CHAPTER 14

SWIMMING WITH WILD CETACEANS IN THE SOUTHERN HEMISPHERE

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INTRODUCTION

Swimming with free-ranging cetaceans is increasing in popularity (Hoyt 2001) but the scope of these activities and the effects on animals are not well known. Here we present a review of this form of nature-based tourism to determine what is known about effects on the animals' behaviour and well-being, to provide a body of scientific literature to inform management decisions, and to emphasise where gaps in information exist. This chapter is based upon a review of the literature pertaining to swimming with wild cetaceans in US waters (Samuels *et al.* 2000) that was commissioned by US regulatory agencies to assist in the formulation of national policy (NMFS 2002). The present chapter is updated and more comprehensive, being a synthesis of reports about swim-with tourism from around the world. In particular, we highlight and discuss information from the Southern Hemisphere where this tourism is widespread and proliferating. Analysis of 'swim-with' tourism in the Southern Hemisphere is an expedient and advantageous way to obtain an overview of current knowledge, research and management practices pertinent to swimming with wild cetaceans worldwide.

We collected a comprehensive set of contemporary and historical documents pertaining to in-water encounters between humans and wild cetaceans, and we summarised the available information from the perspective of the welfare of targeted animals. To assess the scope of swim-with tourism on a global scale, we tried to chronicle all sites and situations. This proved impossible because there is an expanding list encompassing newly-initiated swim-with tours, many of which are not described in the literature. In fact, searching the internet for 'swim with whales' provides a catalogue of former and current swim-with activities for which information from other sources is not currently available. Thus, to provide as complete an inventory as possible, we supplemented peer-reviewed scientific articles with conference and workshop abstracts, working papers, popular books, magazine and newspaper articles, websites, and information from local scientists and tour operators. Grey literature, popular sources, internet reports, and anecdotal accounts were included only when we were unable to obtain details from a published, more complete, and/or scientific source.

The review is organised around the four basic categories of in-water encounters between humans and cetaceans. These involve swimming with cetaceans that are 'lone sociable', 'food provisioned', 'habituated', and 'not habituated'. Defining criteria for these categories are provided in Table 1. The first three categories involve animals that are habituated to interactions with humans (i.e. individually identified cetaceans that are known to tolerate

Table 1 Defining criteria for categories of in-water encounters between humans and free-ranging cetaceans

'Lone sociable'	Typically solitary cetaceans that are habituated to in-water encounters with humans through close proximity to humans and human activity which appears to take the place of interactions with conspecifics
'Food provisioned'	Cetaceans that are habituated to in-water interactions through regular provisioning of food by humans
'Habituated'	Groups of cetaceans in which many individuals have repeated and sustained interactions with human swimmers on a regular basis without pursuit by humans, without signs of disturbance in response to human actions, and without the incentive of food provisioning.
'Not Habituated'	Cetaceans that have opportunistic encounters with humans and human activity, cetaceans that have long-term exposure to swimmers and/or swim tours but still show signs of disturbance, and cetacean communities in which an unspecified subset of individuals may be habituated to in-water encounters.

and/or seek repeated, sustained interactions with humans on a regular basis). The distinction between these three categories is the means by which habituation to humans originated or is maintained. Inclusion in the fourth category was determined by the presence or absence of one or more specified conditions (Table 1). Our assessment, specifically with respect to the third and fourth categories is not always in agreement with other reports. This is due to different definitions of 'habituation', or different rules for categorising situations in which there are a few habituated individuals within a largely unhabituated community.

Because each of the four categories is likely to result in different types of encounters, responses, effects, management, and research designs, we initially treat the categories separately in this review. Reported types of interactions and impacts on cetaceans, and the corresponding codes used in subsequent summary tables, are listed in Table 2. It is important to note that effects sometimes go unreported, not only when none exist but also when they go undetected due to inadequate monitoring or inappropriate research methodologies (see also: Chapter 12, this volume). Integration and analysis of the findings of the review, based on a regional Southern Hemisphere perspective, is presented in the last section.

Cetaceans that are typically solitary and seek human company (lone, sociable)

Lockyer (1990) provided a comprehensive review of lone, sociable dolphins until 1988 (e.g. Mundey 1967; Lockyer 1978; Webb 1978a, 1978b; Doak 1981; Dobbs 1981; Burgess 1982; Dobbs 1984; Lockyer and Morris 1985a, 1985b, 1986, 1987a, 1987b; Holmes 1987; Doak 1988; Robson 1988). Recent additions to this list include 'Filippo' in Italy, 'Flipper' in Norway, 'Freddy' and 'Georges' in England, 'Holly' in Egypt, 'JoJo' in Turks and Caicos, 'Maui' in New Zealand, 'Pita' in Belize, 'Sandy' in the Bahamas, 'Tiao' and an unnamed calf in Brazil, 'Wilma' and 'Kuus' in Canada, and a pair of unnamed immature dolphins in the United Kingdom (Perrine 1990a, 1990b, 1998; Bloom 1991; St John 1991; van der Toorn *et al*. 1992; Doak 1994; Bloom *et al*. 1995; Dudzinski *et al*. 1995; Flanagan 1996; Santos 1997, 1998, 1999; Cirilo *et al*. 1998; Clarke 1999; Bilgre *et al*. 1999; Constantine 1999; Goffman *et al*. 1999; Wood 1999; Bearzi and Barbieri 2000; Frohoff *et al*. 2000; CNN 2002a; CNN 2002b). With the exception of 'Sandy', a *Stenella* sp.; 'Wilma' and 'Kuus', two immature beluga whales, *Delphinapterus leucas*; and the unnamed Tucuxi, *Sotalia fluviatilis*, calf in Brazil, all lone, sociable dolphins are bottlenose dolphins, *Tursiops truncatus* or *T. aduncus*.

From the swimmer's perspective lone, sociable dolphins provide the greatest degree of contact. 'Generally they are well habituated to humans, so scaring them away is less of a worry than failing to provide adequate entertainment' (Perrine 1998). However, what constitutes 'adequate entertainment' for these habituated dolphins can be problematic for both the dolphin and human swimmers.

The activities and fates of 29 lone, sociable dolphins are well documented (Table 3). More than two-thirds were males (17/25 whose sex was known), and slightly more than half were immatures (15/28 whose age was estimated). Most were reported to have near-daily interactions with humans and infrequent interactions with conspecifics. One lone, sociable dolphin was locally acclaimed for 'saving' a drowning boy ('Flipper'); however, others achieved notoriety for 'abducting' people who then had to be saved by boat (e.g. 'Donald', 'Percy'). At least 13 dolphins had periods of mis-directed sexual behaviour towards humans, buoys, and/or vessels, and approximately two-thirds (at least 18) directed aggressive behaviour towards humans. Dolphin-to-human aggression sometimes resulted in such serious human injury as unconsciousness, a ruptured spleen, and broken ribs, (e.g. 'Donald', an unnamed dolphin from Florida Keys) or even death ('Tiao'). At least eight dolphins were reported to cause damage to human property, primarily vessels and fishing gear. Aggression, damage to human property, and/or disruption of fishing operations resulted in conflict with local people in several cases (e.g. 'JoJo', 'Nudgy', 'Percy'). Although the focus of this review is the welfare of cetaceans, it is important to note the risks for humans because inappropriate behaviour with humans has often had disastrous outcomes for lone, sociable cetaceans (Table 3).

Table 2 Assessment of cetacean welfare related to swim-with tourism: Reported interactions and impacts

Category	Code	Description
Type of interaction	**FP**	Food provisioning by humans
	SW	Swim with, in-water encounters with humans
	WW	Whale watch, dolphin watch tours
Adverse effects on cetacean health	**BO**	Boat collision injury
	FI	Fishing gear entanglement or injury
	IL	Illness or other injury
	MO	Mortality
	PO	Exposure to pollution
Adverse effects on cetacean behaviour	**FO**	Foraging behaviour
	GR	Grouping behaviour
	HA	Habitat use, ranging patterns
	JD	Juvenile development
	MC	Maternal care
	RE	Resting behaviour
	RP	Reproduction
	SO	Social behaviour
Indicators of cetacean disturbance	**AV**	Avoidance
	BC	Behavioural change
Inappropriate behaviour towards humans	**AG**	Aggression directed towards humans
	PD	Property damage
	SX	Sexual behaviour directed towards humans

Doak (1988) noted that 'in the history of lone dolphins approaching human settlement, one thing is clear – it is highly dangerous for the dolphin'. More than half (16) of lone, sociable dolphins received injuries as a result of their habituation to humans and close proximity to human activity. For example, 'Freddy' was frequently entangled in fishing gear and three times had fishing hooks or line embedded in his body. 'Nudgy' was speared and hit with oars. 'Percy' had a fish hook in his eye. 'Donald', 'Georges', and 'Horace' received serious wounds from collisions with boats or propellers. 'Wilma' was estimated to have had at least 16 injurious encounters with boats. 'JoJo' was reported to have 37 injuries related to human interaction during 1992–1999 including eight that were deemed life threatening.

Other lone, sociable dolphins have died as a result of their contact with humans. The original 'Simo' in 109 AD was said to have been killed by local people when his popularity resulted in overcrowding of the town with dolphin tourists. Although this account may be fictional, this fate is likely to be a common one for lone, sociable dolphins. Four of the well-documented lone, sociable dolphins ('Opo', 'Nudgy', 'Dobbie', 'Costa Rican') were known to be killed by humans, and five others disappeared under mysterious circumstances, e.g. soon after local people complained about their disruptive behaviour ('Percy', 'Tiao', 'Horace', 'Simo', 'Nina'). Some of these dolphins are presumed dead at human hands, and others like 'JoJo' and 'Georges' seemed destined for a fatal accident related to their habituation to humans.

Recently, management actions have improved the chances of survival for some lone, sociable cetaceans. For example, there was a reduction in potentially risky behaviour directed by humans toward the beluga, 'Wilma', concurrent with the daily presence and direct intervention by a voluntary management team (Frohoff *et al*. 2000). In addition, the frequency of interactions with lone, sociable dolphin, 'Maui', was substantially reduced, presumably as a result of New Zealand regulations coupled with voluntary restrictions specific to this dolphin that were instituted by local tour operators (Constantine 1999). Local campaigns have been instituted to protect so-called 'nuisance' dolphins (e.g. 'Freddy', 'JoJo'). And, although his ultimate fate is unknown, 'Tiao', the Brazilian dolphin who killed a swimmer who provoked him, was protected from retaliation for at least a while by a public education campaign (Santos 1997). In addition to these apparently successful interventions on behalf of lone, sociable dolphins, an attempt of unknown outcome was made to lead 'Georges' away from a popular beach resort in England where he was endangered by, and a threat to, the throngs of people who come to swim with him or view him from boats (CNN 2002a; CNN 2002b).

Table 3 Lone sociable cetaceans
Codes from Table 2

Sex	Dolphin A=adult J = subadult, juvenile or calf	Location	Risk to humans	Risk to dolphins	Dolphin risk details	Habituation D or H = initiated by dolphin or human G or R = process was gradual or rapid FP = food provisioning T = touching	References
MALE	Costa Rican[A?]	Costa Rica		**FI, MO**	entangled in net; killed by fisherman	**no FP**	Lockyer 1990
	Donald (Beaky)[A]	England, Wales	**AG, PD, SX**	**BO, IL**	serious head injury from propeller; gun shot wound	**no FP, T**	Doak 1981, 1988; Lockyer 1978, 1990; Webb 1978a, b
	Dorad (Funghi)[A]	Ireland	**AG**			**G, H, no FP, T**	Holmes 1987; Lockyer 1990
	Filippo[A?]	Italy	**AG**				Bearzi and Barbieri 2000
	Flipper[A]	Norway	**AG? SX**		knocked people off surfboards but not perceived as threat		van der Toorn *et al.* 1992
	Freddy[A]	England	**AG, PD, SX**	**FI, PO**	entangled in fishing gear, fishing line imbedded three times; exposed to sewage	**G, T**	Bloom 1991, Bloom *et al.* 1995
	Georges[A?]	England	**AG, SX**	**BO**	attempt to relocate to location of origin in France where SW is illegal; outcome not known	**no FP, T**	CNN 2002a, 2002b
	Percy[A]	England	**AG, PD, SX**	**FI, PO, MO?**	fish hook in eye; exposed to sewage; disappeared soon after conflict with locals	**G, no FP, T**	Doak 1981, 1988; Lockyer and Morris 1985a, b, 1986; Lockyer 1990; Morris 1988
	Tiao[A]	Brazil	**AG, MO**	**IL, MO?**	harassed by crowds who put ice cream sticks in blowhole; disappeared and may have been killed 'out of vengeance' for swimmer's death	**G, T**	Flanagan 1996; Santos 1997
	Nudgy[J]	USA	**AG, PD**	**IL, MO**	speared, hit with oars; conflict with locals resulted in being penned then died	**G, T**	Burgess 1982; Doak 1988; Lockyer 1990
	Horace[J]	New Zealand	**AG, PD, SX**	**BO, MO?**	injured in ship collision; disappeared soon after explosion; believed to be scared away, not killed	**H, T**	Doak 1981, 1988; Dobbs 1981; Lockyer 1990; Robson 1988
	Sandy[J]	Bahamas	**AG, SX**	**IL**		**G, no FP, T**	Doak 1981, 1988; Lockyer 1990
	Dobbie[J?]	Red Sea		**MO**	killed by gun shot	**no T**	Doak 1988; Lockyer 1990; Orams 1997a
	JoJo[J]	Turks and Caicos	**AG, PD, SX**	**BO**	37 boat-related injuries (8 life threatening) during 1992–99	**T**	Clarke 1999; Perrine 1990; St. John 1991
	Kuus[J]	Canada	**AG?**	**BO**	injuries from propellor	**G, not FP, T rare**	Frohoff 1999; Frohoff et al. 2000

	Romeo[J]		**AG, SX**		Two companions killed (one shot, one ingested plastic bag)	**D**	Doak 1988
	Simo[J]	Wales	**AG, SX**	**IL? MO?**	became ill then disappeared	**R, no FP, T**	Doak 1988; Lockyer and Morris 1987ab; Lockyer 1990
FEMALE	Charlie[A]	England, Scotland	**AG? PD**	**BO?**	propellor scars?	**G, no FP; T**	Doak 1988; Gilchrist 1967; Lockyer 1990; Mundey 1967
	Holly (Olin)[A]	Egypt	**AG**	**IL, MC?**	harassed by crowds of swimmers; two previous calves did not survive; present calf surviving at age 3+ yrs	**H, R, FP (after 2 yrs), T**	Goffman *et al.* 1999; R. Corner (Wild and Free Dolphin Swims, Forres, Scotland, UK), 2002, pers. comm.
	Maui (Woody)[A?]	New Zealand				**no FP**	Constantine 1999
	Nina[A]	Spain	**SX**	**MO?**	found dead; 'human agency was suspected'	**R, no FP, T**	Doak 1981, 1988; Lockyer 1990
	Jean-Louis[J]	France	**SX**			**H, no FP, no T**	Doak 1988; Lockyer 1990
	Opo[J]	New Zealand	**AG**	**MO**	killed by explosion on day after Act of Parliament to protect her	**G, no FP, T**	Doak 1981, 1988; Dobbs 1984; Lockyer 1990
	Pita[J]	Belize	**AG, SX**	**BO, IL**	harassed by crowds of swimmers; propellor scars	**G, initially FP, T**	Bilgre *et al.* 1999; Dudzinski *et al.* 1995; Flanagan 1996
	Wilma[J]	Canada	**AG, PD, SX?**	**BO, FI? FO?**	estimated from body scars to have had >= 16 encounters with boats; liked to touch outboard motors	**G, not FP, T**	Frohoff 1999; Frohoff *et al.* 2000
Unknown	Florida Keys[?]	USA	**AG**			**T**	Perrine 1990
	Sao Vicente[J]	Brazil				**G, FP**	Cirilo *et al.* 1998
	#8 and #10[J]	England				**R, T**	Wood 1999

The label 'sociable' implies that these dolphins seek human company, but the origin of their habituation to humans is not always clear. Food provisioning does not appear to be a factor for most lone, sociable dolphins, and many, in fact, are reported to refuse fish handouts from humans. 'Donald' accepted fish from people but did not eat them; 'Percy' and 'Dorad' each caught fish that they offered to humans. 'Pita' is an exception: as a juvenile, she became habituated to humans who fed her after a shark injury; as an adult, however, Pita reportedly refused fish handouts (Dudzinski *et al.* 1995). 'Holly' is another lone, sociable dolphin who accepts fish handouts, but food provisioning was initiated more than two years after her first encounter with humans (Goffman *et al.* 1999). An orphaned Tucuxi calf in Brazil was also reported to accept fish from fishermen, which Cirilo *et al.* (1998) suggested might be a common way that young dolphins learn to seek human company. Several other immature dolphins reportedly sought out humans after losing the mother or a companion ('Opo', 'Romeo', '#8' and '#10') but none of these accepted fish handouts.

In some cases, habituation appears to have been initiated by a dolphin with an attraction to boat traffic (e.g. 'Donald', 'Freddy', 'Funghi'). 'Nudgy', on the other hand, was an example of a dolphin forced into close proximity to people after being trapped in a small bay after a storm. A few lone, sociable dolphins were quick to allow human contact (e.g. 'Simo', 'Holly' '#8' and '#10'), but for many, habituation to in-water encounters and touching by humans was a gradual process achieved through considerable effort on the part of humans (Table 3; see also: Lockyer 1990; Orams 1997a). As an example, the habituation of 'Dorad' was a concentrated effort that occurred over a period of months (Holmes 1987). In several cases it was noted that a dolphin initially shy of human contact would, after a lengthy habituation period by humans, become bold and initiate frequent sexual and aggressive behaviour with humans. For example, Frank Robson 'set about establishing a personal relationship [with 'Horace']' and enticed the dolphin into shallow water to interact with people, but he later became concerned when the situation with 'Horace' and swimmers got out of hand (Dobbs 1981).

Quantitative data that systematically document the behaviour and daily life of a lone, sociable cetacean are provided in two studies. Bloom *et al.* (1995) conducted 24-hour watches of 'Freddy' to monitor his activity budget, ranging, foraging, and acoustic behaviour as well as his interactions with humans. Interactions with swimmers or boats occurred during approximately 34% of daylight observations, and 'Freddy' responded by approaching in 62% of opportunities to interact with humans, sometimes abandoning foraging or rest to do so. Frohoff *et al.* (2000) recorded interactions between 'Wilma' and humans, documenting that 28% involved physical contact and 8% involved agonism. Aside from these studies, there is only anecdotal information about the interactions of lone, sociable dolphins with humans or the effects of in-water encounters on each dolphin's behaviour and daily life. It is likely to be difficult, however, to design a study that would truly assess the effect of human interaction on the behaviour of these dolphins, given the considerable amount of time each dolphin spends with humans on a daily basis.

Cetaceans that are habituated to in-water encounters with humans through food provisioning

Although food provisioning has rarely been associated with lone, sociable cetaceans, provisioning is one method used to facilitate regular interaction with wild animals (reviewed in Orams 2002), including swimming with wild cetaceans. Bryant (1994) provided a comprehensive review that documented the detrimental effects of uncontrolled food provisioning on dolphin health and well-being. Mann and Kemps (Chapter 15, this volume) review the effects of provisioning on maternal care in dolphins at Monkey Mia, Western Australia. Those authors also provide a review of the detrimental consequences of, and management of, provisioning wild dolphins. Readers are referred to those papers for a full discussion of the feeding issue. In Table 4 we summarise several recent references that strengthen the conclusion that uncontrolled food provisioning is harmful to wild cetaceans.

None of the research on food provisioned dolphins has focused on impacts of in-water encounters with humans. However, given the pervasive effects of food provisioning, it would not be easy to design a study that could partition which impacts are due to food provisioning and which are due to in-water encounters. In a pilot study conducted in Panama City, Florida, the behaviour of dolphins habituated through food provisioning was compared to that of unhabituated dolphins in the same location. Dramatic differences in behaviour and ranging patterns were documented: in particular, over a period of several days, one juvenile dolphin was observed to interact with humans including swimmers during 74% of observations, was fed by humans at least once per hour, and had dangerous encounters involving humans or vessels once per 12 min (Samuels and Bejder 1998, in press). Given the prevalence of food provisioning for habituated dolphins in this region (Samuels and Bejder 1998, in press; Colborn 1999), it could not be determined whether these behavioural differences were due to food provisioning, frequent in-water encounters with humans, or both.

Cetaceans that are habituated to in-water encounters with humans

We defined 'habituated' to refer to groups of cetaceans in which many individuals have repeated and sustained interactions with human swimmers on a regular basis without pursuit by humans,

Table 4 Cetaceans that are habituated to in-water encounters with humans through food provisioning
Codes from Table 2

Location	Species	Affected animals	Extent of human activities	Potential impacts	Cetacean risk details	References
Bunbury, WA, Australia	bottlenose dolphin	6–8 dolphins	FP since 1960s; regular controlled FP since 1989; supervised SW ('float-with-dolphins') in designated area; 70 000 tourists visit tourist center per year	BO, FI, IL, MO	entanglement in fishing line; begging from boats; stealing bait from fishing lines; hit with oars; one dolphin harpooned	Wringe 1993a, 1993b; Wilson 1994; Orams 1995; Smith 1999; A. Horan (Dolphin Discovery Centre), pers. comm. 2001
Monkey Mia, WA, Australia	bottlenose dolphin	now 3 females and immature offspring; historically, *c.* 24 since 1980s	regular FP since 1970s, strict controls since 1994; now, regular controlled FP of 3 females in designated area, dolphins spend *c.* 2.25 hrs/da at beach waiting for FP; SW opportunistic, occasional and discouraged; 80 000–114 000 visitors annually during 1987–1994	AG, BO, FI, IL, JD, MC, MO, PO, RP, SO	previously: decreased maternal behavior and high mortality of calves; intraspecific aggression in feeding area; inappropriate foods; injuries associated with fishing gear; begging at boats; "Old Charlie" reported to have been shot; 7 dolphins died after pollution event; dependency of juvenile on handouts; now: improved dolphin welfare since strict controls instituted	Gawain 1982; Edwards 1988; Connor and Smolker 1985; EPA 1989; Lockyer 1990; Connor *et al.* 1992; Trayler and Shepherd 1993; Wilson 1994, 1996; Donaldson 1998; Mann and Smuts 1999; Chapter 15, this volume; Mann and Barnett 1999, Mann *et al.* 2000; Samuels *et al.* 1999; Pearce 2000; Smith 2001
Tangalooma, QLD, Australia	bottlenose dolphin	up to 9 dolphins	FP attempts in 1989; regular controlled FP since 1992; 20–100 visitors per FP session; sessions last *c.* 30 min; SW not allowed	AG	previously: documented "pushy" behaviour by dolphins to tourists; management of Tangalooma FP based on strict controls specified by Wilson (1994); claim to have averted adverse effects of FP	Green and Corkeron 1991; Orams 1994, 1995; Orams *et al.* 1996; Orams 1997b, 1998; Corkeron 1998; Neil and Brieze 1998; Webster *et al.* 1998
Tin Can Bay, QLD, Australia	Indo-Pacific Humpback dolphin	up to 8 dolphins	FP since *c.* 1974; regular uncontrolled FP & SW during 1992–2000; dolphins present on near-daily basis; currently controlled FP and no SW allowed but no enforcement; FP being phased out	no information	previously: swimmers climb on backs and hold dorsal fins of dolphins (including calf); calf fed; no controls on quality or quantity of fish; since 2000: feeding controlled, only 2 dolphins fed; controls on human interaction not enforced	Garbett and Garbett 1997; Corkeron 1998; Neil and Brieze 1998; Aitken 1999; Wortel 2000; K. Wortel (Queensland Parks and Wildlife Service), 1999, pers. comm.
FL Panhandle, USA	bottlenose dolphin	in Panama City: at least 7 dolphins	commercial FP tours 1984–93; FP banned in 1993 but did not stop; during 3 mos in 1997, >7000 warnings/citations issued for illegal FP; frequent uncontrolled SW tours; some individual dolphins in proximity to humans during 77% of daytime observations	BO, FI, IL	potential dependency of juveniles on handouts; no control of quantity or quality of fish; begging from boats; surrounded by boats; close proximity to fishing gear; anchor dropped on head	Flanagan 1996; Ford 1997; Spradlin *et al.* 1997; Samuels and Bejder 1998,in press, Colborn 1999
FL Gulf coast, USA	bottlenose dolphin	2 dolphins	opportunistic, uncontrolled FP and SW since *c.* 1990	BO, FI, IL	inappropriate foods; begging at boats; entanglement in fishing gear	Flanagan 1996; Colbert and Cunningham 1998; Smith 1997
Sao Vicente and Cananéia sanctuary, Brazil	Tucuxi	one calf at SV; up to 4 dolphins in sanctuary	opportunistic, uncontrolled FP and SW since *c.* 1996–97	no information	concerns that FP will lead to increased tourism in sanctuary set aside for calving and breeding	Cirilo *et al.* 1998; Santos 1998

without signs of disturbance in response to human actions, and without the incentive of food provisioning. It was not always easy to make this determination based on available information.

There are several locations where people are reported to swim with 'friendly' groups of cetaceans, but in most cases, there are no data with which to confirm that the animals meet the above criteria for classification as 'habituated'. For example, there are anecdotal reports that tour operators at Rockingham, Western Australia, and in the Florida Keys, United States, made lengthy and concerted efforts to habituate individual resident bottlenose dolphins to in-water encounters; however, other anecdotes suggest that dolphins in the same locations exhibit signs of disturbance. Similarly, bottlenose dolphins in waters near Mikurajima, Japan, are reported to approach humans for sustained interactions on a regular basis (Dudzinski 1998a); however, there is little published information about swim-with programmes in Japan and no data available with which to evaluate this assertion. In addition, Doak (1988) reported a group of 'friendly' dolphins in Brazilian waters, but without any further information, this story cannot be verified.

The situation is also unclear for dwarf minke whales, *Balaenoptera acutorostrata*, at the Great Barrier Reef Marine Park in Australia. They can be regarded as 'friendly' because they frequently initiate approaches to boats and swimmers, and have sustained interactions, sometimes lasting several hours (Arnold and Birtles 1998; Arnold and Birtles 1999). In addition, at least a few individual whales have repeated interactions with humans (Birtles *et al*. 2001b). Research is ongoing to clarify whether the same individuals have frequent, repeated interactions with human swimmers, whether those whales are typical of whales of the region, and what proportion of whales under what circumstances exhibit disturbance responses to human activity (Birtles *et al*. 2001b).

Dolphins that participate in cooperative fishing efforts with humans might also be considered to belong to the 'habituated' category because fishermen appear to form close, long-term relationships with individual dolphins, and humans and dolphins work together in the water on a regular basis (e.g. Busnel 1973; Pryor *et al*. 1990) However, as cooperative fishing is not directly relevant to swimming with wild cetaceans, this will not be discussed further in this chapter.

Using this conservative assessment in which habituation is assumed absent until proven to be present, we found only one location where dolphins are *confirmed* to be habituated to swimmers in the water: many individually known, resident bottlenose and Atlantic spotted dolphins, *Stenella frontalis*, at Little Bahama Bank in the Bahamas are documented to have regular, sustained, in-water encounters with humans. In Table 5, we present information about the habituated dolphins of the Bahamas and cetaceans of unconfirmed habituation status.

For dolphins in the Bahamas, the origin of habituation to in-water encounters with humans dates back to the 1970s. Curious dolphins were said to frequent a wreck salvage operation, and subsequent underwater filming of the dolphins eventually led to organised swim-with-dolphin tours (St John 1988). These dolphins have also been subjects of underwater behavioural research since 1985 (e.g. Herzing 1991, 1996, 1999; Rossbach and Herzing 1997; Dudzinski 1998b; Ransom 1998). It was the dolphins that made first contact, but their habituation was likely to have been a gradual process involving repeated exposure to divers, researchers, filmmakers, and tourists in the water. Herzing (1999) describes 'interactive' encounters between dolphins and researchers to promote 'rapport and trust', and thereby facilitate close-up, in-water observations. The finding that the durations of in-water encounters became longer over a six-year period (median duration ranged from 7–11 min) may be taken to suggest that this community of dolphins (or a subset of individuals) has become more habituated to swimmers over time; however, the ever-increasing experience levels of tour operators cannot be ruled out as an alternate explanation for this finding (Ransom 1998).

There is little documented about dolphins' reactions to in-water encounters with human swimmers. Ransom (1998) looked at dolphin responses to tour vessels in the Bahamas, an investigation pertinent to the swim-with-dolphin issue because 'almost all swim-with-dolphin tours are conducted from a boat [and] it is almost impossible to isolate the dolphins' response to swimmers from the confounding effect of vessel presence' (Constantine 1999: 22). Ransom (1998) found that spotted dolphins changed their behaviour 68% of the time when a boat approached, they were least likely to respond while socialising, and 'positive' approach responses predominated. In the same study, bottlenose dolphins changed their behaviour during 59% of approaches with 'negative' avoidance responses predominating (Ransom 1998). Dolphins habituated to tour vessels may be at risk of injury from boat collisions: one spotted dolphin calf was reported to have life-threatening wounds presumably from a boat propeller (Ransom 1998).For the human swimmer, habituated cetaceans are said to pose little danger and to provide an opportunity for extended, spontaneous interaction and to observe natural behaviours (Perrine 1998). For the scientist, habituation of cetaceans provides an opportunity to observe the behaviour of identified individuals closely from an underwater vantage (e.g. Herzing 1991, 1996, 1999; Rossbach and Herzing 1997; Dudzinski 1998b). Continuous viewing of the behaviour of identified individuals is commonplace among studies of terrestrial animals (e.g. Goodall 1986) but unusual among studies of marine animals.

Information about responses of habituated dolphins to swimmers is anecdotal. Ransom (1998) reported an instance of intraspecific aggression among spotted dolphins when an assertive

Table 5 Cetaceans that are confirmed or suspected to be habituated to in-water encounters with humans in absence of food incentives
Codes from Table 2

Status	Location	Species	Affected aNIMALS	Extent of human activities	Potential impacts	Cetacean risk details	References
Habituated	Little Bahama Bank, Bahamas	Atlantic spotted and bottlenose dolphin	initially 1 now 12+ groups; 150 spottted, 30 bottlenose identified individuals, resident	SW since 1970s; in-water research since 1985; site protected by remote location; SW tours increased from c. 2 to 12 vessels in past 15 yrs; mean SW encounter is 10 min; boats anchor and wait for dolphins to approach 'of their own free will', then tourists enter water; SW governed by Oceanic Society guidelines	BO, IL?, MC? MO? SO?	limited information; presumed mother "forced the calf to the bottom and held it there" after the calf interacted with aggressive swimmer; another calf had life-threatening wounds presumably from boat propeller	St John 1988; Herzing 1991, 1996, 1999; Simonds 1991; Würsig 1996; Rossbach and Herzing 1997; Ransom 1998
Habituated?	Miyake / Mikura, Japan	bottlenose dolphin	165 identified individuals, resident	SW for >10 yrs in Mikura; 5–6 boats offer SW tours; 10 000 swimmers during May–Sep 1997; up to 4–5 SW attempts per group of dolphins at a time; voluntary guidelines for SW	AV?	limited information; swimmers advised dolphins will avoid if touched; some operators may not comply with voluntary guidelines?	Amano et al. 1998; Dudzinski 1998a, 1999; Barbosa 1999; Mori 1999; Shimomaki *et al.* 1999
Habituated?	Great Barrier Reef, Queensland, Australia	dwarf minke whales	several 100's of whales, some seasonally resident; at least a few individuals have repeat SW encounters	SW since 1985; at least 5 dedicated SW operators; mean encounter = 1.2 hrs; whales often approach and remain nearby stopped boats; one encounter with 8 whales = 11 hrs; strict marine park regulations for SW	AG? AV?	limited information: disturbance behaviors thought to be associated with direct approaches or touching by swimmers include veer away, speed away, dive away; video showed aggressive approach	Arnold and Birtles 1998, 1999; Corkeron 1998; Aitken 1999; Birtles *et al.* 2001a,b; Stokes *et al.* in press
Habituated?	Rockingham, Western Australia	bottlenose dolphin	120-150 resident dolphins; some identified individuals	SW since early 1990s; one licensed SW operator takes c. 30 swimmers per day; swimmers towed using underwater motor scooter; operator said to make concentrated effort to habituate certain dolphins; some dolphins beg at boats in region but origin unknown	FO? MC? JD?	limited information; anecdotes that calves and juveniles and foraging groups may be targeted for SW	Orams 1995; Weir et al. 1996; Perrine 1998; H. Finn (Murdoch U.), B. Donaldson (Murdoch U.), D. Coughran (Conservation and Land Management), 2001, pers. comm.
Habituated?	Key West, Florida, USA	bottlenose dolphin	resident dolphins; some identified individuals	SW for >15 yrs; in past 4 yrs, increase from 4 to 12+ dedicated SW operators; dolphins readily accessible at near-shore shallow banks; one operator said to make concentrated effort to habituate certain dolphins; some people said to have special relationships with certain dolphins	no information	at least one swimmer injured when mistakenly jumped into water with sharks	Simonds 1991; Henning 1993; Frohoff and Packard 1995; L. Engleby (National Marine Sanctuary), 2001, pers. comm.

swimmer came between a presumed mother and calf. That spotted dolphins in the Bahamas 'come to the humans, and can leave at any time they wish' (Würsig 1996) is presumed to indicate a degree of attraction to humans for the animals. However, the animals' ability to choose to interact may, in part, be an artifact of the remote location where the number of tour vessels is not yet so great that operators are competing for access to the animals (Herzing 1999). As Würsig (1996) noted: 'This situation [in the Bahamas] would need stricter regulation only when the number of vessels and attendant underwater activity and noise increased, no longer allowing the animals to easily and comfortably "escape"'.

Descriptions of the behaviour of 'friendly' dwarf minke whales in proximity to swimmers are based on data collected since 1996 (Arnold and Birtles 1998; Birtles *et al*. 2001a, 2001b). These whales were reported never to be aggressive to human swimmers (Arnold and Birtles 1998), although in a recent presentation, Birtles *et al*. (2001b) showed a film clip in which a whale made a high-speed, gaping approach to a swimmer that appeared quite aggressive in nature (L. Bejder personal observations). Dwarf minke whales were frequently observed to initiate and sustain lengthy interactions with boats and swimmers, with one such encounter lasting 11 hours (Aitken 1999). Avoidance behaviours have also been recorded, including veer away, speed away, and dive away, but the extent and circumstances under which avoidance occurs is not specified (Arnold and Birtles 1998).

For dwarf minke whales, ongoing research is taken into consideration in the management of whale-focused tourism in the Great Barrier Reef Marine Park (Arnold and Birtles 1998; Birtles *et al*. 2001a, 2001b). In contrast, for habituated dolphins, there are no published studies that specifically address effects of regular, sustained, in-water interactions with humans, despite the fact that the habituation and accessibility of these animals to human observers make them ideal subjects for certain inquiries. An additional research need is the application of systematic criteria to clarify the habituation status of 'friendly' cetaceans. Studies of local communities to which habituated cetaceans belong will provide information about what proportion of animals are resident or habituated (Birtles *et al*. 2001b), and whether there are certain individuals or age/sex classes that are more likely to seek, be affected by, and/or avoid human interaction (Ransom 1998). Studies are also needed to assess long-term effects (e.g. of increasing vessel traffic in the Bahamas on ranging, reproductive, and behavioural patterns of dolphins (Ransom 1998)) (see Chapter 12, this volume).

Cetaceans that are not habituated to in-water encounters with humans

We defined 'not habituated' to refer to cetaceans that have recent or infrequent contact with humans and/or show disturbance reactions to the presence of vessels or swimmers. The distinction from 'habituated' cetaceans was often difficult to discern from the literature. For example, although animals are sometimes labelled as 'habituated' because tour vessels have been in operation in the region for many years, research findings suggest that duration of exposure may not be the defining feature. In Kaikoura, New Zealand, research on dusky dolphins, *Lagenorhynchus obscurus*, showed that 'dolphin groups often react to vessels and do not appear to have greatly habituated despite nine years of tourism' (Würsig *et al*. 1997). This lack of habituation persisted despite the fact that 'humans are with the dolphin group during about 70% of daylight hours' (Würsig 1996).

Habituation status is also difficult to assess when a few individuals appear to be habituated within a larger community of unhabituated animals. This may be the case for the spinner dolphins, *Stenella longirostris*, of Kealakekua Bay, Hawaii, United States, for which there are anecdotal reports that certain humans have formed long-term relationships with individual dolphins in the bay (McNarie 1999). However, preliminary results of studies there suggest that resting dolphins are disturbed by human activity that includes tour boats, kayaks, and swimmers (Wursig 1996; Green and Calvez 1999; Forest 2001), therefore, these dolphins are not habituated. Thus, we included as 'not habituated', cetaceans that have opportunistic encounters with humans and human activity, cetaceans that have long-term exposure to swimmers and/or swim tours but still show signs of disturbance, and communities in which an unspecified subset of animals may be habituated to in-water encounters.

The 'Diver's Guide' advertises that swimming with unhabituated cetaceans incurs a 'low risk of aggression' (Perrine 1998). However, a woman was nearly killed by an unhabituated pilot whale, *Globicephala macrorhynchus*, illustrating that swimming with any wild cetacean can be dangerous (Shane *et al*. 1993; Shane 1995).

The majority of swim-with situations involve unhabituated cetaceans. The list of unhabituated cetaceans that are the focus of this tourism includes such familiar swim-with situations and species as spinner dolphins in Hawaii (Simonds 1991; Barber *et al*. 1995; Würsig 1996; Driscoll-Lind and Östman-Lind 1999; Green and Calvez 1999; McNarie 1999; Psarakos and Marten 1999; Forest 2001), and dusky, bottlenose, and common dolphins, *Delphinus delphis*, in New Zealand (Doak 1994; Amante-Helweg 1996; Würsig 1996; Barr 1997; Constantine and Baker 1997; Findlay 1997; Würsig *et al*. 1997; Barr and Slooten 1998; Constantine 1999; Suisted 1999; Yin 1999; Yin and Würsig 1999; Constantine 2001). The list of unhabituated cetaceans also includes a number of less well-known sites and species. These include Hector's dolphins, *Cephaloryhnchus hectori*, in New Zealand (Bejder and Dawson 1998; Bejder *et al*. 1999; Constantine 1999), dense beaked whales, *Mesoplodon densiros-*

tris, near the Canary Islands (Ritter 1996; Ritter and Brederlau 1999), melon-headed whales, *Peponocephala electra*, and humpback whales, *Megaptera novaeangliae*, in the South Pacific (*e.g.* Constantine 1998; Orams 1999) and the Caribbean (Streeter 2000), killer whales, *Orcinus orca*, in Norway (Cochran 2001), and sperm whales, *Physeter catodon*, near the Azores and Canary Islands, and in the Caribbean and Mediterranean seas (Ritter 1996; IFAW 1997; Constantine 1999). In all, we documented at least 47 locations where people regularly swim with at least 17 species of cetaceans (Table 6). The list of swim-with tourism involving unhabituated cetaceans is so extensive that, for clarity, we summarised available information by region.

New Zealand

There are now more than 20 tour operations dedicated to swimming with dolphins in New Zealand. Some of these operations have received considerable scientific scrutiny, primarily evaluating responses of dolphin groups to vessel approaches. Research includes shore- and boat-based studies of bottlenose, common, dusky and Hector's dolphins, with most studies indicating that vessel approaches are associated with behavioural change. In several studies (e.g. Yin 1999; Constantine 2001), dolphins interacting with swimmers or boats appeared to be small subsets of the larger group. For bottlenose dolphins in Bay of Islands, 32% of vessel approaches resulted in changes in group activity with feeding least likely and socializing most likely to be disrupted; for common dolphins, 52% of approaches resulted in behavioural change with resting least likely and socializing most likely to change (Constantine and Baker 1997). For dusky dolphins in Kaikoura, 83% of vessel approaches resulted in behavioural change, with interruptions to feeding and resting behaviour (Würsig *et al.* 1997). There, disrupted resting and feeding did not resume after the boats departed (Barr 1997; Barr and Slooten 1998). In the presence of boats, dusky dolphins also formed more compact groups, changed direction of travel, and/or became more active during their normally quiescent afternoon period (Barr 1997; Barr and Slooten 1998; Yin and Würsig 1999). Similarly, Hector's dolphins in Porpoise Bay formed more compact groups in the presence of boats; in addition, they appeared to be attracted to boats during the early stages of encounters, but tended to orient away from vessels if encounters lasted more than 70 min (Bejder and Dawson 1998; Bejder *et al.* 1999). In Akaroa Habour, Hector's dolphins increased swimming rates with corresponding increases in the number of boats present (Nichols *et al.* 2001). Although no significant effects of boat presence on group travel speed by dusky dolphins were detected, Yin (1999: 41) cautioned that 'observable trends … are potentially important enough that a conservative approach is recommended.'

New Zealand studies provide some of the best information to date about responses of dolphins to swimmers in the water. In these studies, sustained interactions are typically interpreted as evidence of attraction to humans and unsuccessful swim attempts as evidence of avoidance. For Hector's dolphins in Porpoise Bay, 57% of in-water encounters were sustained ($\geq$5 min), whereas 42% were classified as at least potentially disturbing (Bejder and Dawson 1998; Bejder *et al.* 1999). For bottlenose and common dolphins in Bay of Islands, 60% and 31%, respectively, of swim attempts were successful (*i.e.* at least 1 dolphin within 5 m of a swimmer), with 48% and 24% of successful swims resulting in sustained interactions (mean = 4.2 and 5.3 min, Constantine and Baker 1997). A follow-up study by Constantine (2001) found that from 1994-95 to 1997-98, the success of swim-with attempts with bottlenose dolphins decreased from 48% to 34%, while avoidance increased from 22% to 31% of attempts. In Bay of Islands, the average bottlenose dolphin was estimated to be exposed on an annual basis to 29 encounters with swim-with boats and 31 swim attempts, a level of exposure suggesting that individual dolphins have, with cumulative experience, become sensitised to swim attempts (Constantine 2001).

Australia

There are four locations where people swim with unhabituated bottlenose dolphins in Australia. Swim-with-dolphin operations are best documented in Port Phillip Bay, Victoria. There, research, modelled on the Constantine and Baker (1997) study, showed that 60% of swim attempts were successful with dolphins nearby. However, in only 17% of these swims did dolphins interact with swimmers; whereas in 33% dolphins avoided swimmers (Weir *et al.* 1996). They noted that extended observations by sequential boats result in groups being disturbed for hours at a time, and reported situations where the dolphins were hemmed in by more than 20 boats (Weir *et al.* 1996). A recent study in Port Phillip Bay reported a vocal response to vessel approaches, in the presence of commercial tour vessels (Scarpaci *et al.* 2000). Current research in Port Phillip Bay includes investigations to determine what proportion of the local dolphin community, and which individual dolphins, have regular interactions with humans (W. Dunn, personal communication).

Only limited information is available from other Australian sites, although there is on-going research at Port Stephens, New South Wales (Allen and Harcourt 2001; Allen *et al.* 2001). Little is known about the effects of the recently-initiated, state-licensed operations in Mandurah and Bunbury, Western Australia.

Canary Islands

Two studies have focused on unhabituated cetaceans in waters near the Canary Islands (Heimlich-Boran *et al.* 1994; Ritter 1996; Ritter and Brederlau 1999; Ritter 2002). Pilot whales delayed rising to the surface and formed more compact groups in the presence of boats (Heimlich-Boran *et al.* 1994). However,

Table 6 Cetaceans that are not habituated to in-water encounters with humans
Codes from Table 2

Location		Species	Affected animals	Extent of human activities	Potential impacts	Cetacean risk details	References
Australia	Bunbury, Western Australia	bottlenose dolphin	coastal resident dolphins	1 seasonal boat-based SW tour operator since 1999; in 1999–2000 season, 61 tours/449 swimmers during 155 days; free swim and mermaid lines	NA = information not available	NA	O'Neill and Lee 2001; F. O'Neill (formerly of Dolphin Discovery Center, Bunbury WA), 2001, pers. comm.
	Mandurah, Western Australia	bottlenose dolphin	80–100 coastal resident dolphins; some known individuals	1 seasonal boat-based SW tour operator since 1999; 1 boat w/ up to 8 tourists, 1 trip per day; some individual dolphins more interested in SW than others	NA	NA	S. Kirby (Dolphin Encounters, Mandurah WA), 2001, pers. comm.
	Port Stephens, New South Wales	bottlenose dolphin	100–150 coastal dolphins; *c.* 50% resident; *c.* 50% involved in majority of SW activity	year-round SW tours since *c.* 1991; increase from 2 to 13 dolphin-watch (including SW) vessels in past 10 yrs; most operators use boom nets but one operator does free swims	GR, AV	responses to tour vessel approaches include avoidance & original group splitting into subgroups	Allen *et al.* 2001; Allen and Harcourt 2001; S. Allen (Macquarie U. PhD program, NSW), 2001, pers. comm.
	Port Phillip Bay, Victoria	bottlenose dolphin	100 coastal resident dolphins, many identified individuals; juveniles more likely to interact?	SW since 1989; 4 dedicated SW operators, each doing 2–3 trips per day, plus several occasional vessels; in 2001, at least 1 tour vessel on the water from dawn till dusk; average interaction duration = 35 min	FO, MC, JD, AV, panic	tour boats attracted to foraging groups; dolphins more likely to avoid swimmers in nursery/ foraging area; when surrounded by boats dolphins exhibit panicky behavior; in 1996: 40% of 440 swims unsuccessful; most invasive approach types resulted in highest % successful swims as well as highest % avoided swims; whistling increased in presence of tour vessels	Orams 1995; Weir *et al.* 1996; Perrine 1998; Scarpaci *et al.* 2000; W. Dunn (Dolphin Research Institute, VIC), 2001, pers. comm.
New Zealand	Kaikoura	dusky dolphin	large, inshore groups of up to 750 dolphins	SW since 1989; year-round since 1994; in 1996: humans with dolphins during *c.* 70% of daylight hours; in 2001, 1 dedicated SW operator w/ 3 boats, maximum 50 trips per week	FO, RE, GR, AV, BC, no respite from tourists during daytime	responses to boat approaches include interrupted feeding and rest; behavior changes include bow-ride, form subgroups, scatter or bunch together, change direction or speed up; dolphin groups more compact and active when boats nearby during afternoon rest period; unable to compare dolphin behavior in presence/ absence of tourists because tourists nearly always present	Würsig 1996; Barr 1997; Würsig *et al.* 1997; Barr & Slooten 1998; Constantine 1999; Perrine 1998; Yin and Würsig 1999; Yin 1999

	Bay of Islands	bottlenose, common dolphin	450 resident coastal bottlenose dolphins; juveniles more likely to interact	SW since 1991; since Dec 1998, 6 vessels run up to 10 trips per day year-round; from 1994-95 to 1997–98, # SW attempts increased from 2.7 to 3.1 per encounter; in 1997-98, average dolphin annually exposed to 29 encounters with SW boats and 31 SW attempts; most frequently seen dolphin likely to be exposed to 147 SW attempts per year	SO, JD, BC, AV, increased avoidance over long-term	bottlenose dolphins: feeding least likely and socializing most likely to change during vessel approach; 32% of approaches resulted in behavioral change (including dolphins approaching vessel); from 1994-95 to 1997-98, decreased SW success (from 48% to 34% of attempts) and increased SW avoidance (from 22% to 31%); common dolphins: resting least likely and socializing most likely to change during vessel approach; 52% of approaches resulted in behavioral change but no avoidance; operator strategy had significant effect on dolphin response to swimmers	Amante-Helweg 1996; Constantine and Baker 1997; Constantine 1999, 2001; Perrine 1998
	Porpoise Bay	Hector's dolphin	50–65 dolphins, seasonally resident	one commercial dolphin-watch operator; casual SW from shore; at least 1 boat and at least 1 swimmer present during 12% and 11% of observations, respectively, during season of highest impact	FO, RE, HA, BR, AV	dolphins remained nearby in 57% SW attempts, left w/in 5 min in 30%, left immediately in 12%; lengthy, repeated WW tours speculated to disrupt critical energy budgets with possible consequences on rest, feeding, breeding success, habitat use	Bejder & Dawson 1998; Constantine 1999; Bejder *et al.* 1999
	Banks Peninsula	Hector's dolphin	NA	SW since 1990; now 3 SW and 1 WW operators, total of 8 boats (+ 12 kayaks) running 26 trips per day	NA	NA	Nichols *et al.* 2001
	many other locations	bottlenose, common, dusky, Hector's dolphin	NA	50 permits at 22 sites in 1999; now 20+ operators dedicated to SW	NA	NA	Constantine 1999
South Pacific	Nuka Hiva, Marquesas, French Polynesia	melon-headed whale	NA	opportunistic encounters	NA	NA	M. Poole (CRIOBE, Moorea), 2001, pers. comm.
	Rurutu, French Polynesia	humpback whale	NA	dedicated SW recently initiated	MC?	possible harassment of cows with calves	M. Poole (CRIOBE, Moorea), 2001, pers. comm.
	New Caledonia	humpback whale	NA	19 WW vessels; SW occasional	NA	NA	Garrigue and Virly 2000
	Tonga	humpback whale	NA	8 permits for WW; all allow SW	NA	NA	Orams 1999; Peluso 2001; O. Andrews (Whales Alive Australia), 2001, pers. comm.
	Niue	spinner dolphin, humpback whale	NA	small scale SW operation; 2 dedicated and 1 opportunistic operators	NA	NA	Constantine 1998

Table 6 Cetaceans that are not habituated to in-water encounters with humans *(Contnued)*
Codes from Table 2

Location		Species	Affected animals	Extent of human activities	Potential impacts	Cetacean risk details	References
South America	Fernando de Noronha, Brazil	spinner dolphin	dolphins resting near shore	previously there were *c.* 14 vessels conducting year-round SW tours; SW banned following pilot study showing disturbance; WW still allowed	RE	concerns expressed about effects of tours on resting dolphins	F. Mourao (Brazilian Right Whale Project), 2001, pers. comm.
Central America	Silver Bank, Dominican Republic	humpback whale	animals on breeding and calving grounds	NA	NA	NA	Streeter 2000
North America	Big Island & Oahu, Hawaii, USA	spinner dolphin	resting dolphins in sheltered bays	SW in Kealakekua Bay since early 1980s; dolphins easily accessible from shore; when dolphins in bay, may be 10–30 swimmers, 30–40 kayakers, commercial and private vessels	RE, HA, BC	disturbance to resting dolphins; increased aerial displays in presence of tourist activity; decrease in dolphin presence in bay since 1979 may be linked to increased tourist activity	Simonds 1991; Barber (now Forest) *et al.* 1995; Würsig 1996; Perrine 1998; Driscoll-Lind and Östman-Lind 1999; Forest 2001; Green and Calvez 1999; McNarie 1999; Psarakos and Marten 1999
	Big Island, Hawaii, USA	pilot whale	single encounter with 5 whales	opportunistic encounter in which swimmer stroked whale, whale bit and dragged her under	NA	NA	Shane *et al.* 1993; Shane 1995
Southern Africa	Kizimkazi, Menai Bay, Zanzibar	focus on bottlenose dolphin; also humpback dolphin	resident coastal dolphins; *c.* 160 bottlenose & 65 humpback individually identified	SW since 1992; now 5 dedicated operators from 2 villages, *c.* 35 boats, 1-2 trips per day, peak tourism in Oct-Feb	AV? BC?	disturbance behaviors (tail slap, chuff) in response to inappropriate boat approaches, e.g., multiple boats surround dolphins, revved engines, quick approaches	Stensland *et al.* 1998; Berggren 2000; Amir and Jiddawi 2001; Englund 2001; P. Berggren (U. Stockholm) and O. A. Amir (U. Dar es Salaam), 2001, pers. comm.
	Ponta D' Ouro, Mozam-bique	bottlenose dolphin	NA	SW since 1995; 1 permanent and 2 seasonal operators	NA	NA	V. Peddemors (Kwa Zulu Natal Sharks Board), 2001 pers. comm.
	4 locations in Kwa Zulu Natal, South Africa	bottlenose dolphin, occasional spinner, spotted, common dolphin	NA	dedicated SW at 2 locations (Salt Rock, Umhlanga Rocks) ongoing despite ban	NA	NA	V. Peddemors (Kwa Zulu Natal Sharks Board), 2001 pers. comm.
North Atlantic	Norway	killer whale	NA	NA	NA	NA	Cochran 2001

	La Gomera, Canary Islands	bottlenose, rough-toothed, spotted, striped dolphin; pilot, beaked, sperm, sei whale	cetaceans within 5 km of shore	WW since 1992; SW banned since 1996; previously: 2 tour operators make multiple SW attempts per trip; opportunistic encounters; average swim duration <4 min; in 27% of in-water encounters >=2 boats present; dense beaked whals comprised 5% of encounters; longest interaction (1 h 40 min) resulted in underwater photos of beaked whales	AV, BC, GR	46 cetacean encounters resulted in 20% avoidance, 22% distant sighting, 20% cetaceans curious about boat but avoided swimmers, 38% in-water encounters with swimmers; variable responses by dense beaked whales to boats/swimmers included in 7 encounters: approach, spy hop, change speed or direction to accomodate boat movements versus form compact group; breach, tail-slap, frequently change direction of travel, porpoise away at high speed	Heimlich-Boran *et al.* 1994; Ritter 1996, 2002; Ritter and Brederlau 1999
	Tenerife, Canary Islands	pilot whale	resident coastal whales	SW since 1991, banned since 1996; up to 25 medium-sized to large commercial boats, each carrying 20–150 passengers, some run multiple trips per day	AG, FO, SO	presence of boats may alter feeding and social behavior; observed aggressive behavioral displays directed towards boats and between whales in presence of boats	Heimlich-Boran *et al.* 1994; Ritter 1996
	Azores	bottlenose, spotted, striped, common, Risso's dolphin; sperm, killer, false killer, pilot whale	near-shore animals	SW since 1992; as of 1996, at least 4 commercial operators; opportunistic encounters; details re sperm whales provided below	not specified	boat approaches and placement of swimmers may be "aggressive"	IFAW 1997; S. Heinrich, 2000, pers. obs.
Worldwide	Azores, Dominica, Grenada, Galapagos, Mediterra-nean Sea	sperm whale	coastal whales, including cow/ calf	SW since 1992 in Azores, 1990 in Dominica, 1994 in Grenada, 1987 in Med; as of 1996, at least 1–4 operators w/ WW programmes in each location; SW is opportunistic (Azores, Med) and/or discouraged (Dominica)	MC? SO?	in Dominica (and elsewhere): SW occurs in near-shore waters frequented by socializing and cow/calf groups; may disrupt maternal care	IFAW 1997

the study provided no information about the increasingly popular 'Swim-With-The-Whales' trips. This study was noteworthy in that the focus was on the behaviour of individuals rather than groups of whales. In another study, Ritter (1996) conducted group-focal observations of in-water interactions between cetaceans and humans, making observations from tour vessels and from in the water: 46 cetacean encounters by commercial tour vessels resulted in 20% avoidance and 38% 'intense' in-water encounters (i.e. cetaceans interacted with swimmers) with pilot whales or spotted, bottlenose, or rough-toothed dolphins, *Steno bredanensis*. Ritter (1996) provided anecdotal information about swimming with uncommon species, such as dense beaked whales, which did not appear to avoid the presence of humans, and sei whales, *Balaenoptera borealis*, which seemed to tolerate the boat and were partially curious. In a later report, Ritter and Brederlau (1999) described variable responses of beaked whales to boats and swimmers. In seven sightings, dense beaked whales remained distant or were curious and approached; groups were compact; whales oriented towards the boat or changed swim speed or direction to accommodate boat movements; whales breached, tail-slapped, spy-hopped, or frequently changed direction of travel; and in one instance, a group sprinted several hundred meters with the animals repeatedly porpoising at high speed. Ritter (2002) described opportunistic swim encounters with rough-toothed dolphins, and reported that swim-with activities have been prohibited in the Canaries since 1996.

United States

Swimming with spinner dolphins occurs in coastal waters of the Hawaiian Islands, even though this activity has been interpreted by the US National Marine Fisheries Service as harassment (NMFS 2002), and is therefore illegal under the Marine Mammal Protection Act. Several researchers have focused on responses of spinner dolphin groups to human activity in Kealakekua Bay and elsewhere in Hawaii but results are preliminary (Barber (now Forest) *et al*. 1995; Forest 2001; Green and Calvez 1999; Psarakos and Marten 1999). Spinner dolphins enter protected bays in daytime to rest and socialise, critical activities that may be disrupted because the dolphins are readily accessible to large numbers of human swimmers and kayakers (Würsig 1996). Green and Calvez (1999) described diurnal activity patterns for humans and spinner dolphins in the bay. In the early morning, a few local people swam, and dolphins were interactive, at midday, there were many tourists and boats, and dolphins appeared to avoid them, in the afternoon, there was decreased human activity, and the dolphins rested. Forest (2001) collected data in 1993-94 and was able to make comparisons with pre-tourism data from 1979-80. Her results suggested that tourism has had detrimental effects on the dolphins but she noted that other explanations cannot be ruled out (such as effects of a weak El Niño during her study). Dolphin residence was 21% lower in 1993-94, a finding that may be taken to indicate that the bay has become less suitable for the dolphins (Forest 2001). In addition, there was an overall reduction in the frequency of the most athletic aerial displays, a finding which may suggest that dolphins have reduced energy levels, presumably due to increased tourist activity (Forest 2001). Furthermore, human activity (swimmers, kayaks, motor boats) had a significant effect on surfacing patterns during the dolphins' normal rest period in the afternoon, but there was no effect in the morning when dolphins are typically active (Forest 2001).

Other sites

Limited information is available from other sites where people swim with unhabituated cetaceans. In the Fernando de Noronha Archipelago, Brazil, swimming with spinner dolphins was banned recently after a study raised concerns about the effects of tours on dolphins resting in near-shore waters (F. Mourao, personal communication).

In the South Pacific, swimming with humpback whales is occasional in New Caledonia and Niue, and more established elsewhere, with one dedicated operator in the Austral Islands and four operators in Vava'u (Constantine 1998; Orams 1999; Garrigue and Virly 2000; M. Poole 2001, personal communication). In addition, there are opportunistic in-water encounters with melon-headed whales in the Marquesas Islands, and targeted encounters with spinner dolphins in the Austral Islands (Constantine 1998; M. Poole 2001, personal communication).

In Southern Africa, swimming with bottlenose dolphins occurs in Mozambique, and despite a national ban on such activities, in four locations in South Africa (V. Peddemors 2001, personal communication). There is ongoing research on the effects of dolphin-focused tourism in Zanzibar (Stensland *et al*. 1998; Berggren 2000; Amir and Jiddawi 2001; Englund 2001; P. Berggren and O. A. Amir, 2001, personal communication).

Finally, swimming with sperm whales occurs in at least five locations worldwide (IFAW 1997).

There is considerable information from a few sites about behavioural change associated with swim-with tourism that focuses on unhabituated cetaceans. In contrast, from other sites, there is virtually no information either about the scope of this tourism or the effects (Table 6). Some research has laid the groundwork for a better understanding of short-term effects of swim-with-cetacean operations on unhabituated cetaceans, and in a few locations, has proven invaluable to the development of management plans. The contributions, limitations and future of the research efforts are further discussed below.

A DISCUSSION OF SWIM-WITH TOURISM BASED ON FINDINGS FROM THE SOUTHERN HEMISPHERE

This review clearly demonstrates that swimming with free-ranging cetaceans is flourishing in the Southern Hemisphere. We documented at least 46 sites in the Southern Hemisphere where at least 11 species of cetaceans, representing all four categories of in-water encounters, are targeted for swim-with activities (all but lone, sociable cetaceans are listed in Table 7). The Southern Hemisphere inventory includes a number of the less well-known swim-with locations and species, including dwarf minke whales and Indo-Pacific humpback dolphins in Australia, melon-headed and humpback whales in the South Pacific, and Tucuxi in Brazil. A survey of swimming with wild cetaceans within the Southern Hemisphere encompasses the full range of swim-with programmes found around the globe, including some of the most and least familiar of targeted species, some of the most and least disruptive of human interaction scenarios, some of the most and least successful of management scenarios, and some of the topics about which there is the most and the least knowledge. Therefore, a discussion from a Southern Hemisphere perspective is a profitable way to obtain an overview of issues pertinent to swim-with tourism worldwide.

A range of methods have been used to place people in the water near free-ranging cetaceans. The majority of situations are ones in which commercial boat-based tours are dedicated to swimming with wild cetaceans. In a few locations, however, swim-with activities occur opportunistically, either as part of commercial dive tours (e.g. some tours in the Great Barrier Reef, Australia); on an informal, non-commercial basis, as when tourists try to swim with provisioned dolphins after feeding sessions (e.g. Monkey Mia, Australia); or when casual swimmers have easy access from shore to wild cetaceans (e.g. Porpoise Bay, New Zealand). Swimming with provisioned cetaceans usually involves access from shore (e.g. Monkey Mia and Tin Can Bay, Australia) where the behaviour of humans in the water can be explicitly controlled (e.g. Bunbury, Australia). Putting people in the water with wild cetaceans

In boat-based programmes, tour operators may make one or multiple successive attempts, using a variety of strategies to get swimmers close to cetaceans. In the Bay of Islands, New Zealand, Constantine (2001) identified three main methods of swimmer placement: 'line abreast' (swimmers enter the water slightly ahead and to one side of the cetaceans' path of travel), 'in path' (swimmers enter the water in the cetaceans' path of travel), and 'around boat' (swimmers enter the water while cetaceans are milling near a stationary boat). Current New Zealand regulations specify that tour operators cannot cut off the animals' path of travel, but it is apparent that this rule is currently inadequate. Elsewhere, more invasive strategies have sometimes been used, including encircling a cetacean group with one or more boats (e.g. Port Phillip Bay, Australia).

In some boat-based programmes, tourists are permitted to swim freely in proximity to cetaceans (e.g. Bay of Islands and Kaikoura, New Zealand). At other locations, various methods have been used to control swimmer movements and to transport people through the water, including holding on to a motorised underwater scooter (e.g. Rockingham, Australia), and grasping onto 'mermaid lines' (e.g. Great Barrier Reef, Australia) or sitting in 'boom nets' (Port Stephens Bay, Australia, and Bay of Islands, New Zealand) that are towed by vessels.

Operator strategy has a significant effect on the dolphins' responses to swimmers. In the Bay of Islands, New Zealand, 'line abreast' and 'in path' strategies resulted in the lowest and highest rates of avoidance, respectively (Constantine and Baker 1997), with increasing avoidance over the years to 'in path' and 'around boat', and decreasing avoidance to 'line abreast' (Constantine 2001). Techniques resulting in high rates of sustained interaction were the same ones that yielded high rates of avoidance, which led Constantine and Baker (1997) to recommend that minimizing disturbance to the dolphins should be considered a higher priority in regulatory decisions than maximizing swim success. Using a similar research paradigm in Port Phillip Bay, Australia, Weir *et al.* (1996) documented that the most disruptive operator techniques yielded both the highest percentage of successful swims and the highest rate of avoidance. In fact, highest rates of avoidance occurred in the context of placement types that are not allowed in New Zealand, which was taken as circumstantial evidence to suggest that New Zealand regulations effectively target the most invasive strategies.

Protecting wild cetaceans in swim-with activities

New Zealand has been touted by some as a model country for its careful regulation of nature-based tourism to protect free-ranging cetaceans (Hoyt 2001). There, all swim-with operators must be licensed under the Marine Mammals Protection Act (1978) which prohibits in-water encounters with cetacean calves or any whale species. Regulations, combined with conditions on each permit, specify for each operator the number of boat trips that may be made per day, the number of boats that may be near cetaceans at any one time, and the number of swimmers that may be in the water at any one time. There are good examples in some areas in which open channels of communication among wildlife managers, researchers, and tour operators facilitate the acknowledgment and resolution of potential problems (Würsig 1996).

As one example, the finding that dusky dolphins were repeatedly disturbed by tourists while resting (Barr and Slooten 1998) led to local voluntary guidelines to safeguard the dolphins' midday rest periods (Yin 1999). In addition, local voluntary guidelines

Table 7 A special focus on swimming with wild cetaceans in the Southern Hemisphere

Status	Location		Species	Regulations, guidelines, licensing
Habituated?	**Australia**	Great Barrier Reef, Queensland	dwarf minke whale	access limited by state permit, national park regulations, and remote location; current proposal to increase number of permits; specific guidelines for interacting with whales
		Rockingham, Western Australia	bottlenose dolphin	state licensing for one SW operator
Habituated through food provisioning	Australia	Bunbury, Western Australia	bottlenose dolphin	state licensing for food provisioning; SW provisioned dolphins permitted
		Monkey Mia, Western Australia	bottlenose dolphin	state licensing for FP; SW provisioned dolphins occasional and discouraged
		Tangalooma, Queensland	bottlenose dolphin	state licensing for FP; SW provisioned dolphins prohibited
		Tin Can Bay, Queensland	Indo-Pacific humpback dolphin	recent controls on FP and SW, with partial compliance
	Brazil	Sao Vicente and Cananéia sanctuary	Tucuxi	as of late 1999, Brazilian Marine Mammals Action Plan did not specifically address SW and FP
Not Habituated	Australia	Bunbury, Western Australia	bottlenose dolphin	state licensing for one SW operator
		Mandurah, Western Australia	bottlenose dolphin	state licensing for one SW operator; may be illegal operations as well?
		Port Stephens, New South Wales	bottlenose dolphin	bottlenose and common dolphins excluded from state WW regulations; current proposal to institute permitting system for SW and boat-based tours
		Port Phillip Bay, Victoria	bottlenose dolphin	voluntary SW code since 1994; state licensing since 1997, but does not limit number of permits or time with dolphins; *c.* 50% compliance with regulations in 2001
	New Zealand	Kaikoura	dusky dolphin	all SW operators licensed under national MMPA; additional voluntary guidelines to safeguard dolphin rest periods
		Bay of Islands	bottlenose, common dolphin	all SW operators licensed under national MMPA
		Porpoise Bay	Hector's dolphin	all SW operators licensed under national MMPA; current proposals for permit conditions to limit durations of encounters and number of operators
		many other locations including Auckland, Banks Peninsula, Bay of Plenty, Coromandel, Doubtless Bay, Marlborough Sounds, Tutukaka, Whangarei	bottlenose, common, dusky, Hector's dolphin	all SW operators licensed under national MMPA; national regulations include ban on SW all whale species and dolphin calves
Not Habituated	South Pacific	Nuka Hiva in Marquesas Islands, French Polynesia	melon-headed whale	
		Rurutu in Austral Islands, French Polynesia	humpback whale	
		Tonga	humpback whale	8 permits for WW and SW
		New Caledonia	humpback whale	
		Niue	spinner dolphin, humpback whale	
	South America	Fernando de Noronha, Brazil	spinner dolphin	as of 2001, SW banned pending further research
		Galapagos Islands	sperm whale	as of 1996, voluntary guidelines for SW
	Southern Africa	Kizimkazi on Menai Bay, Zanzibar	primarily bottlenose dolphin	SW guidelines introduced in 1998 with improved compliance in 2001
		Ponta D' Ouro, Mozambique	bottlenose dolphin	
		Salt Rock, Jodwana, Umhlanga Rocks, and Umkomaas in Kwa Zulu Natal, South Africa	primarily bottlenose dolphin	national ban on SW since 1998 but some opertations persist

were instituted to minimise the impact of tourism on the lone, sociable dolphin, Maui (Constantine 1999). A study in Porpoise Bay demonstrated that Hector's dolphins avoided tour vessels after prolonged exposure, and that the same individual animals within a resident population were being subjected to repeated exposures (Bejder *et al*. 1999). These findings led to pending proposals for permit conditions that will restrict durations of encounters and limit the number of commercial operators to one (H. Kettles, personal communication). Do these examples indicate that cetaceans in New Zealand waters are effectively protected? Perhaps not – a study with a unique longitudinal perspective indicates that there is still a lot to be learned about the ways in which cetaceans may be affected by human activity and that continued monitoring over the long term is essential (Constantine 2001).

Management of cetacean-focused tourism in the Great Barrier Reef Marine Park in Australia has also been held up as a good model (Corkeron 1998). There, access to dwarf minke whales has been limited by the remote location, state licensing, and particularly by national park regulations specific to swimming with whales. There, too, an exchange of ideas among wildlife managers, researchers, and tour operators is apparent (Birtles *et al*. 2001a; Birtles *et al*. 2001b). Nevertheless, there is a proposal to increase the number of permitted operators in this region (Stokes *et al*. 2002). Only ongoing, long-term monitoring will affirm whether the management partnership is successful in minimizing adverse effects on these whales.

In Brazil, wildlife managers have taken a cautious stance in regards to swimming with spinner dolphins in and around Fernando de Noroha National Marine Park. In response to preliminary evidence that in-water encounters were disturbing to resting dolphins, these activities were suspended pending further research (F. Mourao, personal communication).

The dolphin feeding programme at Monkey Mia, Australia, provided confirmation that uncontrolled (or even moderately controlled) food provisioning is harmful to cetaceans. However, ensuing reviews of dolphin feeding at Monkey Mia (Wilson 1994; Wilson 1996) had the positive effect of setting the stage for strict management protocols that were needed there and elsewhere around the world. Now, with the exception of existing sites, food provisioning of wild cetaceans is prohibited throughout Australia (Environmental Protection and Biodiversity Conservation Act, 1999). At Monkey Mia and Tangalooma, rigorous controls on food provisioning and human interaction have been instituted, and managers at those sites are now cautiously optimistic that this form of cetacean-focused tourism, if strictly controlled, can be sustained with minimal detrimental effects on the animals. However, as it took years to confirm that Monkey Mia dolphins were being harmed by food provisioning, it will likely be years more before controlled feeding can be regarded as successful.

In Port Phillip Bay, Australia, a voluntary code of conduct established in 1994 by tour operators and local researchers led to a state licensing system that was instituted in 1997 (W. Dunn, personal communication). It has not yet been demonstrated whether the licensing system has had an effect on interactions with dolphins.

For all its promise of progressive management, the Southern Hemisphere also provides some examples of inadequate management of cetacean-focused tourism. Tin Can Bay, Australia, is perhaps the most egregious of these examples. In its heyday, up to eight Indo-Pacific humpback dolphins, a rare species, were illegally fed to satiation with fish of questionable quality by unsupervised and badly-behaved tourists (Garbett and Garbett 1997). Things have improved since state wildlife managers and the local community negotiated some controls on this activity (Wortel 2001), but the agreement is a compromise, albeit well-intentioned, that protects some but not all of the animals (R. Constantine, observations).

Studying wild cetaceans involved in swim-with activities

With respect to impact assessment, Gales (1999) noted that 'the management of commercial swim-with-dolphin programs… has proceeded without clear scientific guidance. As is the case with most marine mammal/human interactions the demand and growth of this industry has significantly outstripped the ability of scientists to develop and implement sufficiently sensitive tools that might provide some sound basis for management decisions.' This observation was specific to the situation in Australia but is valid elsewhere in the world (see also: Bejder and Samuels, this volume). Even in New Zealand where there has been considerable scientific scrutiny evaluating swim-with-cetacean tourism, and where wildlife managers have been responsive to scientists' findings, research that focuses on impacts of these activities is in its infancy.

Nevertheless, it is research from the Southern Hemisphere that has highlighted the significance of longitudinal monitoring of human impact situations. For example, it took long-term records of offspring survival and the behaviour of individual dolphins to discover that food provisioning was harmful to Monkey Mia dolphins in Australia (Wilson 1994; Mann *et al*. 2000). Similarly, it took longitudinal research on bottlenose dolphins in Bay of Islands, New Zealand, to demonstrate increased avoidance of swimmers due to long-term exposure to swim-with tourism (Constantine 2001).

However, most studies that evaluate swim-with situations have focused on short-term responses by groups of cetaceans, and particularly, group responses to vessel approaches. These emphases

are in part dictated by methodologies used (distant, shore-based observations; in-water or tour vessel-based observations), and are necessary first steps. But, as noted by several researchers, this is only the tip of the iceberg, and more refined, in depth, and longitudinal investigations are needed (e.g. Chapter 12, this volume; Ransom 1998; Samuels and Bejder 1998, in press; Constantine 1999;Yin 1999; Constantine 2001).

Authors themselves have pointed out the limitations of their research findings. Barr and Slooten (1998) noted for dusky dolphins, a species already heavily impacted by human activity, that there are insufficient control data on undisturbed behaviour to assess impacts of swim-with activities: 'It is very difficult to determine whether boats and swimmers affect dolphin behaviour when periods without boats and swimmers are so few and so brief... If dolphins take several hours to return to 'normal' behaviour after a boat visit, then almost all of the observations reported on here represent modified behaviour.' Constantine and Baker (1997) were clear that their observations, collected from commercial tour vessels, may have included only those dolphins that were tolerant of boat approaches. Yin (1999) noted that her results may have been biased by selecting focal groups that were small in size and far from other dolphin groups, i.e. potentially less accessible to tourists. Finally, 'before and after' comparisons have rarely been made because pre-tourism data have been collected on very few populations. As noted by Bejder and Dawson (1998): 'Despite the obvious need… no New Zealand [or any other] cetacean population has received detailed study before being targeted by commercial whale or dolphin-watching operations. Hence, 'before and after' comparisons are impossible' (but see: Forest 2001).

The available research sets the stage for beginning to understand effects of swim-with tourism on the behaviour and well-being of wild cetaceans. In addition to existing shore-and commercial-vessel-based studies that focus on group behaviour and group response to vessel approaches (Southern Hemisphere examples include: Weir *et al.* 1996; Würsig *et al.* 1997; Constantine and Baker 1997; Barr and Slooten 1998; Arnold and Birtles 1999; Bejder *et al.* 1999; Yin 1999; Yin and Würsig 1999; Birtles *et al.* 2001b; Constantine 2001), complementary studies are also needed that: identify which age/sex classes within cetacean groups interact with or avoid swimmers (Constantine 2001), take a longitudinal approach (Constantine 2001), provide baseline data prior to new tourist activities (Bejder and Dawson 1998; Forest 2001), and focus on the behaviour of individual animals (*e.g.* Heimlich-Boran *et al.* 1994; Samuels and Bejder 1998, in press; Smith 2001).

The technique of focal-animal follows of individually-recognised animals is valuable in that it allows for quantitative measures of frequencies of specific behavioural events, durations of behavioural states, and time budgets, all of which lend themselves to direct comparisons between individuals, age/sex or reproductive classes, and disturbance conditions (Altmann 1974; Martin and Bateson 1986). Focal-individual follows are not practical in all situations (*e.g.* groups of dusky dolphins numbering in the hundreds), but are likely to be feasible in many cases of both habituated and unhabituated cetaceans, and would complement and fill the gaps in information obtained from existing methodologies. Studies using this method would provide much-needed information for formulating and implementing sound management decisions regarding in-water interactions between humans and cetaceans. Such research might include: (1) details of in-water interactions between cetaceans and humans, including types and frequencies of interactions, (2) comparisons of the behaviour of the same individual cetaceans in the presence and absence of swimmers, (3) comparisons of the behaviour of individual cetaceans that do and do not interact with swimmers in the same region or community, and (4) determining which individual cetaceans, or which age/sex classes, and what proportion of local communities, are likely to interact with swimmers, avoid swimmers, or be detrimentally affected by swim-with tourism. Conducted over several years, this would provide information about short- and long-term effects of swim-with encounters on cetacean communities, and on the lives of individual animals of different age/sex classes, activity states, or reproductive conditions.

Which cetaceans are at risk in swim-with activities?

The science has yet to be able to pinpoint which individual cetaceans, or which age/sex classes, are more likely to be targeted, attracted to, or detrimentally affected by swim-with encounters. However, preliminary results suggest that juvenile cetaceans (immature animals that are independent from their mothers but not yet sexually mature) may be disproportionately affected by these activities. Juvenile bottlenose dolphins were significantly more likely than adults to interact with human swimmers in Bay of Islands, New Zealand (Constantine 2001). Similar situations are believed to exist in other locations where some animals are individually identified (e.g. Port Phillip Bay and Rockingham, Australia (W. Dunn, B. Donaldson, personal communication)).

Juvenile and infant cetaceans may also eschew the society of conspecifics for interactions with humans. Approximately half of well-documented lone, sociable cetaceans were immature (Table 3). Orphaned calves and recently weaned juveniles may be more inclined than other age classes to seek out human company, and this has been suggested as one origin for lone, sociable cetaceans (Lockyer 1990; Cirilo *et al.* 1998; Frohoff *et al.* 2000).

For many mammalian species, members of the juvenile age class are in the process of learning critical skills that they need to become successful adults (e.g. Pereira and Fairbanks 1993). These immature animals may therefore be particularly vulnerable if activities such as habitual human interaction distort essen-

tial behaviours or alter the normal course of juvenile behavioural development. For juvenile cetaceans, frequent interactions with humans may result in altered patterns of social behaviour or reduced caution around boats, fishing gear, and other human activities. In addition, habitual human interaction for juveniles may produce a generation of adults who interact with humans at the expense of more vital activities. Because the juvenile life stage may last up to 10 years from weaning to sexual maturity for some odontocetes, and details of the normal course of juvenile development have yet to be defined for any cetacean species (Samuels 1996). Long-term monitoring of the lives of individual juvenile cetaceans that do and do not interact with humans is needed to assess the effects of human interaction on members of this vulnerable age class (Samuels and Bejder 1998; Samuels and Bejder in press).

Do swim-with activities engender respect for marine life?

It is often claimed that close encounters with wild animals motivate tourists to respect wildlife and to develop environmentally responsible attitudes and activism, thereby providing direct benefits for nature areas. This is an oft-cited rationale for commercial tours taking people to swim with wild cetaceans (e.g. Dudzinski 1999), but rarely have these ideas been systematically evaluated.

First, it is important to know what level of encounter is needed to promote a shift in tourist attitudes towards conservation. Is viewing of wildlife sufficient, or do people require direct contact with animals (e.g. feed, touch, swim with, make eye contact)? There is no cetacean research that specifically addresses this question; however, several studies suggest that tourists do not require intimate encounters with cetaceans in order to be fulfilled by their experience. Based on surveys of tourists watching humpback whales in Moreton Bay, Australia, Orams (2000) found that it was not necessary for whale watch operators to get close to whales in order to satisfy their customers. Similarly, in a study of public perceptions of marine mammals and their management in the US, Kellert (1999) found that only 17% of people surveyed supported the idea that whale watching depended on getting as close as possible to whales. Additionally, surveys of dolphin tourists in Bunbury, Australia, showed that people were significantly more satisfied with seeing dolphins from a boat than seeing them from in the water, in part due to dissatisfaction with poor water clarity (O'Neill and Lee 2001).

There are a small number of studies assessing the effectiveness of educational programmes related to cetacean-focused tourism. In Bay of Islands, New Zealand, Amante-Helweg (1996) assessed tourists' knowledge about the cetaceans they came to see: she found that swim-with tourists came with little specific knowledge about bottlenose dolphins, and would benefit from educational programmes designed to make biological information more accessible. Comparisons of visitor knowledge before and after dolphin tours in Akaroa Harbour, New Zealand, and in Hong Kong showed that tourists obtained at least short-term gains in their overall knowledge about marine mammals and the marine environment (Beasley 1997). At Tangalooma, Australia, Orams and Hill (1998) found that an educational programme designed to promote compliance with management rules for the protection of the dolphins led to a reduction in such inappropriate tourist behaviour as touching the dolphins. Also at Tangalooma, Orams (1997b) demonstrated that an educational programme combined with the dolphin interaction experience not only encouraged tourists to become more environmentally aware on the short term, but several months later, some people reported persistent changes in their behaviour that may reflect changes in attitude.

There is a need for more in-depth evaluation of the effects of educational programmes associated with cetacean-focused tourism. Attitude and lifestyle changes can be difficult to achieve. For example, Manfredo *et al*. (1995) defined a successful educational programme as one that changed the attitudes and behaviour of 5% of the intended audience. In addition, it is apparent that the careful management and educational programmes needed to realise that potential benefits are seldom in place (e.g. Duffus and Dearden 1993; Amante-Helweg 1996). Thus, systematic evaluation of educational programmes is essential to determine which techniques may be most effective in promoting tourist knowledge, attitude shifts, and long-term conservation behaviour.

CONCLUSIONS

Commercial tours that advertise swimming with wild cetaceans now occur worldwide, including Australia, the Azores, the Bahamas, the Canary Islands, Dominican Republic, French Polynesia, Galapagos, Grenada, Japan, the Maldives, Mozambique, New Caledonia, New Zealand, Niue, Norway, South Africa, Tonga, United States, and Zanzibar. New operations are initiated on a frequent basis. More than 20 cetacean species are targeted in these activities. Species include Atlantic spotted, bottlenose, common, dusky, Hector's, humpback, Risso's, rough-toothed, spinner, striped, and Tucuxi dolphins, and beluga, dense beaked, dwarf minke, false killer, humpback, killer, melon-headed, pilot, sei, and sperm whales.

This review was organised around the four basic categories of cetaceans involved in in-water encounters with humans: lone sociable, food provisioned, habituated and unhabituated. Conclusions specific to each category follow:

1 Although lone, sociable dolphins typically make first contact with humans, habituation to humans and in-water encounters is usually a gradual process achieved through considerable effort on the part of humans. Habituation to

humans clearly puts the animals at risk of injury or death. In some cases, strict management programmes may reduce this risk.

2 Food provisioning is the primary basis for in-water encounters with dolphins at several locations worldwide. Research findings and anecdotal evidence indicate that uncontrolled food provisioning is harmful to wild cetaceans, although there are some indications that rigorous controls on food provisioning may minimise the risks.

3 We identified only one location where tourists regularly interact with habituated dolphins in the water. There, the dolphins' freedom of choice to interact, or not, with humans was achieved through considerable effort on the part of humans to habituate the animals. Several other locations exist where people swim with reportedly friendly groups of cetaceans, but there are no data with which to confirm that these animals meet our criteria for classification as habituated. There is virtually no research that specifically addresses short- or long-term effects of regular swim-with operations on the behaviour and well-being of habituated individuals or affected cetacean communities.

4 The vast majority of swim-with situations involve unhabituated dolphins and whales. In some cases, lack of habituation is related to the infrequency of encounters; in other cases, cetaceans remain unhabituated despite regular and long-term exposure to human activity. Several recent studies focusing on responses of unhabituated cetacean groups to vessel approaches and swimmers provide first steps in understanding the effects of these activities on the animals. Both quantitative data and anecdotal information indicate that swim-with operations are associated with changes to the behavioural patterns of targeted cetaceans, for some approaches and for some subset of approached animals. Results of the few longitudinal studies indicate some effects of tourist activity on targeted dolphins. Studies have yet to be conducted that document details of human/cetacean in-water interactions, or the short- and long-term impacts of swim-with activities on individual animals and affected cetacean communities.

Although there are considerable sources of information about in-water interactions between humans and cetaceans, we found much of it to be descriptive, anecdotal, and not suitable for management purposes. This highlights the fact that the science of assessing the impacts of cetacean-focused tourism is in its infancy, and scientists and managers are only starting to learn what the potential long-term effects such activities might have on the animals. The information that is available indicates that in many cases swim-with activities are disturbing to targeted animals. Nevertheless, intense popular demand for swim-with activities is pushing the growth of the industry beyond the limits of what current data might deem prudent.

Although, in a few instances, management decisions have been based on specific research results, more often cautionary findings are not taken as sufficient justification for limiting local expansion of the industry. More and better designed research programmes are needed to evaluate effects, and with such long-lived species, longitudinal studies are vital. Improved dialogue is needed among all stakeholders. More flexible management systems are needed that can detect and respond readily to changing conditions and new research findings. In particular, 'an adaptive approach [in] which managers regularly improve the effectiveness of management schemes and researchers continually update their understanding about causal relations, will, in many situations, be the most reliable and defensible strategy to minimise recreational impacts and to learn about their causes' (Gutzwiller 1995: 177).

It is often presumed that licensing commercial swim-with operations will serve to benefit the animals, and this is partly true when permits limit access to the animals by restricting the number of operators, boats, and swimmers, time spent in proximity to animals, or approaches to certain classes of animals. However, permits do not necessarily ensure protection for the animals. In several countries where cetaceans are protected by law, the process was designed for the purpose of giving special exemption in a few limited situations such as scientific research or species recovery programmes. Thus, a permit to operate swim-with tours is technically legal permission to harass cetaceans by putting people in the water with them. This interpretation must be taken into consideration in all discussions regarding issuance of permits for swimming with cetaceans.

The National Watchable Wildlife Program in the US provides a set of guidelines designed to minimise disruption caused by wildlife tourism. These recommendations include viewing wild animals from a distance using binoculars, not attempting to interact with wild animals, and avoiding areas that are critical for foraging, resting, and parental care (Duda 1995). Although there are many indications that wildlife viewing is associated with habitat preservation and reductions in poaching (e.g. Youth 2000), very few studies have substantiated the claim that tourists must have *direct* interactions with wildlife (e.g. touch, swim with, feed) in order to affect attitudes and actions. Based on the findings of this review, it is apparent that if the welfare of free-ranging cetaceans is of paramount importance, then cautious look-but-don't-interact principles like those of the Watchable Wildlife program should be the guide.

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