香港におけるイルカと開発：競合の一例

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DOLPHINS AND DEVELOPMENT IN HONG KONG: A CASE STUDY IN CONFLICT

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SUMMARY

Hong Kong is the most densely-populated and arguably the most aggressively-developing city in the world. Marine habitats in the territory are being swallowed up at an alarming and accelerating rate and pollution of the remainder runs rampant. The construction of the huge new airport at Chek Lap Kok, on reclaimed land off northern Lantau Island, is symbolic of the conflicts between development interests and concerns for environmental conservation. Those opposing development of the airport and related projects, have strived to focus discussion on Hong Kong's marine environment and have chosen the Indo-Pacific hump-backed dolphin, *Sousa chinensis* (known locally as the Chinese white dolphin), as a symbol of what is being lost. In fact, very little is known about this species in general, or about the "population" in Hong Kong in particular; so, the sometimes gratuitous debate has often been polarized by emotional claims lacking factual basis. This paper reviews what is known about dolphins in Hong Kong, discusses Hong Kong's current and long-term development strategy, and outlines what is known and what can only be speculated about conflicts between the two. It suggests some appropriate roles for science in such conflicts, and touches on the responsibilities of workers from the natural and social sciences. Finally, it discusses the importance of Hong Kong's success or failure in resolving this conflict as a model for conflicts between development interests and desires for

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INTRODUCTION

Until recently, almost nothing was known about the cetaceans of Hong Kong. In fact, until 1955 there were no authenticated records of any cetacean species in Hong Kong's waters. In that year, Romer (1955) published records of three species. Parsons *et al.* (1995) recently updated the species list to 15 species (3 balaenopterids, 1 physeterid, 1 phocoenid, and 10 delphinids), many of them known only from strandings. Until 1993, there was no dedicated research on any species of cetacean in Hong Kong. Many residents of Hong Kong still do not know that there are year-round "populations" of both Indo-Pacific hump-backed dolphins and finless porpoises, *Neophocaena phocaenoides*, in Hong Kong.

While finless porpoises still attract relatively little attention, hump-backed dolphins now figure prominently in local newspaper headlines several days a week. In recognition of the hump-backed dolphins' rising profile, the government of the People's Republic of China (PRC) has recently chosen this species to be the official symbol of the transition of Hong Kong from British to Chinese rule in July 1997.

There has been a tremendous explosion of local interest in hump-backed dolphins in just a few years, but there has not been a matching increase in the amount of factual information on the animals that occur in Hong Kong. As a result, debates involving conflicts that are perceived to affect the dolphins have often been based largely on misconceptions and emotional viewpoints. A rational, fact-based approach to management has been lacking. This paper describes the current situation with regard to dolphin conservation in Hong Kong, and attempts to suggest a direction for future informed management.

THE PLACE - HONG KONG

For the past 150 years, Hong Kong has been under the umbrella of the British crown. Under British control, Hong Kong has become a very rich state. It has one of the highest percentages of millionaires and billionaires in the world, and its businesses have connections throughout the international economic community. Hong Kong is currently a British Dependent Territory, but that will change soon. On 1 July 1997, Britain will hand Hong Kong back to China. Not surprisingly, then, many aspects of life in Hong Kong are currently in a state of flux and the next few years may well be instrumental in defining the future directions that Hong Kong takes in wildlife conservation, as in other matters.

The important business, industrial, and residential centers surrounding Victoria

Harbour distinguish Hong Kong as one of the most densely human-populated cities in the world. One by-product of the concentrated 6.2 million people who inhabit Hong Kong (Planning, Environment, and Lands Branch, 1995) is extensive pollution and environmental destruction. The Hong Kong government is committed to developing and maintaining Hong Kong as the major economic center and shipping port in southeast Asia. Population in the territory is projected to increase over the next few years, and the government has taken the view that, to obtain this goal, massive reclamation is the answer to the territory's land needs (see Planning, Environment and Lands Branch, 1995)

The territory of Hong Kong is situated along the south coast of China, adjacent to the PRC's Guangdong Province. It is at the eastern edge of the delta of the Pearl (Canton) River, a major estuary. Much of the colony's total area is composed of marine waters, which are now heavily used for shipping. Because of seasonal rainfall patterns and the influence of the Pearl River, the waters of Hong Kong (and especially those north of Lantau Island) undergo significant changes in salinity. The continental shelf in the vicinity of Hong Kong is broad, and the deepest waters within the territorial boundaries are only 20-25m deep.

Perhaps surprisingly, much of the 1,070km^2 of land that makes up Hong Kong is relatively undeveloped. So much of Hong Kong's human activity has been concentrated along the northern coast of Hong Kong lsland and the Kowloon Peninsula that large sections of the territory (especially steeper mountainous regions) have been left more-or-less intact, and much of this area is protected by Hong Kong's extensive country parks system. The territory is unofficially committed to developing much of the remaining undeveloped mainland and outlying islands, and "reclaiming" coastal waters, toward the end of creating southeast Asia's largest port facilities (Planning, Environment and Lands Branch, 1995).

THE ANIMALS - INDO-PACIFIC HUMP-BACKED DOLPHINS

Most taxonomists, in recent years, have recognized two species of hump-backed dolphins: *Sousa chinensis* (the Indo-Pacific hump-backed dolphin) and *Sousa teuszii* (the Atlantic hump-backed dolphin). However, the taxonomy of these animals has been controversial, with some biologists recognizing as many as five species (Ross *et al.*, 1994). Most recently, there appears to be a move towards the recognition of only one, highly-variable species, *S. chinensis* (Ross *et al.*, in prep.). However, resolution of *Sousa* taxonomy will likely be heavily influenced by results of molecular genetic studies and additional morphological analyses, currently underway (V.G. Cockcroft, pers. comm.)

Hump-backed dolphins reach maximum lengths of only about 2.8m (Ross *et al.*, 1994). They tend to be moderately stocky, and in some populations are highly sexually dimorphic. Hump-backed dolphins have a long beak, broad flippers, and a short, wide-based dorsal fin. In some regions, the dorsal fin sits on a longitudinal hump, from which the animal derives its common name. Coloration is highly variable, ranging from dark gray to white or pink. Spotting and mottling are present in many areas, and show considerable developmental and geographical variation (Fig. 1).

Indo-Pacific hump-backed dolphins occur from southern China and the northern coasts of Australia in the east, throughout the Indochina and Indo/Malay regions, westwards along the Indian Ocean coastline, all the way down to the southwest tip of Africa. Atlantic hump-backed dolphins are found along the coast of West Africa, from at least Morocco to Cameroon. Throughout their range, hump-backed dolphins occur primarily in shallow, nearshore waters, often with highest densities near river mouths (Ross *et al.*, 1994). However, they can occur far from shore where the water is shallow.

Although, the species is not endangered on a worldwide basis, hump-backed dolphin populations in many areas have undoubtedly declined as a result of heavy human development and use of their nearshore and estuarine habitat. The World Conservation Union (IUCN) lists the species as Insufficiently Known, and the Convention on International Trade in Endangered Species of Flora and Fauna (CITES) lists it in Appendix I, affording it the highest level of protection. In Hong Kong, all cetaceans are protected from exploitation by the Wild Animals Protection Ordinance.

Although mentioned earlier by travellers to the area (Carnac-Temple, 1919), it was Per (Peter) Osbeck (1765) who described the species, based on sightings in the Pearl River delta. A type specimen was not collected. From this time until relatively recently, no research was conducted on hump-backed dolphins in the Hong Kong area and most people living in the Territory did not even know of the presence of these dolphins in their waters. In 1973, the Hong Kong Agriculture and Fisheries Department (AFD) began collecting data on stranded cetaceans, and in 1989 the World Wide Fund for Nature Hong Kong developed a sighting network scheme. Hammond and Leatherwood (1984) mentioned that the species occurred in Hong Kong waters between June and October. But it wasn't until 1993 that directed research on the dolphins began. In that year, with government funding, two students at the Swire Institute of Marine Science (SWIMS) began their Ph.D. research on these dolphins. Their project aims to examine the distribution, abundance, ecology, behavior, population structure, and mortality patterns of hump-backed dolphins in Hong Kong (Parsons and Porter, 1995).

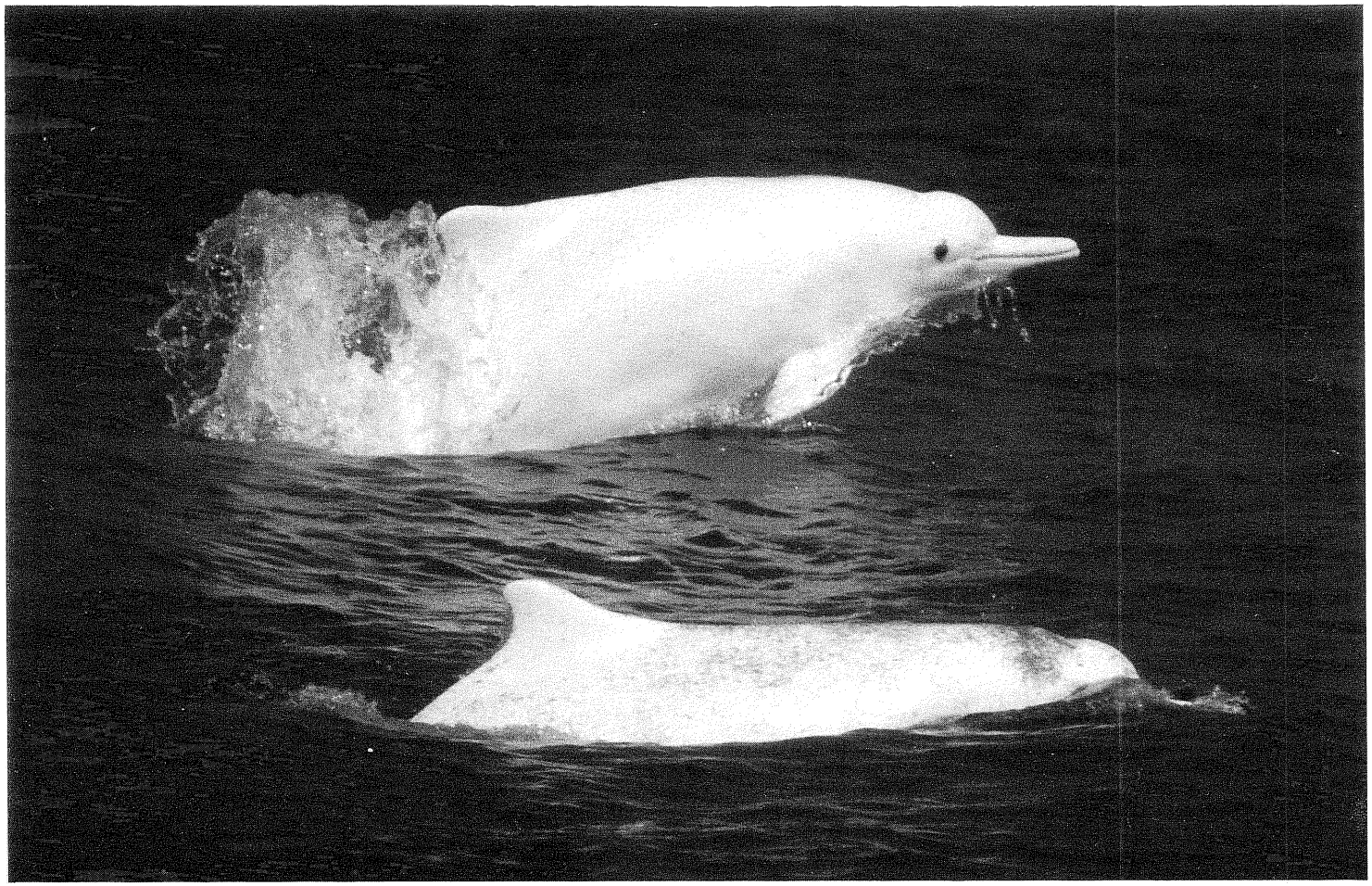

Fig. 1. Indo-Pacific hump-backed dolphins in Hong Kong, showing some of the variation in coloration in this area. The upper animal is an unspotted adult, and the lower animal is a large subadult, with more extensive spotting.

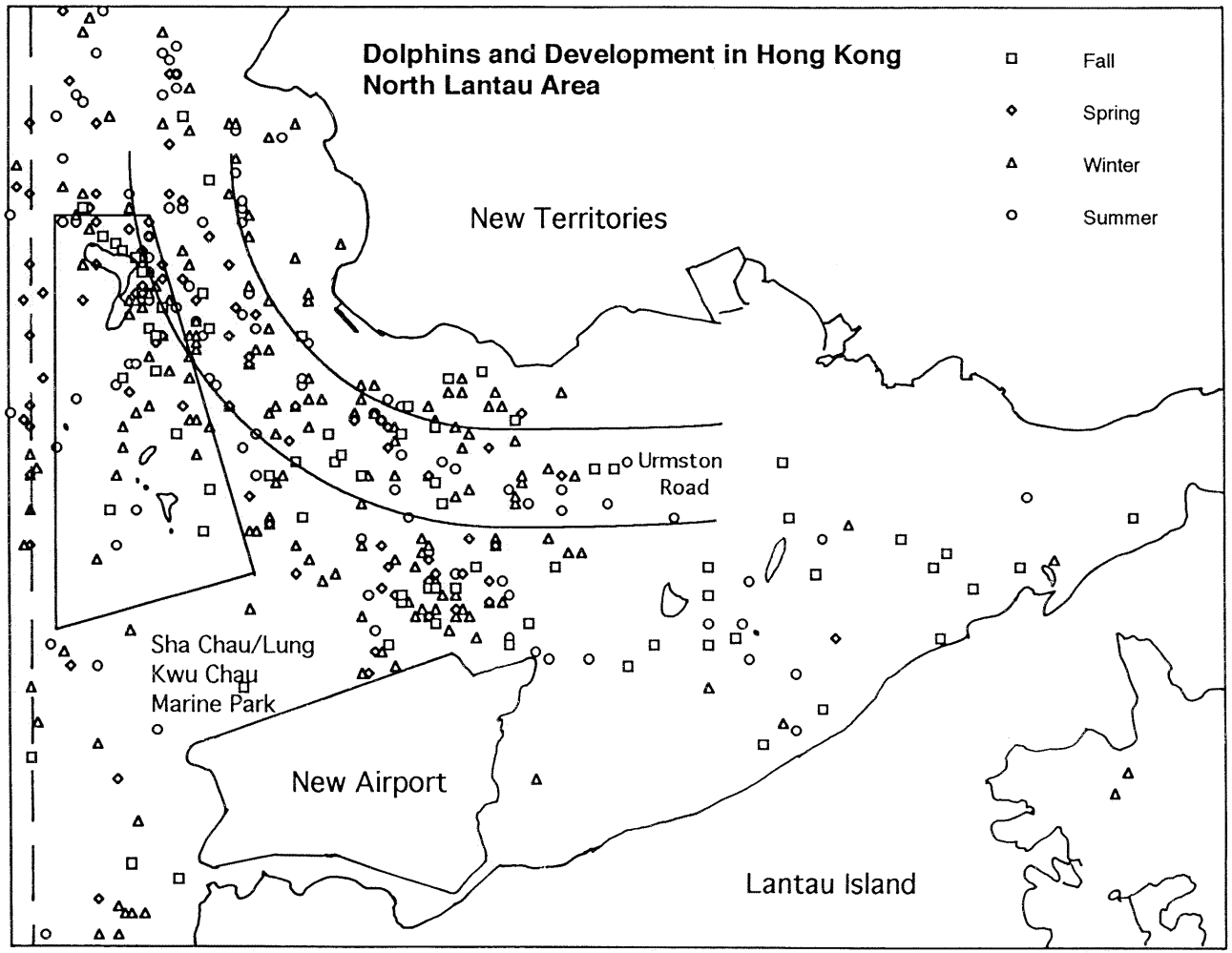

Fig. 2. Map of the North Lantau area of Hong Kong, showing the regions of concentration of hump-backed dolphin sightings in relation to some development activities, such as the new airport at Chek Lap Kok and the busy Urmston Road shipping channel.

In mid-1995, with support from the AFD, the Airport Authority, and the Ocean Park Conservation Foundation, we began a research project on Hong Kong's hump-backed dolphins (Jefferson, 1996). Although the project is many-faceted, it aims to complement the SWIMS study to learn as much as possible about the general biology of these dolphins and other cetaceans in Hong Kong. The major foci of the study are to establish numbers and define trends in abundance using line transect methods, to monitor individuals through use of photo-identification techniques, and to learn more about mortality rates and causes, as well as to conduct other biological studies, through development of a dedicated stranding recovery program.

There has been much debate about the "population" status of Hong Kong's dolphins. Many members of the public, due to mass media dissemination of misinformation, believe that dolphins in Hong Kong are a unique species. There is no scientific basis for this. In fact, the stock structure of dolphins in the Pearl Rivar estuary is not known. There have been no published studies of geographic variation on these animals, but studies are currently underway to clarify this issue.

In Hong Kong, hump-backed dolphins occur throughout the year, primarily in the area to the north of Lantau Island, near the new airport at Chek Lap Kok (Fig. 2). Until recently, there were no statistically-defensible estimates of density or abundance for Hong Kong dolphins. Concern that the "population" may be declining is based primarily on the high-level human usage of the area and on the incidence of strandings. A minimum "population" estimate of over 100 dolphins has been obtained through the development of a photo-identification catalog (L.J. Porter, pers. comm.). Line transect surveys in the area north of Lantau Island, conducted and overseen by Ocean Park Conservation Foundation, have resulted in a preliminary estimate of abundance for that area of 126 dolphins (CV=0.14) (Jefferson, 1996). Trends in abundance will be examined over the next two years, by use of continued shipboard line transect surveys and power analysis (see Gerrodette, 1987).

Wise management of hump-backed dolphins in Hong Kong would require good information, not only on abundance and trends, but also on reproduction and feeding habits. Life history parameters, such as age and length at sexual maturity, reproductive rates, and natural mortality rates, generally require large samples of moderately fresh specimens to estimate accurately. Unfortunately for science, strandings are fairly rare events and most carcasses are badly decayed when found. As strandings have been the exclusive source of specimens in Hong Kong to date, there is little information on reproduction or feeding habits for this population. We currently are examining the feasibility of using biopsy sampling to obtain some of the needed data.

THE POTENTIAL THREATS

The potential threats to the Hong Kong population have been categorized by Parsons and Porter (1995) as habitat loss, depletion of food resources, vessel traffic, pollution, and deliberate and incidental capture. Habitat loss is definitely occurring in the dolphins' range. For example, plots of sightings of dolphins before the creation of the airport platform at Chek Lap Kok show sightings in what is now "reclaimed" land. Whether or not removal of this habitat has caused a decline in dolphin numbers in the area is unknown. Depletion of food resources is also likely to be a factor affecting the carrying capacity of the dolphin population. Fishing pressure in the dolphins' habitat is heavy, and there is evidence of overfishing in many cases. Although there is not much known about dolphin feeding habits, dolphins in Hong Kong commonly follow pair and shrimp trawlers, indicating a probable overlap in prey of dolphins and fishing boats.

Vessel traffic in the region is intense, and the busy Urmston Road shipping channel passes right through an area of dolphin concentration (Fig. 2). It has been claimed that the continued presence of dolphins in the shipping channel indicates that they are not bothered by the activity. However, this type of thinking is flawed, as it fails to recognize two points: 1) dolphins may have an important need to use the area for feeding or breeding, and may thus simply accept the risk of collisions and noise, and 2) dolphins do not always know what is best for them in the long term - noise and other influences may be causing stress or other harm to the animals that may evidence themselves at a later point in time.

Pollution in Hong Kong is heavy and is increasing at an alarming rate. It is likely that Hong Kong's hump-backed dolphins are suffering from some kind of damaging effects from pollution (E.C.M. Parson, pers. comm.). In fact, strandings show similar patterns to what would be expected if organochlorines were having a significant impact on the animals; however, it is all but impossible to relate such suspected effects of chemical pollutants to a trend in population abundance. Despite the difficulty, we suggest that contamination from pollutants, such as organochlorines, may be the major long-term threat to dolphins, and we therefore consider this issue of high priority.

Unlike in other parts of Asia (such as Taiwan, Japan, Indonesia, and the Philippines), there appears to be no direct fishery for dolphins in southern China, including Hong Kong. Fishermen have been discovered with spinner dolphin, *Stenella longirostris*, remains in Hong Kong waters (see Parsons and Porter, 1995), but the dolphins were apparently caught in Chinese waters near Hainan Island, and it seems likely that they were the result of incidental catches. Thus, deliberate capture of dolphins does not appear to be a significant threat at this

point. There is very little information on bycatch levels of small cetaceans in Hong Kong. Fishermen in the territory do use gillnets, a technique which is known to kill dolphins in other areas (Perrin *et al.*, 1994). Various types of trawl nets are used in Hong Kong, and cetaceans sometimes do get caught in these nets. At least one recent stranded dolphin showed evidence of having drowned in a fishing net (probably a pair trawl). Thus, although the incidental catch problem does not appear to be severe at this time, it should be examined further.

HUMAN DIMENSIONS OF THE ISSUE

The potential for conflict between development interests and environmentalists has existed for some time in Hong Kong. It was not until plans for the construction of Hong Kong's new multi-billion dollar airport at Chek Lap Kok, off north Lantau Island, were announced in the late 1980s that the issue became heated. Local green groups, concerned about the effects of the construction of the airport in prime dolphin habitat, began a campaign to raise consciousness about the issue. Unfortunately, at the time, very little knowledge about the Hong Kong dolphins existed and the press, in reporting the issue, made little distinction between fact and speculation. There is intense competition among the news media in Hong Kong, especially among the two (previously three) English-language and dozens of Chinese newspapers. In order to outcompete their competitors, Hong Kong newspaper reporters, in general, tend to sensationalize issues, and this often occurs at the expense of getting the facts straight. International reporting of the issue tends to be better (see Verrall, 1995), but this trend has occasionally surfaced also in reports about the issue in the scientific literature (Ambrose, 1993; Anonymous, 1996). The result has been that several misconceptions have become lodged in most people's minds. For example, it is probably still true that most people in Hong Kong who follow the issue believe that a unique species is present in Hong Kong and that this species is declining toward local extinction (the prior misconception is reinforced by the insistence, by many people, on using the local vernacular name, Chinese white dolphin). In fact, there is no solid evidence for either of these concepts, but this perception of the issue has resulted in polarization and, at times, a lack of communication between those involved in the airport and those in the environmental community.

There currently appears to be a serious attempt, by both sides of the issue, to sort out reliable factual information from information that is unreliable or simply untrue. This represents a step in the right direction, and the potential for an open dialog between the various parties may eventually be realized. However, there are at least two stumbling blocks. First newspaper reporters continue to focus on

tabloid-type reporting. Apparently, facts are just not interesting enough to sell newspapers in Hong Kong. Second, certain interested parties appear to be taking an obstructionist stance, so as to delay implementation of protection measures for the dolphins that might run counter to their long-term goals.

The AFD of the Hong Kong Government set up a Marine Mammal Conservation Working Group (MMCWG) in 1995, to aid in the process of establishing and managing a marine park (often inaccurately referred to as a "dolphin sanctuary") around the islands of Sha Chau and Lung Kwu Chau (see Fig. 2). The group is made up of representatives of the AFD, other relevant government departments, the environmental community, research and educational institutions, fishermen's unions, and the airport project. The diverse membership is in keeping with the recognition that the objectives of marine nature reserves are diverse, and involve many different sectors (Jones, 1995). The working group could be very effective in resolving (or at least minimizing) the dolphin conflict. At recent meetings, there has been a useful flow of information, and people from very different perspectives have, at times, rallied in an attempt to push things in a positive direction. However, the group has no formal mechanism to resolve disputes and conflicts. Thus, despite its best intentions, the group can be thrown into gridlock by the protests of a single powerful member. This happened recently. As the need to firm up details and implement the proposed park became more urgent, the Marine Department objected to the proposed boundaries, on the grounds that they might interfere with shipping in the area. Their refusal to accept any compromise, set against a failure to show any convincing evidence of their claims, for a time brought the process to a standstill. Fortunately, the group was eventually able to move beyond this point, however, and agree on a set of boundaries.

The Sha Chau and Lung Kwu Chau Marine Park (Fig. 2) came into effect in late 1996. It has been recognized that the park, by itself, will not ensure the survival of hump-backed dolphins in Hong Kong (UNEP, 1996). Some have even gone so far as state that the park has no biological value for the dolphins (Hoffman, 1995). However, we feel it is a step in the right direction, and as such, represents an important precedent.

CONCLUSIONS

A fuller recognition of the importance of the human dimensions of the wildlife conflict would greatly strengthen the effectiveness of the MMCWG. Members are government officials, biologists, environmentalists, policy advocates, and wildlife managers. There is not a participant trained in the social sciences and skilled at dealing with the diverse viewpoints brought to the meetings by members. Such a

person would be a useful part of the formula for avoiding gridlock, as skills in mediation and arbitration could help to move the group forward. Finally, for the group to be maximally effective it should develop a formal process for settling disputes (perhaps through a vote or some other exercise).

Of course, with only three years of dedicated scientific research conducted so far, there is still a shortage of much of the biological information that we need about the animals in order to properly manage them. However, great progress is being made in this direction. The Hong Kong government has devoted relatively large amounts of research funding to studying the dolphin issue, and accordingly our knowledge base is growing rapidly. However, a proper management plan still remains to be formulated. We strongly recommend that the "principles for the conservation of wild living resources" outlined by Mangel *et al.* (1996) be applied to management of marine mammals in Hong Kong. These principles are comprehensive and fully recognize the complex biological, social, and economic issues involved in wildlife conservation. Only if dolphin management in Hong Kong follows such a pattern will it have any chance of succeeding.

Dolphins and porpoises in Hong Kong are still in great danger, and their long-term survival is by no means assured. However, there is some reason for optimism. Environmentalism in Hong Kong is growing, and the government has begun to take the issue quite seriously. Of course, these points are countered by Hong Kong's rapidly accelerating rate of development and burgeoning human population. Only time will tell if the recent changes in favor of Hong Kong's cetaceans have come too little, too late (as some believe), or if they will ultimately help the cetaceans of Hong Kong survive in the long term.

Hong Kong, as one of the major economic and political forces in southeast Asia, serves as an important test-case and will, inevitably, be viewed as a precedent in the future of environmental protection in the Asian region. Hong Kong is a rich state, and it can not claim not to have the resources or capital required to clean up its environment, or to save its two local species of cetaceans. All that is needed is the will, by the government and by the people. Some sacrifices will need to be made, to be sure. But, if the people of Hong Kong can learn to honestly and sincerely accept such sacrifices, with the realization that, by doing so, they are helping to ensure their own quality of life, then there is a chance for these animals. If the "Chinese white dolphin", the symbol of Hong Kong's return to China, is to die out in this area, then what does that say for the future of Hong Kong as a place for people to live ? The world will be watching.

REFERENCES

Ambrose, P. 1993. The decline of the Hong Kong white dolphin. Mar. Poll. Bull. 26:415-416.

Anonymous. 1996. The last of the Hong Kong pink dolphins ? Mar. Poll. Bull. 32:5.

Carnac-Temple, R. 1919. "The Travels of Peter Mundy, in Europe and Asia, 1608-1667." Vol. 2, Part 1. The Hakluyt Society.

Gerrodette, T. 1987. A power analysis for detecting trends. Ecol. 68:1346-1372.

Hammond, D.D. and S. Leatherwood. 1984. Cetaceans live-captured for Ocean Park, Hong Kong, April 1974-February 1983. Rep. int. Whal. Commn. 34:491-495.

Hoffman, C.C. 1995. The feasibility of the proposed sanctuary for the Chinese white dolphin, *Sousa chinensis*, at Lung Kwu Chau and Sha Chau, Hong Kong. Unpublished report to the World Wide Fund for Nature Hong Kong, 51pp.

Jefferson, T.A. 1996. Multi-disciplinary research program on the Indo-Pacific hump-backed dolphin population: Second quarterly progress report. Unpublished report to the Agriculture and Fisheries Department, 15pp.

Jones, P.J.S. 1994. A review and analysis of the objectives of Marine Nature Reserves. Ocean Coast. Manage. 24:149-178.

Mangel, M. *et al.* 1996. Principles for the conservation of wild living resources. Ecol. Applic. 6:338-362.

Osbeck, P. 1765. "Reise Nach Ostindien und China." Volume ll. Koppe, Rostok,

Parsons, E.C.M. and L.J. Porter. 1995. The threats to Hong Kong's Indo-pacific humpbacked dolphin population. pp. 101-117. *In:* The Third Symposium on Cetacean Ecology and Conservation, Taipei, Taiwan, June 15-16, 1995.

Parsons, E.C.M., Felley, M.L. and Porter, L.J. 1995. An annotated checklist of cetaceans recorded from Hong Kong's territorial waters. Asian Mar. Biol. 12:79-100.

Perrin, W.F., Donovan, G.P. and Barlow, J. (eds.). 1994 "Gillnets and Cetaceans." Rep. Int. Whal. Commn. (Spec. Iss. 15), 629pp.

Planning, Environment and Lands Branch. 1995. "The Shape of Things to Come: An Overview of the Role of Harbour Reclamations in the Future Development of Hong Kong. " Hong Kong Government, 137pp.

Romer, J.D. 1955. Cetaceans recorded from within or near Hong Kong territoreal waters. Mem. Hong Kong Biol. 3:1-4.

Ross, G.J.B., Heinsohn, G.E. and Cockcroft, V.G. 1994. Humpback dolphins *Sousa chinensis* (Osbeck, 1765), *Sousa plumbea* (G. Cuvier, 1829) and *Sousa teuszii* (Kukenthal, 1892). pp.23-42 *In:* S.H. Ridgway and R.J. Harrison (eds.) Handbook of Marine Mammals. Vol. 5: The First Book of Dolphins. Academic Press, London.

Ross, G.J.B., Heinsohn, G.E., Cockcroft, V.G., Parsons, E.C.M., Porter, L. and Preen, A. In Prep. Review of the taxonomic status of humpback dolphins, genus *Sousa*. Manuscript in preparation.

UNEP. 1996. Report of the Workshop on the Biology and Conservation of Small Cetaceans and

Dugongs of Southeast Asia. United Nations Environment Programme (W) /EASWG. 1/2, 101pp.
Verrall, M. 1995. Airport plans threaten dolphin sanctuary. Nature 375:98.