, are so expensive to run. The cost of education and science, if considered together, puts the figure for the Vancouver Aquarium at about 13 percent of the annual budget. Unfortunately, no other marine park would reveal how much they spent on education and science as a percentage of their budget. Even though Sea World spends much more on science and education than the Vancouver Aquarium, it may well be a smaller percentage of the budget. By contrast, to support research and education, some zoological societies set aside as much as 20 percent or more and certain environmental groups – albeit without the considerable cost of feeding and caring for animals – typically set aside 60 to 75 percent of their annual budget.

At the AAZPA 1984 workshop on "Animals on Display: Educational and Scientific Impact", the Research Working Group, led by Stephen Leatherwood, gave a brief shopping list of potential research on captive marine mammals that could "be used to benefit the animals and expand our knowledge in the following areas: evolutionary relationships (including taxonomy, phylogeny, genetics, and hybridization); life history (including age structure and reproduction); disease processes (including microbial and helminth diseases, immune incompetence, epidemiology, and clinical and pathological parameters); behaviour (including learning ability, sensory processes, and communication); physiology (including metabolism, nutritional requirements, and gas exchange); responses to environmental perturbations (such as oil-related activities and industrial noise); and population biology (including group structure, genetic relationships, color patterns, and individual markings).

A detailed, practical assessment of the research marine parks could do to learn more about captive as well as wild cetaceans is provided by Margaret Klinowska and Christina Lockyer in *Dolphinaria. Report of the Steering Group,* on pages 86-105. They include notes about priority, expense and feasibility of each project. The list reveals just how valuable marine parks could make themselves. Few of these suggested research projects have ever been undertaken.[202]

We have learned a few things from keeping orcas captive, but is it enough to justify the practice? At present, no marine park or aquarium is in a position to boast to the public about its scientific mission. None has contributed – in terms of science, conservation and education – to anywhere near the same extent as the best zoological parks. If science were a primary goal at marine parks, rather than display, much better scientific results could have been obtained with a fraction of the number of captive orcas and in a fraction of the time. Once the research was finished, the orcas could have been returned to the wild. Science, as it is currently conducted at most marine parks with orcas, is more than anything else an *excuse* for keeping orcas captive.

13. The Ethics of Keeping Whales and Dolphins Captive

In February 1984, there was a workshop on "Animals on Display: Educational and Scientific Impact" held at the John G. Shedd Aquarium in Chicago. In it, the AAZPA's Ethics and Law Working Group considered the ethics of keeping animals in captivity. The group, which included representatives from marine parks and Hubbs-Sea World Research Institute, acknowledged a "special responsibility to preserve and respect animals as part of the natural environment" and a "moral obligation" to show "compassion and humane treatment to animals in captivity."

Its report said: "Those who work with captive animals in aquariums and zoos have a special obligation to convey knowledge of the natural world to the public, to interpret the lives of animals accurately...to portray animals as they are, to display animals under conditions that, so far as possible, allow them to behave naturally, and to offer them adequate social contact, ideally with others of their species. In addition, a workable ethic for the treatment of animals in captivity must include a requirement to provide appropriate space, nutrition, and health care."

The group felt that if "bringing animals into captivity...causes adverse effects, these effects, on balance, are outweighed by such benefits as enhancement of human appreciation for all animals, conservation of species, and advancement of knowledge." But then, they took their views a step further, trying to pre-empt any possible argument: "Some people contend that it is morally wrong to remove animals from the wild and hold them in captivity, either because they believe that some animals have evolved sufficiently to acquire rights equivalent to those recognized for human beings, or because they believe animals are severely harmed by life in captivity....These beliefs are not currently supported by sufficient scientific evidence. Consequently, they do not provide a factual basis for an overriding moral objection to displaying animals in captivity."[203]

The AAZPA statement, however, misses the whole point of a moral or ethical view, which is that is a matter of belief. There is no need for facts, only a true conviction. The AAZPA panel and other marine park proponents have a right to their beliefs, too, but they cannot *disprove* those who disagree with them.

The AAZPA workshop was partly a response to the "Whales Alive" conference (Global Conference on the Non-Consumptive Utilisation of Cetacean Resources) held at the New England Aquarium in Boston in June 1983. Whales Alive was attended by a wide group of whale researchers and environmentalists, as well as those affiliated with marine parks and aquariums. Consensus could not be reached on the moral issue, but participants came up with a number of recommendations, suggesting better standards for captive cetacea and further research into the possible effects of capture. A report of the conference noted that captivity for cetaceans would need "to be continually reviewed in the light of...future research findings, aquarium experience and changing public sentiments." Yet in the end, the conference resolutions suggested: "Efforts should be made to bring to an end, in due course, the keeping of cetaceans in captivity."[204]

Since then, at an April 1990 "Earth Week" symposium held in Ottawa, Canada, entitled "Whales In Captivity: Right or Wrong?", participants drawn from marine parks, as well as whale scientists and environmentalists, sought greater understanding and dialogue on the issues. But, after a day with some fierce arguing, they came up with no consensus.[205]

In July 1990, as the issue became more polarized, the Bellerive Symposium on Whales and Dolphins in Captivity, met in Geneva. There were no marine park owners or curators in attendance, no one arguing in favour of keeping whales and dolphins captive. The Chairman's conclusions: "Whales and dolphins are self-aware beings that routinely make decisions and choices about the details of their lives. They are entitled to freedom of choice. Thus, they are entitled to freedom. Imprisoning them in captivity is, quite simply, wrong."[206]

The greatest impact of this view – in changing the rules and regulations about keeping cetaceans captive – came in the state of Victoria, Australia where, in 1985, all further capture of cetaceans was banned. At the national level in Australia, the Report of the Senate Select Committee on Animal Welfare, entitled *Dolphins and Whales in Captivity*, stated: "Many people concerned with animal welfare now question whether humans are entitled to exploit animals and to act in a manner which will cause animals to suffer. Critics argue that oceanaria exploit cetacea primarily for profit and that this is morally indefensible because it causes suffering to cetacea who, as intelligent and complex beings, are entitled to greater consideration by humans. They believe that arguments advanced by oceanaria, for keeping cetacea captive, such as enrichment, awareness and improved knowledge, are inconsistent with, and subordinate to, their commercial motives....Critics consider that, even if oceanaria could show that profit and recreation were not the primary motives of oceanaria, the use of captive cetacea for education and research is not only of dubious benefit but is also morally questionable."[207]

Some people are opposed to making money from exhibiting orcas. However, they do not object – or object much less – if bonafide science, education and conservation form part of the programme. But philosphers Dale Jamieson and Tom Regan argue that, although scientific study may have many benefits which will accrue to cetacea themselves, the morality of these benefits depends "on the means used to secure them. And no benefits are morally to be allowed if they are obtained at the price of violating individual rights."

A few years earlier, when Australia was coming to grips with a century of intensive whaling, Sir Sydney Frost, in his report on whales and whaling, decided that any interference with cetacea required strong justification on the grounds that it was either "essential or unavoidable". In considering whether humans should "use" cetacea, he took into account the suffering that might occur as a result of that use and the effect of the possible high intelligence of cetacea on their propensity to suffer. He recommended that "the taking or killing of any cetacea – whether intentionally for scientific, display or other purposes, or incidentally such as in fishing or shark-netting operations – should be carefully scrutinised to ensure that it is either essential or unavoidable."

Australia's Senate Select Committee on Animal Welfare also considered the suffering of the animals: "The fact that cetacea undergo some suffering in captivity is not, of itself, an overriding factor in determining whether cetacea should be held in captivity. All animals, including human beings, suffer to a varying extent in their natural environment and it would be inconceivable for animals not to suffer at times in captivity. Rather, it is the nature and extent of suffering which should be taken into account in deciding whether to keep particular species of animals in captivity."

The committee noted that empirical data has shown that cetaceans suffer varying degress of stress and trauma during capture and captivity. The same may not be true of the third generation bottlenose dolphins born in captivity. But, after weighing all the evidence, the committee concluded that cetaceans should "*not* be subjected to the possibility of deprivation or suffering which conditions and quality of life in captivity might occasion."

Ethical arguments against keeping orcas captive sometimes cite the importance of culture in orcas and the intensity of family ties. Michael Bigg, in his address at the Third International Orca Symposium in March 1990, stated: "Cultures are simply learned behaviours that are passed on to the next generation. The killer whale's longevity, its intelligence, its long-term bonds between adults and offspring, and localized populations make it a very good candidate for possessing cultures."

The ethical considerations of keeping animals captive has been treated at length by various authors, such as Peter Singer in his 1977 book *Animal Liberation: A New Ethics for our Treatment of Animals* and the papers of philosophers Dale Jamieson and Tom Regan.[208]

Perhaps the clearest explanation of the ethical arguments is given by Victor B. Scheffer, former US federal biologist and chairman of the Marine Mammal Commission. In trying to understand both sides of the issue, he has explored the sentiments people have about animals in general and whales in particular, and has written perceptively about it in his many articles and books:

"At the core of humaneness," he wrote in the final chapter of *Marine Mammals of Eastern North Pacific and Arctic Waters*, "is the idea of *kind-ness*, or the idea that we and the other animals are basically of one kind." To Scheffer, the key is that we are all "part of the living animal world...caught up together in a sort of spiritual biomass" and therefore "we have the right to insist not only that animals be spared distress (pain and fear) but that they be used in ways acceptable to large numbers of thoughtful men and women."[209]

Scheffer confessed an "inability to deal adequately with the problem of how one learns what the general public wants from, and for, the whales, seals and other marine mammals," adding: "I myself believe that what men and women are saying today about them is, 'Let them be.' A useful marine mammal, they say, is one out there somewhere in the wild – free, alive, hidden, breathing, perpetuating its ancient bloodline.

"My real argument is emotional or, if you wish, sentimental. I believe, quite simply, that sentiment is one of the best reasons for saving not only some of these animals – but all of them."

The orca captivity debate is important for many reasons. All of us are trying to come to terms with a world which the human species has put in peril by its actions of domination over nature. The removal of these few animals probably does not represent a risk to the future of *Orcinus orca* as a species; in fact, as we have seen, some of what is learned in captivity may in future be helpful to wild populations. But the ethical issue should not be dismissed because only a few animals are involved. Whether or not "animals have evolved sufficiently to acquire rights equivalent to those recognized for human beings" or "animals are severely harmed by life in captivity", this is an issue involving not only a couple hundred orcas but also millions of people – the millions who see orcas every year in marine parks as well as those who choose to stay away. The feelings of all of these people, their ethical views, are crucial.

Feelings about animals differ of course from person to person. The differences are partly cultural, partly the differences between urban vs. rural backgrounds. Developmental psychologists tell us that our caring about animals – mostly acquired as children and developed as young adults – is closely tied to our feelings about nature, as well as other people, including our families and ourselves. We must explore these links and develop them. Our improvement and ultimate survival as a society depends upon fostering respectful links with animals.

"In the long run," says Paul Spong in a recent article in *Whalewatcher*, "the whales will only be truly saved when we humans no longer regard them as resources to be exploited and 'managed', but rather as fellow creatures – self-organized social animals – with clear rights that we acknowledge, grant, and protect. Paramount among these rights should be those that address issues of habitat protection and freedom."[210]

Part of that freedom is freedom from captivity. Complicating the issue of not wanting to "manage" orcas, however, is the fact that as we move into the 21st Century, habitat for all animals, in competition with humans, is increasingly in short supply. For better or worse, humans have the job of "managing" the Earth. Rather than pressing for "no management", we must work for more caring management – utilizing a technique that business calls "hands-off management". We must intensify non-invasive research programmes and, at the same time, fight against those who would distort scientific information or use it, for example, to exploit whales. We need the scientific background to know when whale populations are in trouble and what might be done to help them. Humans, despite a poor record of respecting the rights of other humans, as well as whales in general, or orcas in particular, are now in the position of helping or hurting all life on Earth. The question may well become: Can humans be good managers without assuming the traditional role of exploiter?

14. The Future of Marine Parks and Aquariums

"Every major city should have an aquarium," says Ron Forman, president of the New Orleans' Audubon Institute in the United States. His group runs the $43 million US Aquarium of the Americas, owned by the City of New Orleans and the Audubon Park Commission. Since opening in September 1990, it attracted more than 2.3 million people in the first year.[211]

Forman's words are being acted on in some 30 cities across the United States and Canada, where new aquariums and marine parks are in the planning stages or have just opened. And existing aquariums – Chicago's Shedd Aquarium and Baltimore's National Aquarium – have expanded their facilities to display cetaceans, an operation that cost the National Aquarium $35 million US. But most are completely new ventures and many plan to feature cetaceans – the traditional drawing cards. Among them, Chattanooga (Tennessee) and Tampa (Florida) have raised between $40-84 million US to complete facilities.

In the works in Canada, are a $52 million US marine park in Toronto and a $35 million US transformation of the Velodome into the Biodome in Montréal with white whales, or belugas, to be exhibited. Plans are also being discussed for marine parks in Ottawa, Winnipeg, and Halifax. Japan is experiencing a marine park/aquarium boom with three large facilities just opened in Tokyo, Osaka, and Toba City and six more in the planning or construction stages. The one at Awaji Island, Hyogo Prefecture, plans to display orcas and other cetaceans. In Europe, at Tenerife on the Canary Islands, Mundo Marino has become Europe's largest aquarium and dolphinarium complex. Busch Entertainment-Sea World, too, has been involved in a $300 million US project to build a large marine theme park and resort near Barcelona, Spain.[212]

After the National Aquarium opened in Baltimore (Maryland) in 1981 – almost overnight transforming a dilapidated innercity and waterfront, bringing millions of visitors, spurring civic pride and a real estate boom – city fathers and chambers of commerce suddenly considered aquariums and marine parks the answer to all their problems. Says Audrey Tawa, editor of *Zoo Life*: "Of the American Association of Zoological Parks and Aquariums' 150 institutional members, only 17 are aquariums. Yet this handful of facilities accounted for nearly half the income generated [in 1989] by all 150 facilities combined. Over 20 million visitors passed through aquariums in 1989." The National Aquarium itself, according to a March 1990 report by the Maryland Department of Economic and Employment Development, produced $128.3 million US in business revenue and more than $5 million US in city and state taxes.[213]

The New Orleans' Aquarium of the Americas is the latest success story, and that development has only begun. By 1995, "phase II" of the aquarium will have opened, estimated cost $20 million US. As part of its ambitious "Riverfront 2000", New Orleans will have one of the most developed riverfronts in the world. Besides the centrepiece aquarium and a convention centre and public park, there are plans for a species survival

centre ($10 million US), a plant conservatory ($10 million US), a natural history museum ($40 million US), and a new zoo ($17 million US). These projects, to be completed within the next decade, are expected to produce a total economic impact of $842.2 million US annually, mostly from an expected 1,134,000 new visitors to the city each year.[214]

As part of their justification, the New Orleans project and some of the other new parks are starting out with better education programmes than some existing parks. Yet only time will measure the depth of their commitment to education, science and captive breeding. One problem continues to be that space is still at a premium for city aquariums and parks. Pool design and the overall architecture has sometimes been clearly unsuitable for the animals. In the rush to have trained cetaceans on hand for the opening of the National Aquarium in Baltimore in 1981, dolphins were kept in highly stressful conditions – loud pumping sounds, people, lights, and other factors. After a few months, they had to be sent away to recuperate from ulcers.[215]

Future for orcas in new marine parks

The cost of buying, transporting and keeping orcas is high compared to fish and smaller marine mammals. Facilities with orcas are *forced* to keep the turnstiles moving and to pay for costlier facilities and veterinary care. The wisdom of a non-profit society or corporation taking on such a large overhead might be questionable. The costs of keeping orcas allows the Vancouver Aquarium far less to spend on education and science than it otherwise might. But how many visitors would go to the aquarium without the whales? It might be a much smaller institution. That is not necessarily bad, of course, but these questions should merit serious discussion at board meetings, as well as in the public forum. In the past, these questions have been largely ignored. In early 1992, however, the Vancouver Public Aquarium decided to conducted a policy review regarding the keeping of whales in captivity and solicited public input. The decision was to be announced in a few months.

In a 1988 letter to a prospective client in Israel, marine mammal veterinarian David C. Taylor wrote that orca prices can vary from $150,000 to $275,000 US for an untrained animal. Prices do, however, sometimes go higher. To obtain prime orcas for its breeding programme, Sea World has paid up to $1 million US for a single orca, according to inside reports. Bottlenose dolphins, of course, are much cheaper – $10,000 to $20,000 US for an untrained dolphin – with trained, healthy dolphins going for up to $40,000 US, although supply and demand sometimes pushes the price higher. Some former dolphin-catching grounds in US waters are now off limits and regulations make it tougher to obtain US catching permits. Many bottlenose dolphins are breeding in captivity, but strong demand for them continues because of the new parks and exhibiting plans of hotels and shopping malls. Helping to satisfy the world demand are Cuba and Mexico, as well as Japan.[216]

Will the number of orcas in marine parks increase over the next few years? Censuses taken over the past ten years reveal 33 orcas in 17 world-wide parks in 1980, 34 orcas in 20 parks in 1983, and 47 orcas in 17 parks in 1990. The number of parks has stayed about the same, some ending orca display programmes and an equal number taking their place between 1980 and 1990. But the number of orcas in captivity has risen, from 33 to 47. Part of the reason is the six captive births since 1985 at Sea World. But there are two additional factors: the continued import of orcas into Canada, Japan, France and a number of developing countries from Iceland; and Sea World's successful efforts to obtain, through purchase or breeding loan, orcas from various parks outside the USA. The latter trend seems set to continue through the early 1990s, with Sea World offers to buy orcas at two parks in Canada. However, limiting the number of orcas that will come into captivity in general are the present US import regulations, the cost of

buying and maintaining the species, and the reliability of Iceland as a source for orcas. For 1990 and 1991, the Icelandic Minister of Fisheries has refused orca capture permits. As protests to the Icelandic government have mounted in recent years, the future for orca captures – even to obtain new orcas to replace those that die in captivity – remains uncertain.[217]

Problem of smaller marine parks

Besides the more established US and Canadian marine parks, there have been smaller, marginal parks in Brazil, Mexico, Agrentina, Japan, Spain, as well as in the US and Canada, that have exhibited orcas. These places have tended to operate on much lower budgets than the better US or Canadian parks. Their facilities are comparatively poorly equipped and staffed, and some operate outside laws demanding educational and scientific programmes. The orcas are often obtained at cut rates. In the past, this has happened when Icelandic captors have caught orcas but the main buyers–US, Canadian, Japanese or others–are not in the market or, in the case of the US, find import regulations difficult. In Argentina, two orcas have been obtained as strandings. In Japan, fishermen sometimes drive orcas ashore and sell them alive to a marine park for a few thousand dollars more than they could fetch as meat. The result is that smaller parks sometimes will buy and keep orcas for a limited time–until the whales die or are sold to a better park. In recent years, US parks have had trouble importing orcas from the Icelandic captors, but have managed to obtain a few "bargain" orcas from smaller parks in Brazil, Japan, Canada, and other countries.

The smaller marine parks will probably continue to be a factor in worldwide orca trade. Marine park owners and curators are reluctant to criticize these marginal parks, or to help to improve or close them down. In fact, it seems to be in the interest of Sea World and other parks to keep them open as additional sources of orcas.

Alternative aquariums and marine parks: new approaches

The new wave of marine parks and aquariums are trying new approaches. The Monterey Bay Aquarium, south of San Francisco along the California coast, has been one of the first signs of change. Here is a high profile institution – costing $55 million US and drawing some two million visitors a year – that consciously decided not to include cetaceans in its plans. Instead, beautiful life-size models of offshore California whales and dolphins seem to fly through corridors and there are interpretive graphics on the walls. The centre-piece is the 28-foot high "Kelp Forest" tank (8.5 m high, equivalent to three storeys) holding about 335,000 gallons (1,244 cu m) of ocean-more voluminous than some dolphin pools-in which are found fish and invertebrates. These, and the sea otters in a separte pool, plus an aviary with typical shore birds are all living animals. Notably, there are no performing seals, dolphins or whales.

Another important departure is the local rather than the "exotic species" approach. The Monterey Bay Aquarium displays the complex marine life and ecology of its own backyard – Monterey Bay. The aquarium functions also as a gateway to exploring further the marine life of Monterey Bay and the offshore Pacific. There are frequent whale-watching tours, and seals and sea lions can be viewed from shore nearby or at sea – in the wild.[218]

The showing of animals in simulated habitats has become a more important part of the displays at newly designed aquariums in, for example, New Orleans, Baltimore, Vancouver, and Corpus Christi, Texas. Most of the "habitats" are fish and invertebrate displays. Even Sea World is doing this to some extent, though not with their whale pools: Shamu Stadium is *not* a simulated whale habitat!

It is possible to learn something about the underwater ecology, how that world works, by watching these "habitat" displays. But can large cetaceans such as orcas be exhibited this way? Is the Vancouver Aquarium a fair representation of orca habitat in the wild? Will the new marine parks, none of which have orcas, be tempted to expand and put in an orca pool? If they do, will they offer shows like Sea World – or go for the low-key, more educational approach of the Vancouver Aquarium? There may be another option, however: to offer insight into the lives of whales using new technologies.

Capt. Jacques Cousteau, who helped invent the aqualung which gave humans leisurely access to the undersea world, has been pioneering once again. In Paris, in July 1989, the Cousteau Society opened Parc Oceanique Cousteau, the first waterless aquarium.

"We are totally against marine mammals in captivity," says Jean-Michel Cousteau, Jacques Cousteau's son. The Cousteaus spent some three decades managing the Oceanographic Institute in Monaco, complete with dolphins, which at the time the Cousteaus felt were necessary to make the place more successful. However, after getting to know the dolphins and watching some of them die in captivity, including one they concluded was a suicide, they changed their minds. They are not opposed to keeping cold-blooded animals such as fish, if well cared for.[219]

But the new Parc Oceanique Cousteau has no fish either – in fact, no animals at all. Instead, there is a model of a 100-foot-long (30.5-m) pregnant blue whale, mouth open, providing a Jonah-like walking tour through the "whale." It's a stunning audio-visual exploration. The great blue whale heart, as big as a sports car, throbs with life. The realistic view of a whale fetus gives a new insight into whales and a gut-level appreciation of the size of the largest animal that ever lived. Also at the park are numerous hands-on, interactive exhibits. A 70 mm cinema draws on Cousteau's underwater expertise and vast library of stunning film footage to bring the viewer face to face with the creatures of the deep, as well as right into the middle of a breathing, diving pod of whales.

"Many visitors expect because it's Cousteau that they'll see live animals," says a Cousteau Society spokesman. "And some are disappointed. However, that's part of the message – the Cousteau philosophy."

Last year, Parc Oceanique had 500,000 visitors – fewer than the projected 800,000 or more, but Parc Oceanique is new, cost only $4 million US, and was built on donated property. The Paris-based Fondation Cousteau, which exercises "quality control" over the operation and owns 10 percent, is a non-profit society. But there are business partners in the park who want a return on their money and, with visitor traffic down, the park has had financial difficulties. Plans for larger Parc Oceanique projects for Asbury Park, New Jersey, as well as southern California and Tokyo – all with audience projections of more than a million visitors per year – are still on the drawing boards. It remains to be seen if the Cousteau vision will find widespread support from the public. Some say it may be too far ahead of its time.

Marine parks that exhibit orcas and other cetaceans claim there is no substitute for close-up contact with the live animal. It is a powerful argument which many who have seen the animals in captivity acknowledge, even if they do not believe orcas should be there. Still, as one environmentalist mused, there's no substitute for seeing the Grand Canyon close up either, yet we don't need to bring it into a museum. You've got to go out and see it, or look at film or pictures or read about it. That's just the way it's done.

But something called "virtual reality" might help. A new technique that could revolutionize mass entertainment *and* education, it would allow someone to experience the Grand Canyon as well as orcas – up close and in a participatory way. The "viewer" puts on a mask or helmet with computerized pictures and sound inside. Using hand controls, the person can move through a fantastic or realistic simulated world. Because there is no outside visual reference, the simulation is total – virtual reality.[220]

Virtual reality is already being used in games, but it will be a few years before we know if it, perhaps combined with the Cousteau approach, will succeed in replacing exhibits of live cetaceans. Who would want to see captive orcas performing when you could journey with them underwater in the wild?

In the meantime, Paul Spong thinks that marine parks right now could provide a powerful connection to the natural world by using audio and video links with satellites to "tune us into the natural world *live*. Soon," he adds, "I believe that theme parks and museums will highlight 'shows' that are fantastic relays from nature that bring us right into the real world. They will deepen our understanding and appreciation of the natural world. And they will leave it untouched."[221]

15. Conclusions and Recommendations

I believe the days of exhibiting orcas at marine parks and aquariums are – and should be – numbered. The contribution of marine parks and aquariums in acquainting the public with orcas and other marine life is laudable. Yet the 25-year-old practice of keeping this species has paid little more than lip service to conservation through captive breeding and scientific research, and it has actually detracted from any educational experience at marine parks because of the way in which orcas are displayed. As well, there is the cost to individual orcas – both those capture and those remaining in the wild – which are separated from each other, these very social, life-long groups. The captives are then put in odd assemblages in relatively cramped conditions with most of their "problems" neatly solved or eliminated. In a marine park pool, the top predator of the sea – unable to use its speed, strength, and intelligence to hunt – becomes a travesty of evolution. Weighing all the arguments, I must conclude that orcas, in particular, are inappropriate and unsuitable animals for captive display. I realize that the transition to marine parks without captive orcas cannot happen overnight, but in an effort to further matters, I submit the following recommendations:

1. No new orcas should be captured and brought into captivity.

2. The trading in captive orcas must end. Countries such as United States, where most orcas have been exhibited, should take the lead in refusing all imports. This includes imports from Canada – a country whose marine mammal management programme is inconsistent with the purposes and policies of the US Marine Mammal Protection Act.

3. Wherever possible, captive orcas, captured from known pods, should be rehabilitated and returned to the wild. This is probably only an option for a few whales. Much more needs to be learned about the Icelandic orca pods.

For the orcas that remain in captivity, including those captive born now and in the future, I recommend that:

1. The orcas' welfare must be paramount.

2. There should be more investment in science and co-operation with outside scientists, universities and government research institutions.

3. There must be a re-examination of trainer safety because of the now known potential risk in working with orcas – based on the many "accidents" and the death of the trainer at Sealand.

4. More and better educational programmes should be developed at marine parks with more focus on conservation and behaviour in the wild. Research is needed to determine better ways to educate the public.

5. The circus-type tricks should be phased out in favour of an educational approach.

6. There should be research and re-design of facilities to create larger, more stimulating yet naturalistic exhibits.

7. There needs to be serious debate about the future of captive breeding for this species – even if the main goal of the programme is simply to produce more Shamus. As Sea World's breeding programme moves into the mid-1990s, overcrowding of facilities could become a severe problem. At the same time, there has been a shortage of males at all the Sea World parks. In 1991, there was only one male left, but another has since been acquired. This is not a healthy situation in terms of the gene pool. Sea World's mating of Atlantic and Pacific orcas has made the situation even more problematic.

8. Studies should be made of alternatives to keeping orcas captive – such as live-action relays, life-size walk-through models, large-format and high-resolution films, and "virtual reality" productions. New and proposed aquariums and marine parks could look at options to displaying large cetaceans, following the example of the Monterey Bay Aquarium and Parc Oceanique Cousteau in Paris. Freed from the expense and complication of keeping orcas and other large cetaceans, such institutions could explore new and exciting ways of feeding the public's fascination with whales and dolphins.

APPENDICES

Appendix 1: Live Orca Captures[1]

date	place	individuals captured	died	kept	let go	no. of captures
California (USA)						
1961	Marineland (California, USA)	1	0	1	0	1
Washington (USA)						
1962	Marineland (CA, USA)	1	1	0	0	1
1964-73	Seattle Aquar. (WA, USA)	216-248	9	31	176-208	13
1976	Sea World, Inc. (USA)	6	0	0	6	1
British Columbia (Canada)						
1964	Vancouver Aquar. (BC)	1	0	1	0	1
1965	fishermen (Namu, BC)	2	0	1	1	1
1966	fishermen (Steveston, BC)	1	1	0	0	1
1967	fishermen (Port Hardy, BC)	1	0	1	0	1
1968	fishermen (Malcolm Island, BC)	11	0	1	10	1
1968-69	fishermen (Pender Harbour, BC)	20	0	12	8	3
1970-77	Sealand (Victoria, BC)	16	0	9	7	5
Japan						
1972	fishermen (Abashiri, Japan)	1	0	1	0	1
1978-86	Taiji fishermen (Japan)	16	0	12	4	6
Argentina						
1985	Mundo Marino (Argentina)	1	0	1	0	1
1988	Mundo Marino (Argentina)	1	0	1	0	1
Iceland						
1974	fishermen (Iceland)	1	0	0	1	1
1976	Marineland (France)	1	0	1	0	1
1976	Sædyrasafnid (Iceland)/ Dolfinarium Harderwijk (Holland)	3	0	0	3	2
1976-77	Sædyrasafnid (Iceland)/ Dolfinarium Harderwijk (Holland)/ Sea World, Inc. (USA)	8	0	8	0	4
1978	Sea World, Inc. (USA)/ Saedyrasafnid (Iceland)	6	0	6	0	4
1978	Anna h.f. (Iceland)	1	0	1	0	1
1978-89	Sædyrasafnid/ Fauna Co. (Iceland)	44	0	39	5	26

Totals	individuals captured	died	kept	let go	no. of captures
California (USA)	1	0	1	0	1
Washington (USA)	223-255	10	31	182-214	15
British Columbia (Canada)	52	1	25	26	13
Japan	17	0	13	4	7
Argentina	2	0	2	0	2
Iceland	64	0	55	9	39
World Total	**359-391**	**11**	**127**	**221-253**	**77**

1 Sources: as listed in Hoyt, E. 1990. *Orca: The Whale Called Killer*. Third Edition, Robert Hale, London, p 235.

Appendix 2: Marine Park Profiles

Seventeen marine parks around the world are currently exhibiting orcas. Most of the information below comes from various directories, NMFS permit applications, and the marine park itself. In a few cases there was no response from a marine park and very little printed information available; in such cases, the pool sizes were estimated by eyewitness observers. Orca numbers and other background information are from Hoyt, E. 1990. *Orca: The Whale Called Killer*. Figures for pool sizes are given in feet (with metres in parentheses) and US gallons (with cubic metres in parentheses). One US gallon equals 0.83 Imperial gallons or 3.785 litres. Abbreviations are used for the following: AAZPA (American Association of Zoological Parks and Aquariums), IAAPA (International Association of Amusement Parks and Attractions), CAZPA (Canadian Association of Zoological Parks and Aquariums), and Funparks (Funparks Directory: 1990 International Guide to Tourist Attractions, Themed Parks and Fun Parks).

Name of Marine Park	**1. Ocean Park** Aberdeen, Hong Kong	**2. Kamogawa Sea World** Chiba-Prefecture, Japan
Ownership	Nonprofit trust	Private company
Prof. Memberships & Directories	IAAPA, Funparks	None
Annual Attendance	2.06 million	1.07 million
Annual Budget	-	-
1st yr. orcas displayed 1979	1970	
No. of orcas held since	2	11
No. of orcas held 2/92	**1**	**4**
Size of main pool		
-length & width	-	-
-depth	20.7 ft (6.3 m)	21.3 ft (6.5 m)
-volume	1,000,000 gal (3,712 cu m)	924,703 gal (3,432 cu m)
Additional pools	1 holding pool 15 ft deep (4.5 m) and 99,450 gals (369 cu m)	1 holding pool 15 ft deep (4.5 m) and 343,461 gals (1,275 cu m)
Water system	-	Closed; manuf. sea water
Other dolphins in pool?	False killer whale, Pacific white-sided and bottlenose dolphins	Never
Performances	Stunts; riding orca	Stunts; riding orcas

Name of Marine Park	**3. Taiji Whale Museum** Wakayama-Pref., Japan	**4. Adventure World** Shirahama, Wakayama-Pref., Japan
Ownership	-	Private Company
Prof. Memberships & Directories	None	IAAPA
Annual Attendance	-	930,000
Annual Budget	-	-
1st yr. orcas displayed 1979	1978	
No. of orcas held since	6	9
No. of orcas held 2/92	**1**	**4**
Size of main pool		
-length & width	394 x 164 ft (120 m x 50 m) -	
-depth	6.6 to 19.7 ft (2 to 6 m)	23 ft (7 m)
-volume	6,465,000 gal (24,000 cu m)	942,865 gal (3,500 cu m)
Additional pools	Holding and show pools for dolphins	2 holding pools for orcas: 323,268 gal (1,200 cu m); 237,871 gal (883 cu m)
Water system	Open to the sea; cove with concrete walls	-
Other dolphins in pool?	Sometimes	No
Performances	Do not ride orcas	Stunts; riding orcas

Name of Marine Park	**5. Reino Aventura** Ayusco Highway México, DF, México	**6. Acuario Mundo Marino** San Clemente del Tuyu Buenos Aires, Argentina
Ownership	Private	-
Prof. Memberships & Directories	None	None
Annual Attendance	-	-
Annual Budget	-	-
1st yr. orcas displayed 1985	1985	
No. of orcas held since	1	2
No. of orcas held 2/92	**1**	**1**
Size of main pool		
-length & width	85 x 43 ft (26 x 13 m)	108 x 49 ft (33 x 15 m)
-depth	18 ft (5.5 m)	20 ft (6 m)
-volume	510,000 gal (1,900 cu m)	449,100 gal (1,667 cu m)
Additional pools	1 holding pool	2 holding pools: 140,000 gal (520 cu m) and 118,900 gal (441 cu m)
Water system	Closed; manuf. sea water	
Other dolphins in pool?	None; orca kept alone	Sometimes bottlenose dolphins
Performances	Stunts; riding orca	Stunts; riding orca

Name of Marine Park	**7. Zoo Barcelona** Parc Zoológic de Barcelona Parc de la Ciutadella 08003 Barcelona, Spain	**8.Marine World Africa USA** Marine World Parkway Vallejo, California 94589 USA
Ownership	-	Marine World Foundation (nonprofit) managed by Demetrios, Inc.
Prof. Memberships & Directories	None	AAZPA, Funparks
Annual Attendance	-	1,410,000
Annual Budget	-	$28,000,000 US
1st yr. orcas displayed	1983	1968
No. of orcas held since	1	5
No. of orcas held 2/92	**1**	**2**
Size of main pool		
-length & width	-	130 x 65 ft (39.6 x 19.8 m)
-depth	20 ft (6 m)	28 ft (8.5 m)
-volume	538,780 gal (2,000 cu m)	1,000,000 gal (3,712 cu m)
Additional pools	None.	2 holding pools: 200,000 gal (742 cu m) and 1 training pool 250,000 gal (928 cu m) Total pool system: 1,650,000 gal (6125 cu m)
Water system	-	Closed; manuf. sea water
Other dolphins in pool?	1-2 bottlenose dolphins	Bottlenose dolphins
Performances	Stunts; riding orca	Stunts; riding orcas

Name of Marine Park	**9. Sea World of Calif.** 1720 South Shores Road San Diego, CA 92109 USA	**10. Sea World of Florida** 7007 Sea World Drive Orlando, FL 32821 USA
Ownership	Busch Entertainment Corp.	Busch Entertainment Corp.
Prof. Memberships & Directories	AAZPA, IAAPA, Funparks	AAZPA, IAAPA, Funparks
Annual Attendance	3,500,000	4,000,000
Annual Budget	-	-
1st yr. orcas displayed	1965	1973
No. of orcas held since	36+ [2]	See Sea World of California
No. of orcas held 2/92	**3**	**5**
	13 total at all Sea World parks	
Size of main pools		
Pool 1		
-depth	35 ft (10.7 m)	34 ft (10.4 m)
-volume	2,491,400 gal (9,248 cu m)	2,692,800 gal (9,996 cu m)
Pool 2		
-depth	15 ft (4.6 m)	15 ft (4.6 m)
-volume	1,058,500 gal (3,929 cu m)	436,682 gal (1,621 cu m)
Pool 3		
-depth	15 ft (4.6 m)	15 ft (4.6 m)
-volume	1,058,500 gal (3,929 cu m)	436,682 gal (1,621 cu m)
Pool 4		
-depth		15 ft (4.6 m)
-volume		706,860 gal (2,624 cu m)
Total volume	4,608,400 gal (17,106 cu m)	4,273,024 gal (15,861 cu m)
Additional pools		
Medical pools	1	2
-depth	8 ft (2.4 m)	12 ft (3.7 m)
-volume	67,600 gal (251 cu m)	98,511 (366 cu m)
Water system	Manuf. sea water	Manuf. sea water
Other dolphins in pool?	Sometimes	Sometimes
Performances	Stunts; riding orcas	Stunts; riding orcas

2 Figures here are for all Sea World parks because the animals are transported back and forth between the four main parks due to seasonal conditions, breeding concerns and compatability problems with the animals.

Name of Marine Park	**11. Sea World of Ohio** 1100 Sea World Drive Aurora, OH 44202 USA	**12. Sea World of Texas** 10500 Sea World Drive San Antonio, TX 78251 USA
Ownership	Busch Entertainment Corp.	Busch Entertainment Corp.
Prof. Memberships & Directories	AAZPA, IAAPA, Funparks	AAZPA, IAAPA, Funparks
Annual Attendance	1,300,000	2,500,000
Annual Budget	-	-
1st yr. orcas displayed	1970	1988
No. of orcas held since	See Sea World of California	See Sea World of California
No. of orcas held 2/92	**2**	**3**
Size of main pools		
Pool 1		
-depth	26 ft (7.9 m)	34 ft (10.4 m)
-volume	511,105 gal (1,897 cu m)	2,110,000 gal (7,832 cu m)
Pool 2		
-depth	15 ft (4.6 m)	16.75 ft (5.1 m)
-volume	327,943 gal (1,217 cu m)	998,000 gal (3,705 cu m)
Pool 3		
-depth		16.75 ft (5.1 m)
-volume		998,000 gal (3,705 cu m)
Total volume	839,048 gal (3,115 cu m)	4,106,000 gal (15,241 cu m)
Additional pools		
Medical pools	2	1
-depth	8 ft (2.4 m) & 9 ft (2.7 m)	10 ft (3.0 m)
-volume	81,049 gal (301 cu m) 66,250 gal (246 cu m)	60,000 (223 cu m)
Water system	Manuf. sea-water; closed	Manuf. sea-water; closed
Other dolphins in pool?	Sometimes	Sometimes
Performances	Stunts; riding orcas	Stunts; riding orcas

Name of Marine Park	**13. Miami Seaquarium** 4400 Rickenbacker Cwy. Miami, FL 33149 USA	**14. Vancouver Aquarium** P.O. Box 3232 Vancouver, BC V6B 3X8 Canada
Ownership	Marine Exhibition Corp.	Non-profit society
Prof. Memberships & Directories	IAAPA, Funparks	AAZPA, CAZPA
Annual Attendance	-	954,856
Annual Budget	-	$4,400,000
1st yr. orcas displayed	1968	1964
No. of orcas held since	2	11
No. of orcas held 2/92	**1**	**2**
Size of main pool		
-length & width	80 x 73 ft oval (24 x 22 m)	odd-shaped: total surface area 7,700 sq ft (715 sq m)
-depth	12-20 ft (3.7-6 m)	a few inches to 21 ft (6.7 m)
-volume	-	1,000,000 gal (3,712 cu m)
Additional pools	Main pod divided in 2	Main pool can be subdivided
Water system	Untreated seawater; open circuit	Treated seawater.
Other dolphins in pool?	Pacific white-sided dolphins	1 Pacific white-sided dolphin
Performances	Stunts; riding orca	No shows; no one in water

Name of Marine Park	**15. Marineland of Canada, Inc.**	**16. Sealand of the Pacific**
	7657 Portage Road Niagara Falls, Ont L2E 6X8 Canada	1327 Beach Drive Victoria, BC V8S 2N4 Canada
Ownership	Private company owned by John Holer	Private company owned by Bob Wright
Prof. Memberships & Directories	Funparks	Funparks
Annual Attendance	-	-
Annual Budget	-	-
1st yr. orcas displayed	1972?	1968
No. of orcas held since	13	11
No. of orcas held 2/92	**5**	**4**
Size of main pool		
-length & width	75 x 25 ft (22.9 x 7.6 m)	100 x 65 ft (30.5 x 19.8 m)
-depth	up to 22 ft (6.7 m)	up to 35 ft (10.7 m)
-volume	1,000,000 gal (3,712 cu m)	1,700,000 gal (6,442 cu m)
Additional pools	2 holding pools: 25 ft (7.6 m) diam x 12 ft (3.7 m) deep plus indoor training pools	Holding pool called "module": 26 ft (8 m) diam x 20 ft (6 m) deep
Water system	Manuf. sea-water; closed	Open to sea; untreated natural sea water
Other dolphins in pool?	Sometimes	No
Performances	Stunts; riding orcas	No in-water work with whales

Name of Marine Park	**17. Marineland Côte D'Azur** 306, avenue Mozart Antibes, 06600, France
Ownership	Roland de la Poype (Private company)
Prof. Memberships & Directories	IAAPA
Annual Attendance	750,001-1 million
Annual Budget	-
1st yr. orcas displayed	1970
No. of orcas held since	7
No. of orcas held 2/92	**4**
Size of main pool	
-length & width	oval about 230 x 115 ft (about 70 x 35 m)
-depth	up to 32.8 ft (10 m)
-volume	-
Additional pools	2 holding pools (about 20 m in diam)
Water system	Open: filtered, treated natural sea water
Other dolphins in pool?	No
Performances	No riding on orcas

Appendix 3: Marine Parks that Formerly Displayed Orcas

Twenty-one marine parks around the world tried exhibiting orcas for a time but are no longer doing so. Some have closed or have been bought out. Most will almost certainly never exhibit orcas again. In 12 of 21 cases, one orca was kept alone; many had facilities that were simply too small to keep a pair of orcas. For most of the facilities below, orcas just became too expensive to buy and keep in conditions where they might survive for more than a year or two.

Name of Marine Park	**1. Marineland of Australia** Gold Coast, Queensland Australia	**2. Acuarama** Play Center Amusement Ride & Game Park São Paulo, Brazil
Years orcas displayed	1969-71	1986?-1989
No. of orcas held	2	2
Name of Marine Park	**3. Clacton Pier Leisure Park** Clacton-on-Sea, Essex, UK	**4. Cleethorpes Zoo and** Cleethorpes, South Humberside, UK
Years orcas displayed	1981-1983	1970
No. of orcas held	3	1 Closed 1978
Name of Marine Park	**5. Dudley Zoo** Dudley, Worcester, UK	**6. Flamingo Land** Malton, Yorkshire, UK
Years orcas displayed	1971-74	1968-71
No. of orcas held	1	1
Name of Marine Park	**7. Enoshima Marineland** Kanagawa-Prefecture Japan	**8. Izu-Mito Sea Paradise** Shizuoka-Prefecture Japan
Years orcas displayed	1982-84	1986-87
No. of orcas held	2	1
Name of Marine Park	**9. Aquarama on Parade** Isla Mujeres, Q.R., Mexico	**10. Dolfinarium Harderwijk** Harderwijk, Netherlands
Years orcas displayed	1982-83	1968; 1976-87
No. of orcas held	1 Travelling circus	3
Name of Marine Park	**11. Rioléon Safari** El Vendrell, Spain	**12. Connyland** Lipperswil, Switzerland
Years orcas displayed	1980-83	1980-82
No. of orcas held	1	1
Name of Marine Park	**13. Seven Seas (J & L)** Arlington, Texas, USA	**14. Japanese Deer Park** Los Angeles, California, USA
Years orcas displayed	1971-72	1970-71
No. of orcas held	1	1
Name of Marine Park	**15. Marineland of the Pacific** Rancho Palos Verdes, California, USA	**16. New York Aquarium** Brooklyn, New York, USA
Years orcas displayed	1961; 1967-1987	1968
No. of orcas held	11 Purchased by Sea World & closed 1987	1

Name of Marine Park	**17. Sea-Arama Marineworld** Galveston, Texas, USA	**18. Seattle Marine Aquarium** Seattle, Washington, USA
Years orcas displayed	1968-74	1965-77
No. of orcas held	2	12+ (many orcas were kept here for a short time only before being shipped to Sea World and other parks) Purchased by Sea World & closed 1977

Name of Marine Park	**19. Florida Delphin Show** Munich, Germany	**20. Hagenbecks Tierpark** Hamburg, Germany
Years orcas displayed	1970-80	1981-85
No. of orcas held	3	1

rine Park	**21. Windsor Safari Park** Windsor, Berkshire, UK
Years orcas displayed	1970-91
No. of orcas held	4

Two additional places have kept orcas, although not for display:

Name of Marine Park	**21. Naval Ocean Systems Center** Kailua, Oahu, Hawaii, USA	**22. Sædyrasafnid** Hafnarfjordur, Iceland
Years orcas kept	1968-74	1979-89
No. of orcas held	2	Numerous, while awaiting shipment to world marine parks

Appendix 4. Orca Pregnancies and Births in Captivity[3]

Baby's name	Sex	Mother/Father	Conceived in?	Birth date,	Status &	Cause of Death
Marine World Africa USA (California)						
1. No name	?	Bonnie/?	Wild	8/68	Stillborn	
2. No name	?	Kianu/?	Wild	9?/68	Stillborn	
Marineland of the Pacific (California)						
3. No name	M	Corky/Orky	Captivity	2/28/77	Died 2 wks.	Brain damage
4. No name	M	Corky/Orky	Captivity	10/31/78	Died 11 days	
5. No name	?	Corky/Orky	Captivity	4/1/80	Stillborn	
6. Kiva	F	Corky/Orky	Captivity	6/18/82	Died 46 days	Colic, respiratory failure; failure to nurse
7. No name	F	Corky/Orky	Captivity	7/22/85	Died 4 wks.	Failure to nurse
8. No name	?	Corky/Orky	Captivity	Miscarriage 7/27/86		
Adventure World (Shirahama, Japan)						
9. No name	?	No name/?	Wild	3/79	Stillborn	
Enoshima Marineland (Japan)						
10. No name	M	Sacchi/?	Wild	5/82	Died 10 days	
Sea World						
in Florida:						
11. Kalina	F	Katina/Winston	Captivity	9/26/85	Alive 2/92	
in California:						
12. No name	?	KanduV/Winston	Captivity	?/86	Stillborn	
13. No name	?	Kenau/Winston	Captivity	1/86	Died 11 days	Heart defect
in Florida:						
14. No name	?	Kona II/?	Captivity	Fetus found at mother's death 10/87		
in California:						
15. Orkid	F	KanduV/Orky	Captivity	9/23/88	Alive 2/92	
in Florida:						
16. Katarina	F	Katina/Kanduke	Captivity	11/4/88	Alive 2/92	
in Texas:						
17. Kayla	F	Kenau/Orky	Captivity	11/26/88	Alive 2/92	
in Florida:						
18. Taima	F	Gudrun/Kanduke	Captivity	7/11/89	Alive 2/92	
in Texas:						
19. No name	?	Kahana/Kotar	Captivity	Miscarriage of 7 month fetus on 11/6/90		
in California:						
20. Takara	F	Kasatka/Kotar	Captivity	7/9/91	Alive 2/92	
in Florida:						
21. No name	M	Kenau/Kotar	Captivity	12-month fetus found at mother's death on 8/6/91		
Marineland of Canada, Inc. (Niagara Falls, Ontario)						
22. Splash	M	Nootka V/Kandu	Captivity	8/15/89	Alive 2/92	
Marineland (France)						
23. No name	?	Freya/?	Captivity	3/3/91	Stillborn	
Vancouver Public Aquarium (Vancouver, BC, Canada)						
24. No name	F	Bjossa/Hyak	Captivity	11/13/88	Died 22 days	Malnutrition
25. K'yosha	F	Bjossa/?	Captivity	9/30/91	Died 96 days	Fungal infection
Sealand of the Pacific (Victoria, BC, Canada)						
26. No name	M	Haida/Tillikum	Captivity	12/24/91	Alive 2/92	
27. No name	?	Nootka/Tillikum	Captivity	2/4/92	Alive 2/92	

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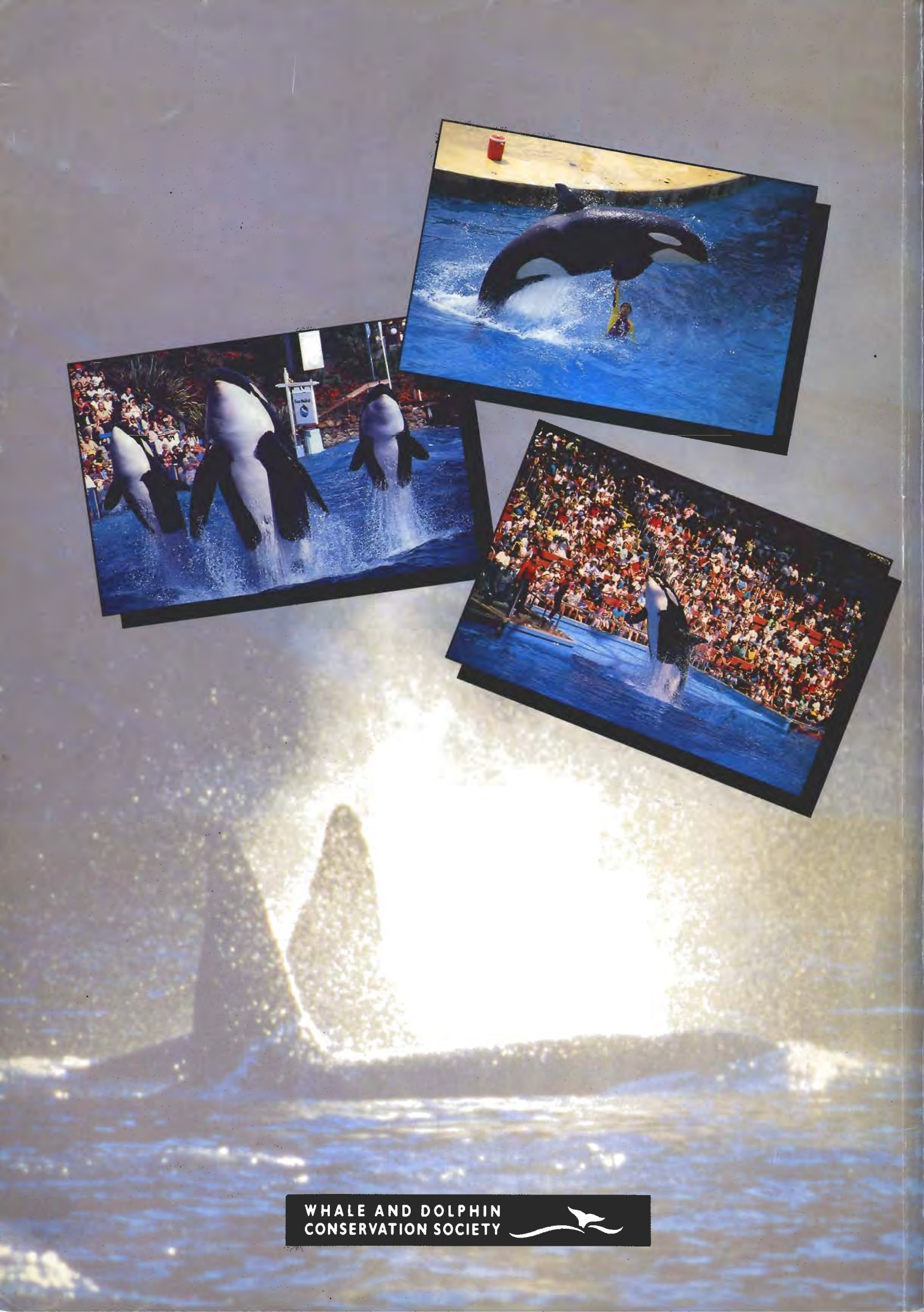

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