

Exploitation of Cetaceans in Venezuela

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ABSTRACT

Cetacean exploitation in the Caribbean is poorly documented but appears to be more widespread than previously recognised. We surveyed the literature, examined historical records and conducted field studies to ascertain the nature and extent of exploitation in Venezuelan waters. We found records indicating practices dating to pre-Columbian times. There is evidence that at least 11 of the 20 cetacean species found in the area have been taken. The species most frequently mentioned are *Delphinus capensis* (25%), *Tursiops truncatus* (23%) and *Inia geoffrensis* (16%). Harpooning and netting (94% combined) are the most frequently noted capture methods. Reports of the methods of capture and the uses of animals taken are associated with the period of the records, with captures by harpooning and usage for bait being the most prevalent since 1961. Two of the most likely determinants of use of a species, its species-typical size and its appearance in coastal and fresh waters as opposed to pelagic ranging, were examined. Exploitation of a species is independent of its size but is associated with its ranging patterns, pelagic species being less likely to be taken. The records examined do not allow the determination of whether the extent of use by fisheries has any effect on local cetacean populations.

KEYWORDS: INCIDENTAL CAPTURE; DIRECT CAPTURE; CARIBBEAN; LONG-BEAKED COMMON DOLPHIN; BOTTLENOSE DOLPHIN; BOTO; TUCUXI; HUMPBACK WHALE; SPINNER DOLPHIN; KILLER WHALE; RISSO'S DOLPHIN; CLYMENE DOLPHIN; ATLANTIC SPOTTED DOLPHIN; FALSE KILLER WHALE

INTRODUCTION

Intentional captures of small cetaceans throughout Latin America have been widely reported (Goodall and Cameron, 1980; Goodall *et al.*, 1988; Read *et al.*, 1988; Van Waerebeek, 1990; Van Waerebeek and Reyes, 1990; 1994; Castelló, 1992; Flórez *et al.*, 1992; Reyes, 1992; Vidal, 1992; Zavala-González *et al.*, 1994) as have incidental captures by gillnets in Meso-America and the wider Caribbean (summarised by Vidal *et al.*, 1994). Although organised commercial whaling of some kind has existed in the southern Caribbean for about two centuries (Caldwell and Caldwell, 1971) and dolphin fisheries were common until recently (Rathjen and Sullivan, 1970; Caldwell, D.K. *et al.*, 1971; Mitchell, 1975; Gaskin and Smith, 1977; Perrin, 1985; Price, 1985; Reeves, 1988), information on their extent, history, species taken and the type of practice employed in Venezuelan waters is largely unpublished or widely scattered in the literature.

Harpoons are used for marine and freshwater captures of cetaceans and for hunting manatees in Venezuela. Archaeological evidence reveals similar implements have been employed since pre-Columbian times (Sanoja, 1989; Suárez and Bethencourt, 1994, p.16), suggesting that exploitation of freshwater and marine mammals not only antedates foreign contact but also that its methodology is largely uninfluenced by outsiders. In the West Indies and elsewhere in the Caribbean, cetacean fisheries can be traced both to aboriginal origins and also to the influence of New England whalers, particularly in the 19th century (Adams, 1971; Perrin, 1985). Although whaling trips to the Venezuelan coasts appear to have been uncommon, even in the heyday of the 19th-century whaling industry, there is some recorded activity (see logbooks listed in the References). Although we found no records of Venezuelan crews aboard whaling ships of any flag operating in Venezuelan waters or elsewhere, nor of Venezuelans having

ever owned or operated whaling vessels in the 19th century, a more focused examination of all historical records would be needed to conclude with greater certainty the absence of a whaling tradition in Venezuela. It is clear, however, that dolphin fisheries date back to antiquity.

Legends about cetaceans occur among many peoples that traditionally inhabit the Orinoco delta area. Human characteristics are attributed to whales and dolphins and most other wildlife. Tales about some animals portray them to be good while others clearly consider them to be bad; some are respected and beloved whereas others are killed by people (De Barral, 1961; Wilbert, 1970; García, 1971). There is no uniform set of characteristics that is attributed to all cetaceans and thus there is no influence of these traditional beliefs on whether cetaceans as a whole are hunted.

Although there are refuges in Venezuela where animals are protected, no law singles out marine mammals for protection, nor have areas been set aside specifically to protect them. Some captures of cetaceans take place in waters of national parks that have been established for animal protection. Venezuelan government officials recently proposed studying dolphin populations in order to ascertain whether they can be exploited for human consumption (Cohen, 1994). Two pieces of legislation are designed to protect wildlife in Venezuela, the Wildlife Protection Law (a civil statute enacted in 1970) and the Environmental Criminal Law (a penal statute enacted in 1992), but enforcement is virtually unknown³.

Our goals in this paper are: (1) to summarise the available published and unpublished evidence regarding cetacean fisheries in Venezuela; (2) to analyse these reports with regard to history, uses and practices; and (3) to provide an illustrative description of one of the most common methods of capture used today. This paper does not review or make reference to the incidental bycatch or intentional take by

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³ The only enforcement of which we are aware are reports of charges brought against AR and AA for 'killing the dolphin' in reference to the animal whose demise is documented in the Results section of this paper (e.g. Holden, 1995) and prosecution of a long-line Venezuelan boat operator for being in possession of eight dead dolphins (Venezuela, 1988).

Venezuelan flag vessels in other waters, such as by the tuna fleet in the Eastern Tropical Pacific Ocean. We will also briefly identify the species involved and their use, comment on the methods and equipment employed in a typical cetacean hunting operation, and review information on catch levels.

MATERIALS AND METHODS

Historical records - published and unpublished

Given the diversity in time and nature of many of the sources used for this research, the basic principles of research synthesis were followed (Cooper and Hedges, 1994). We used traditional scholarly methods of tracing backwards through the literature until we arrived at the primary sources for all published reports. Searching the periodical literature (by computer and traditional printed abstract and index means), examining modern and older books and investigating archival records (including photographic and video) of libraries, museums and government files all

provided avenues that eventually yielded the original records of cetaceans captured in Venezuelan territorial waters (*sensu* Romero, 1990). Information is included from all sources except those indicating that capture was intended exclusively for museum collections. Museum collection is generally a one-off occurrence for each museum and does not represent a sample of the results of continuing practice and custom as do other kinds of capture.

From each source, we determined where possible the date and species captured, tools and methods used and the eventual usage of the captured cetacean. These were grouped into only a few categories so that all forms of capture using nets (purse seine, gill, etc.) are classified as nettings, all uses of oil (fuel for lamps, wood sealant/preservative, etc.) are classified together, and so on.

All sources are itemised in the References. Those which are unpublished or otherwise not readily available ('fugitive literature' *sensu* Rosenthal, 1994) have been deposited in the Reserve Collection of the Richter Library of the University of Miami, from which copies can be requested by interlibrary loan, and are also present in the Library of the International Whaling Commission in Cambridge, UK.



Fig. 1. Locations mentioned in the text. (Mochima National Park includes Punta Tigrillo, Isla Caracas del Este and Santa Fe Gulf).

Table 1

Reported cases of cetacean captures in Venezuela (excluding those strictly for museum collections).

Date	Species involved	Capturing tool	Final use	Source(s)
6,000-2,000 ybp	<i>Sotalia fluviatilis</i> (?)	Harpoons, Spears(?)	Human consumption	Sanoja, 1989; Suárez and Bethencourt, 1994; p.16
1776	<i>Inia geoffrensis</i>	Spears?	Human consumption	Gilij, 1780; p.99
XIX Century	<i>Megaptera novaeangliae</i>	Harpoons	Oil	Mitchell and Reeves, 1983; Townsend, 1935
1883	<i>Delphinus capensis</i>	?	Oil for fuel and sealing wooden vessels	Ernst, 1884a; p.306; 1884b; p.488-489
1883	<i>Inia geoffrensis</i>	?	?	Ernst, 1884a; p.308
1941	'Dolphins'	?	Shark bait	de Burgaña, 1941; p.46
1942	'Porpoises'	Harpoons	Shark bait	Fiedler <i>et al.</i> , 1947; pp.96, 303-4, 316-7
1960	<i>Megaptera novaeangliae</i>	Harpoons	?	Romero and Agudo, 1993
1970	'Dolphins'	?	Shark bait	Mihara and Brito León, 1970; p.6
1971	'Porpoises' and <i>Tursiops truncatus</i>	Beach seine nets, harpoons	Bait, human consumption	Caldwell and Caldwell, 1971
1972	<i>Delphinus capensis</i>	?	?	van Halewijn and van Bree, 1972
1972	<i>Stenella longirostris</i>	?	?	van Halewijn and van Bree, 1972
1973-74	<i>Tursiops truncatus</i>	?	?	Department of Commerce, 1973; p.20585; 1974; p.22918
1975	<i>Inia geoffrensis</i>	Seine nets	Human consumption, aquarium display	Trebbau, 1975
1976	<i>Inia geoffrensis</i>	?	Aquarium display	Ostenrath, 1976
1979	<i>Delphinus capensis</i>	?	Shark bait?	Gremone, 1979
1979	<i>Delphinus capensis</i>	Harpoons	?	Notarbartolo di Sciara, 1979
1979	<i>Orcinus orca</i>	?	?	Rodríguez <i>et al.</i> , 1993
1981	<i>Delphinus capensis</i>	?	Shark bait	Cervigón and Velásquez, 1981; p.37
1981	<i>Tursiops truncatus</i>			
1981	<i>Delphinus capensis</i>	Harpoons, purse seine nets	Shark bait	Mondolfi, 1981
1983	<i>Tursiops truncatus</i>	?	Human consumption	Leatherwood and Reeves, 1983; p.224
1983	<i>Inia geoffrensis</i>	?	Aquarium display	Leatherwood and Reeves, 1983; p.289
1984	<i>Tursiops truncatus</i>	Beach seine nets, gillnets	?	Northridge, 1984; p.60
1985	<i>Sotalia fluviatilis</i>			
1985	'Dolphins'	?	?	Flores, 1985a; Pérez, 1985
1985	'Dolphins'	?	Bait	Flores, 1985b
1985	<i>Delphinus capensis</i>	?	Human consumption	Dollinger, 1985
1985	<i>Sotalia fluviatilis</i>	Gillnets	?	Agudo, 1995
1986	'Dolphins'	Harpoons	Bait	Alarcón, 1986
1986	<i>Stenella longirostris</i>	Firearms	?	Anonymous, 1986
1988	'Toninas'	Harpoons	Bait?	Anonymous, 1988
1988	<i>Delphinus capensis</i>	Gillnets	Bait	Venezuela, 1988
1988	<i>Grampus griseus</i>	Seine net	?	Agudo and Romero, 1996
1989	'Dolphins'	Harpoons	Bait	Thalhoferi, 1989
1989	<i>Inia geoffrensis</i>	Firearms	?	This paper
1990	<i>Megaptera novaeangliae</i>	Harpoons	?	Boher and García, 1990
1990	<i>Delphinus capensis</i>	Gillnets	Shark bait, human consumption	Agudo, 1990
1990	<i>Tursiops truncatus</i>			
1990	<i>Stenella frontalis</i>			
1990	<i>Stenella clymene</i>			
1990	<i>Stenella longirostris</i>			
1990	<i>Sotalia fluviatilis</i>			
1990	<i>Tursiops truncatus</i>	Harpoons	?	Agudo, 1995
1990	'Dolphins'	Harpoons	Bait	Van Waerebeek, 1990
1990	<i>Inia geoffrensis</i>	?	Aquarium display	Boede Wantzeliuss, 1990
1991	'Dolphins'	?	Shark bait	Anonymous, 1991
1993	<i>Megaptera novaeangliae</i>	Harpoons	?	Romero and Agudo, 1993
1993	<i>Pseudorca crassidens</i>	Netting	?	Romero and Agudo, 1993
1993	<i>Delphinus capensis</i>	?	?	Romero and Agudo, 1993
1994	<i>Delphinus capensis</i>	Netting	?	Agudo, 1995
1994	'Dolphins'	?	?	Moreno, 1994
1994	'Dolphins'	Harpoons	Shark bait	American Journal 1994

Statistical analyses

All analyses were performed on counts (e.g. of records of capture of a particular species, of records of use for a particular purpose, etc.). Hypothesis testing was exclusively by non-parametric methods using SYSTAT (Wilkinson and Hill, 1994). Log likelihood ratio statistics are reported as *G* which is compared with critical values from a chi-square table. Other statistical results are self-explanatory. Statistical significance is set at $\alpha = 0.05$.

Field research - descriptive illustration

In November 1992, two of us (AR and AA) travelled throughout the central and eastern northern coast of the Paria

peninsula (Fig. 1), where it had been reported that dolphin harpooning still occur. After visiting a number of villages and interviewing many fishermen, the town of El Morro de Puerto Santo (Fig. 1, Sucre State) was selected for documenting typical practices because of the consensus among those interviewed that this town continued to capture the most dolphins. This was consistent with government records revealing that dolphins had been captured there a few years earlier for bait in shark fishing; the same location was listed as the collecting site for specimens deposited in Venezuelan museums (Agudo and Romero, 1996).

At that time we were told in El Morro de Puerto Santo that the fishing season was almost over, and that we should return when fishing activities resumed following the Christmas

holidays. This pattern is consistent with those observed in other fishing towns of the same state by Breton (1973, pp.14, 138-9), who recorded an annual cycle in fish production, with the highest output between September and November and the lowest between December and January.

On returning in February 1993, AR and AA accompanied two fishermen on one of their frequent and customary dolphin-hunting trips. The vessel was a 10m open wooden skiff with two outboard gasoline engines of 60HP each. The operation was documented from onboard the vessel using still photography and VHS videotape.

Additional information was gathered by talking with fishermen and local people. All those spoken to were asked about methods, periods of activity, fishing crews and boats, hunting seasons and the number of animals taken annually, effectiveness of the fishermen, species captured and use of the animals. Recognising the potential unreliability of information obtained from interviews (e.g. Lien *et al.*, 1994) and in an attempt to confirm independently the information received, particularly regarding kinds and numbers of animals taken, we were taken to the beach where dolphins and other fisheries products are butchered and/or prepared. We photographed and collected remains which we deposited in the Museo de Historia Natural La Salle, Caracas, Venezuela (standard museum abbreviation: MHNLS).

RESULTS

Records of cetacean captures

All the written (published and unpublished) as well as the photographed and videotaped records of cetacean utilisation from captures reported in Venezuelan waters are arranged chronologically in Table 1. Subsequent Tables and analyses derive from the reports listed in this Table.

One question about utilisation is whether there have been any shifts in time or whether, alternatively, the records reveal homogeneity or stability over time. Examining the reports in this way (Table 2) reveals two things. First, most records are very recent. This was not examined statistically because the number of reports is not necessarily associated with the intensity of activity - people are more likely to record such

activities nowadays than formerly. However, there is no reason to believe there is any bias to what kinds of activities are mentioned in the reports as a function of their date, so we statistically examined whether the pattern of use shown in the records is independent of the year of the reported capture.

Table 2
Records of capture categorised by date and usage.

	Pre-1850	1850-1960	1961-date	Total
Bait for fishing	0	2	22	24
Food (human consumption)	2	0	11	13
Oil	1	1	0	2
Aquarium display	0	0	4	4
Unknown	0	2	19	21
Total	3	5	56	64

The null hypothesis is that the usage type (when the records indicate usage) is not associated with the period of the record. This null hypothesis was rejected ($G = 15.4$, $df = 6$, $p < 0.05$) and we therefore accept the alternate hypothesis that usage indicated is associated with the period of the report. This statistical significance is unaffected if we include records where use is unknown ($G = 17.9$, $df = 8$, $p < 0.05$), or if we combine all the pre-1850 records with those of 1850-1960, whether or not we include records where the usage is unknown ($G = 10.1$, $df = 5$; $G = 9.8$, $df = 3$; $p < 0.05$ for both). We conclude that there has been a shift in cetacean usage reported since 1961.

Of the 20 cetacean species found in Venezuelan waters (Romero *et al.*, 1991; Agudo and Romero, 1996), only 11 are mentioned in the reports of exploitation (Table 3). It is clear that the number of records reflects in some fashion the availability of species - both *Delphinus capensis* and *Tursiops truncatus* are common. We did not, therefore, analyse here the extent of use by species (number of records) to determine what characteristics in addition to abundance might affect its exploitation, we only examined if a species was ever exploited. In considering which, if any, fundamental attributes characterise the species taken and

Table 3
Cetaceans of Venezuela: species, maximum size, records of exploitation and ranging habitat.
X indicates the habitat type(s) associated with the species.

Species name	Max. size (m)	Number of records	Ranging habitat		
			Coastal	Pelagic	Freshwater
<i>Delphinus capensis</i>	2.6	11	Mostly	X	
<i>Tursiops truncatus</i>	3.8	10	Mostly		
<i>Inia geoffrensis</i>	2.8	7			X
<i>Sotalia fluviatilis</i>	2.1	4	Estuarine		X
<i>Megaptera novaeangliae</i>	16.0	4	X	X	
<i>Stenella longirostris</i>	2.4	3	Mostly		
<i>Orcinus orca</i>	9.8	1	X	X	
<i>Grampus griseus</i>	3.8	1		Mostly	
<i>Stenella clymene</i>	2.0	1	X	X	
<i>Stenella frontalis</i>	3.0	1	Mostly		
<i>Pseudorca crassidens</i>	6.0	1	Mostly	X	
<i>Balaenoptera physalus</i>	27.0	0		Mostly	
<i>Balaenoptera borealis</i>	18.0	0		X	
<i>Physeter macrocephalus</i>	18.0	0		Mostly	
<i>Balaenoptera edeni</i>	15.5	0	X	X	
<i>Ziphius cavirostris</i>	7.5	0		Mostly	
<i>Globicephala macrorhynchus</i>	6.1	0		Mostly	
<i>Feresa attenuata</i>	2.6	0	X	X	
<i>Steno bredanensis</i>	2.8	0		Mostly	
<i>Stenella coeruleoalba</i>	2.6	0	X	X	
Unidentified cetaceans		14			
Total		58			

distinguish them from those without reported exploitation, the maximum size and usual habitat for each species were examined (based on Jefferson *et al.*, 1993).

It is possible that smaller species are preferentially taken because the larger ones are more difficult to handle, especially from small boats, or that larger ones are preferred so as to maximise the yield per fishing excursion. To test the hypothesis that size is the critical factor, the species in Table 3 were categorised as large and small using the 5m length criterion that represents the traditional minimum length for usage of the common name 'whale' (Leatherwood and Reeves, 1994). For this question, the null hypothesis that the use (or non-use) of a species in fisheries is independent of whether it is a large or small one cannot be rejected ($G = 3.2$, $df = 1$, $p > 0.05$; Fisher's exact test $p = 0.175$).

If, however, we examine whether there is any association between the extent of use of a species (number of records) and its maximum size, a small non-significant negative correlation is found (Kendall $\tau = -0.103$, $n = 11$; $p > 0.05$). If we include species for which there is no record of capture, we find a more negative (but still not significant) correlation because four of the five largest species have not been recorded as captured ($\tau = -0.288$, $n = 20$; $p > 0.05$). We cannot eliminate the influence on this correlation of large size which may be associated with ranging habits and availability.

Ranging habits could also play a major role in exploitation because much of the fishing is reported to be from small boats based in coastal or riverine villages. To examine this possibility, we classified species by ranging habitat (Table 3) and then pooled for analysis the thirteen species that are found in coastal and fresh waters to compare with the seven that are exclusively pelagic. In this test, the null hypothesis that exploitation of a species (its appearance in the records) is independent of coastal/freshwater ranging is rejected ($G = 7.7$, $df = 1$, $p < 0.05$).

We conclude that ranging and habitat is associated with whether or not a species is exploited but that exploitation is not associated with species size.

Harpooning (intentional) and netting (incidental) together account for 34 of the 36 reports indicating the method by which cetaceans were captured (Table 4). We also note from Table 4 that three species (*D. capensis*, *T. truncatus* and *I. geoffrensis*) account for more than half of all the reported captures where the species is identified. We cannot examine to what extent this uneven distribution represents preferences for capturing certain species *per se*, because we do not know the relative numbers of individuals potentially available for each species. We can, however, reject the

hypothesis that exploitation is uniform and accept the alternate hypothesis that there is an association between the species identification and the number of records of exploitation (Pearson chi-square = 35.0, $df = 9$, $p < 0.05$).

Table 4
Records of capture categorised by species and method.

	Harpooning	Netting	Firearms	Unknown	Total
<i>D. capensis</i>	1	4	-	6	11
<i>T. truncatus</i>	3	4	-	3	10
<i>I. geoffrensis</i>	-	1	1	5	7
<i>S. fluviatilis</i>	1	3	-	-	4
<i>M. novaeangliae</i>	4	-	-	-	4
<i>S. longirostris</i>	-	1	1	1	3
<i>O. orca</i>	-	-	-	1	1
<i>G. griseus</i>	-	1	-	-	1
<i>S. clymene</i>	-	1	-	-	1
<i>S. frontalis</i>	-	1	-	-	1
<i>P. crassidens</i>	-	1	-	-	1
Unspecified	7	1	-	6	14
Totals	16	18	2	22	58
Column %	28	31	3	38	100

Fishing bait is mentioned in more than half of the accounts in which the use of dolphin products is mentioned (Table 5). Bait, together with food for human consumption, accounts for the vast majority of all the reported uses.

Methods employed in capturing cetaceans

Although all the other fisheries implements used in Venezuela today can be traced to Mediterranean origins (McCorkle, 1965, p.61), harpoon points sharpened from bone date back to Meso-Indian times (7,000-3,000 years before the present). The ancient harpoon heads are remarkably similar to those made today along the Upper Orinoco (Rouse and Crucent, 1963, pp.40,44).

Despite occasional reports of hunting with .22 calibre rifles and with harpoon guns (Mendoza, 1989), hand-thrown harpoons are still used today for most intentional catches of cetaceans in Venezuela. A recent report by Van Waerebeek (1990) notes a Venezuelan fisherman stating that 'they occasionally harpooned dolphins for bait'. The fishermen we interviewed, some of whom remember hunting dolphins in the 1940s, told us that dolphins have always been harpooned the same way, namely throwing a harpoon from the bow of a small (6-12m) open boat. The boats we observed were wooden skiffs with twin outboard gasoline engines of 25-60 horsepower.

Table 5
Records of usage of cetacean products from each species.

	Bait for fishing	Food (human consumption)	Aquarium display	Oil	Unknown	Total
<i>D. capensis</i>	5	2	-	1	4	12
<i>T. truncatus</i>	4	3	-	-	3	10
<i>I. geoffrensis</i>	-	2	4	-	2	8
<i>S. fluviatilis</i>	1	2	-	-	2	5
<i>M. novaeangliae</i>	-	-	-	1	3	4
<i>S. longirostris</i>	1	1	-	-	2	4
<i>O. orca</i>	-	-	-	-	1	1
<i>G. griseus</i>	-	-	-	-	1	1
<i>S. clymene</i>	1	1	-	-	-	2
<i>S. frontalis</i>	1	1	-	-	-	2
<i>P. crassidens</i>	-	-	-	-	1	1
Unknown	11	1	-	-	2	14
Totals	24	13	4	2	21	64
Column percentage	38	20	6	3	33	100

The hand-thrown harpoon used along Venezuela's eastern coasts consists of a metal piece between 10cm and 25cm in length with a sharpened point at one end and shaped into a hollow cone at the other. The open end is fitted over a wooden pole 1½ to 3m long. There are two types of heads, *arpón* and *la fija*. *Arpón* is the traditional form, a piece of steel shaped into a V with one leg of the V elongated into the metallic cone portion that fits over the wooden pole. They are manufactured in Puerto Ayacucho (Amazonas state) where they were employed in hunting manatees (O'Shea *et al.*, 1988). *La fija* has a pivot so that the longitudinal sharpened end rotates to be perpendicular to the shaft after it is embedded. It is a recent innovation that is manufactured of non-corroding metal in Japan, but even the steel *arpón* can last up to 20 years if properly maintained.

McCorkle (1965, p.60) describes the harpoon used in fishing operations on Margarita island as a detachable iron head attached to a debarked pole by means of a short length of rope. He states that harpoons are not made there. Méndez Arocha (1963, p.135), Mondolfi and Müller (1979, p.18) and O'Shea *et al.* (1988) describe the harpoon head used in the Gulf of Paria, the Orinoco delta and Margarita island as having a V-shaped sharp iron head with its conical extension seated over a stout pole called *guaica* or *asa* of about 3m long. A length of strong string called *chiste*, *chicote* or *mandriago* is wrapped around the outside of the conical portion of the metal point and then attached to a float of light wood or, more recently, to a plastic jug or piece of styrofoam. Harpoons used in the Orinoco delta also fit this general description (Ruddle and Chesterfield, 1977, p.90). Along with this homogeneity in structure in these widely separated locales (Fig. 1), the local names used for the different parts of the harpoons are also similar despite some of them deriving from many different carib languages. This structural and linguistic consistency suggests that use of harpoons is of ancient origin and is widespread. It is even possible that those in use today are all manufactured in the same area.

Once the fisherman throws a harpoon, the wooden pole is jarred loose from the metal head if it strikes an animal. The sisal rope [*cabo japonés* (Mendoza, 1989)] that is fastened to the head is also attached to the pole with a few meters slack, permitting the pole to be recovered, then to the plastic float farther back along its length. The remainder is coiled on the boat and permitted to run if a harpooned animal pulls it.

The success rate depends on the harpooner's skills. Adeptness seems to be an attribute related to native ability, training and experience. Expert harpooners are renowned in their fishing community. Breton (1973, p.45), studying the fishing communities in eastern Venezuela, found using a harpoon to capture large species requires considerable expertise, a requirement that substantially reduces its utilisation.

Ruddle and Chesterfield (1977, pp.94-5) states that 'Training with the harpoon. . . begins during a boy's tenth or eleventh year' and 'An eleven- or twelve-year-old is already familiar with harpooning'. He interviewed a boy who notes, 'It takes a lot of practice to become good at harpooning and both adults and children must practice almost daily' and also comments that, 'it takes four to six years to really learn the art'. According to the fishermen we interviewed, harpooning is an occupational skill transmitted from generation to generation and it takes several years of training to become proficient at it. We observed fishermen's children accompanying and assisting their adult relatives in a dolphin hunting expedition just as Ruddle (1994) reports for other areas of Venezuela.

Field research - descriptive illustration

The following account of a hunting expedition is drawn largely from direct observations but also includes information about typical or usual practices derived from interviews with other fishermen.

The crew that we accompanied consisted of three adults: (1) the boat captain who controls engine speed and vessel direction at all times from the aft section of the boat; (2) the harpooner who remains at the bow of the boat; and (3) an assistant to the harpooner who usually stays near the harpooner and whose role it is to make sure that the rope attached to the harpoon pole does not get entangled. Three children, two sons and one nephew of the captain, were also on board. The crew and family share responsibility for spotting and tracking dolphins.

Before departing, a metal harpoon head is fitted on one end of a pole (*ca.* 2m in length). A sisal rope (about 40m long, 2cm in diameter) is tied to the other end of the pole. The rope is wrapped around a styrofoam cube, ½m edge length, about 10m back from the harpoon. This float serves to maintain a visual position marker on the water's surface if a dolphin dives after being harpooned and it also serves to tire the animal by acting as a drag.

The fishermen motor at high speed to the areas where they expect to find dolphins. Although these fishing grounds are coastal, they are nevertheless about 20km from the shore, just beyond the 25-fathom zone described by Maloney (1967). The dolphins we observed being hunted were the most common target, long-beaked common dolphins, *D. capensis*. In this part of the Caribbean, they are found in groups of 12 to 35 and often hunt fish that live in shoals (various species in the order Clupeiformes). When dolphins are hunting, many fish swim to the water's surface. Fishermen say that the quickest way to locate a group of dolphins is to look out for flocks of piscivorous marine birds diving into the water to get the surfacing schools of fish or to watch for the dolphins' activity as they engage in preying on fish.

Fishermen approach areas of dolphin activity at slower speed to within 15m or so and then reduce to idle speed, permitting the animals' activity to bring one or more close to the bow of the boat. If this occurs, the harpooner throws his weapon. A number of approach manoeuvres by the boat may occur before there is an appropriate alignment of a dolphin target and the boat. On our expedition, the crew and family all helped spot the location and informed the captain of the position of dolphins during these manoeuvres. The captain we accompanied, reported to be a successful fisherman, told us that they capture dolphins on almost every hunting outing. During the hunting expedition that we witnessed, the first throw of the harpoon missed but a second was successful.

The harpoon head remained firmly fastened in the animal's body while the wooden pole broke free and remained floating near the boat where the harpoon struck. The dolphin dived and swam away rapidly but the float showed its location clearly. For about 15 minutes, the boat simply followed the float, the fishermen pulling in free rope, while the animal tired. Next the harpooner began alternately to pull the rope taut, bringing the animal a bit closer, and then to give the tired animal some slack. The dolphin often swam or drifted closer when the rope was not under tension and the free length was shortened. Over about a five minute period, this resulted in bringing the wounded animal next to the boat. The harpooner and his assistant finally pulled in the animals by hand over the gunwale. The bleeding animal, harpoon still embedded, was placed on the floor of the boat. The other

members of the dolphin group remained swimming close to the wounded one throughout this procedure. We were asked, after witnessing, videotaping and photographing this kill, if we were ready to capture more, an invitation which we declined and we then returned to shore. Typically, the expedition would have continued to hunt dolphins as long as they were visible until time or fuel constraints curtailed it.

Processing and use of captured dolphins

At Maracaibo Lake, fishermen told AA that they use the dolphin's meat as bait for crab fishing. Similar use has been reported elsewhere in Latin America (Goodall and Cameron, 1980; Perrin, 1988, p.10; Lescrauwaet, 1989). Mondolfi (1981) states that 'the Atlantic Bottle-nosed [dolphins] are harpooned by fishermen who use the flesh to bait hook lines (called *palangre*) for catching sharks'. Although use may vary geographically and the local details of use may differ, it is clear that the most common reported uses of captured cetaceans are for fishing bait and food (Table 2).

Our experience is consistent with this result and indicates that the same captured animal may be used in both ways. On our expedition, the harpoonist was videotaped explaining 'usamos la carne de tonina como carnada para pescar cazones [we use dolphin meat as a bait for shark fishing]', whilst shortly after the successful harpooning, he stated 'Ahora sí vamos a tener carne [Now we're going to have meat]'.

We were then taken to the location where dolphins are butchered (and other fisheries' products also processed), a beach just east of El Morro de Puerto Santo called *La Francesa*. The dolphin was still alive when brought ashore at this beach. However, a typical hunting expedition takes an entire day (or night) and we believe that most dolphins are already dead from exposure (overheating and desiccation) when boats arrive at the beach.

The first step in butchering was to cut off the head, a part which the fishermen consider useless except for the teeth, which are sometimes harvested for necklaces, a practice that also used to be common in Peru (Van Waerebeek, pers. comm.). The head had been severed from all twelve of the remains of recently butchered *D. capensis* that we found on the beach. This is the typical procedure; it was not simply because this individual was still alive. After decapitation, the animal is skinned and the flesh is cut into pieces. The skin is not used and is discarded. The flesh was taken back to the village and stored under refrigeration. These same fishermen intended to use it as bait for sharks, an economically valuable catch; sometimes it is sold to other fishermen (both large-scale commercial and artisanal) for the same purpose.

The fishermen consider the liver a delicacy and it was removed for consumption. Liver is cooked either fresh or after being frozen and is prepared in the same fashion as they do with other mammalian liver, typically pan-broiling. Its consumption seems to be customary, at least recently, because people in their 60s told us they have been eating it since they were children.

In addition to the remains of twelve other dolphins, the most abundant remnants we saw on the beach that day were from stingrays (family *Dasyatidae*). We also found one of the fins and other body parts (but not the shell) of a leatherback turtle (*Dermochelys coriacea*). Sea turtle soup is common in many coastal areas of Venezuela, despite a prohibition on capturing these animals.

Catch levels

There is no formal system for monitoring or reporting cetacean catches in Venezuela. Fishermen are aware that the activity is illegal. Catches thus go unreported, but the intensity of operations can be gauged by us having observed in February 1993 an estimated 120 artisanal (as opposed to large-scale commercial) fishing vessels in the harbour of El Morro de Puerto Santo of the kind that are used in hunting dolphins.

The fishermen there told us that they capture several dolphins per sortie, a minimum of 2 or 3, sometimes up to 12.

DISCUSSION

Historical changes in exploitation and utilisation

The increase in reports in recent decades is probably partly a product of the heightened interest in biological and fisheries studies in the area. It may also reflect a general intensification of fisheries following the Venezuelan government's policy initiated in the 1960s of granting fishing licenses, docking rights and Venezuelan flags to numerous long-line large-scale commercial fishing boats of Japanese, South Korean and Taiwanese origin (Romero and Agudo, 1993). In addition to their own use of dolphin meat for bait in artisanal long-line fishing, the coastal fishermen also sell it to the large-scale commercial vessels (pers. comm. to AA and AR, Venezuela, 1988). We believe that the historical record, an increase in reports and a dramatic increase in the proportion that identify bait as the use of the animals taken, are best accounted for by the intensification of commercial long-line fishing activities.

Live captures

The only records for live capture of cetaceans in Venezuela for aquarium display are for botos, *Inia geoffrensis*. Freshwater dolphins are uncommon worldwide but are readily captured in Venezuela. Captures can occur close to airports and many captured animals have been sent to European and US aquaria (Brownell, 1983; Collet, 1984). The only aquarium facility in Venezuela big enough to maintain dolphins, José Vicente Seijas Aquarium (Valencia), can handle only fresh water; it keeps botos on permanent display (Boede Wantzelius, 1990).

Other utilisation

Cetacean oil was widely used in Venezuela (and elsewhere) in the last century (Ernst, 1884a; b and logbooks listed in References). Traditional uses that still continue include Apure fishermen employing the blubber of *Inia geoffrensis* as an asthma remedy (Trebba, 1975) and fishermen at Maracaibo lake rubbing the fat of *Sotalia fluviatilis* onto the chests of those afflicted by coughs, flu and asthma (pers. comm. to AA). We also saw many people in fishing villages wearing dolphin-tooth necklaces.

Species taken

The eleven species for which we found reports of capture are briefly identified here. In addition to the English and Spanish common names, the local common name in El Morro de Puerto Santo is also given if it differs. Their conservation status was taken from IUCN (1993) and their CITES listing from CITES (1995).

(1) *Delphinus capensis* (Linnaeus 1758) (long-beaked common Dolphin, delfín común de rostro largo). Local name: tonina de mar. Distribution in Venezuela: mostly throughout eastern coasts, occasionally in the central coasts

(Romero *et al.*, 1991). Conservation Status: Insufficiently Known, IUCN; Appendix II, CITES.

This is currently the most exploited dolphin species in Venezuelan fisheries and many skulls that are probably remnants of fisheries captures are found in museum collections (Agudo and Romero, 1996). It has also been widely reported in the past as a target of exploitation.

Mondolfi (1981) is referring to *D. capensis* when he states that 'A serious threat for small cetaceans in Venezuelan coastal waters are the purse-seiners that operate in a sector from the northern part of Isla Margarita to north of La Guaira. At the present time, three purse-seiners are fishing for tuna with permission from the Oficina Nacional de Pesca. Inspections made of the catch on board have shown dead dolphins and demonstrate that, undoubtedly, the purse-seine causes a high mortality among dolphins'.

(2) *Tursiops truncatus* (Montagu 1821) (bottlenose dolphin, tursión). Local name: guamachín; negro; tonino. Distribution in Venezuela: all coasts, particularly in the east (Romero *et al.*, 1991). Conservation Status: Insufficiently Known, IUCN; Appendix II, CITES.

There have been reports of both incidental takes in nets and also intentional harpooning of this species on Venezuelan coasts, but to a much lesser extent than *D. capensis* (Caldwell, D.C. and Caldwell, 1971; Department of Commerce, 1973, p.20,585; 1974, p.22,918; Leatherwood and Reeves, 1983; Mondolfi, 1981; Northridge, 1984, p.60; Romero and Agudo, 1993). Klinowska (1991) believes that the extent of direct catches is under-reported.

(3) *Inia geoffrensis* (de Blainville 1817) (Amazon river dolphin, boto, tonina de río). Distribution in Venezuela: Orinoco watershed, including the Casiquiare and Negro rivers. Conservation Status: Vulnerable, IUCN; Appendix II, CITES.

Botos were captured for human consumption by Tamanaco Indians, one of the original inhabitants of the Orinoco watershed (Gilij, 1780, p.99). Ernst (1884b, p.308) mentions its tympanic bulla among the 'commercial products' presented at the Venezuelan National Exposition. Trebbau (1975) says that 'Apure fishermen do not have many superstitions regarding dolphins (although the blubber is said to be an excellent remedy for asthma) and it was consequently easy to hire fishermen for aid in capture [sic]'. He also mentions the use of harpoons and nets in capturing these animals. Harpoons that are used to hunt dolphins in eastern Venezuela's marine coasts are manufactured in Puerto Ayacucho on the upper Orinoco river (Romero and Agudo, 1993). Botos are occasionally captured in nets as bycatches. Although they are usually released, some die entangled in the nets.

Whether botos are hunted to any degree today in Venezuela is a matter for further investigation. Despite our extensive experience in Venezuelan savannas, we found no evidence that intentional capture of river dolphins is a common practice. In their extensive study of a rural community in the Orinoco delta, Ruddle and Chesterfield (1977) found that people there use harpoons for killing manatees but did not capture river dolphins that are also found in the area. We have heard many second- and third-hand oral reports, however, of botos being captured in Portuguesa State for human consumption and to use parts as religious artifacts.

This is the only species captured in Venezuela for aquarium display. They are housed domestically (Acuario J.V. Seijas of Valencia, Carabobo State) and abroad (Trebbau, 1975; Ostenrath, 1976; Gewalt, 1978; Brownell, 1983; Collet, 1984; Boede Wantzelius, 1990). They have a

high mortality rate in captivity (Caldwell, M.C. *et al.*, 1989; Boede Wantzelius, 1990). Botos have also been collected for postmortem scientific studies (Harrison and Brownell, 1971; Van Bree and Trebbau, 1973; Trebbau, 1975; Handley, 1976).

(4) *Sotalia fluviatilis* (Gervais 1853) (tucuxi, bufeo). Distribution in Venezuela: throughout the lower and middle Orinoco river. Also found in some estuarine habitats along the coasts (Romero *et al.*, 1991). Conservation Status: Insufficiently known, IUCN; Appendix I, CITES.

Locality records suggest a discontinuous distribution along Venezuelan coasts, mostly in estuarine environments. However, its distribution along the Orinoco river seems to be continuous.

Northridge (1984) reports that this species is taken by gillnets at certain river mouths. Given the high level of pollution along the Venezuelan coasts (Romero, 1992) and the paucity of the coastal shallows that is the marine habitat for this species, we believe that *S. fluviatilis* is not only rare, but should be placed in the IUCN category of Vulnerable (Agudo *et al.*, 1994).

(5) *Megaptera novaeangliae* (Borowski 1781) (humpback whale, ballena jorobada). Distribution in Venezuela: eastern coasts and islands (Romero *et al.*, 1991). Conservation Status: Vulnerable, IUCN; Appendix I, CITES.

This species was hunted off Venezuelan waters during the heyday of the whaling industry. There are records for such activity for 1853 and 1871 as well as recent records from 1960, 1990 and 1993.

(6) *Stenella longirostris* (Gray 1828) (spinner dolphin, delfín girador). Distribution in Venezuela: throughout the country but mostly in the eastern part (Romero *et al.*, 1991). Conservation Status: Insufficiently known, IUCN; Appendix II, CITES.

This species appears to be the target of hunting both for occasional use as shark bait and for human consumption (Agudo, 1990). The three records for capture in Venezuela are by harpooning, firearm and one of unknown origin. The gunshot record was in a national park (Anonymous, 1986).

(7) *Orcinus orca* (Linnaeus 1758) (killer whale, orca). Distribution in Venezuela: all throughout continental and island coasts (Romero *et al.*, 1991). Conservation Status: Insufficiently known, IUCN; Appendix II, CITES.

In the single report of killing, Rodríguez *et al.* (1993) report that in 1979 one individual was killed by local fishermen. It is not clear if the animal was stranded or sick.

(8) *Grampus griseus* (Cuvier 1812). (Risso's dolphin, calderón gris). Distribution in Venezuela: La Blanquilla Island (Agudo and Romero, 1996). Conservation Status: Insufficiently known, IUCN; Appendix II, CITES. One individual was harpooned after becoming entangled in a seine net (Agudo and Romero, 1996).

(9) *Stenella clymene* (Gray 1846) (clymene dolphin, delfín de yelmo). Distribution in Venezuela: reported only once; El Morro de Puerto Santo (Agudo, 1990). Conservation Status: Insufficiently known, IUCN; Appendix II, CITES.

The only record is that indicated above - a single individual captured incidentally in a gillnet.

(10) *Stenella frontalis* (G. Cuvier 1829) [Atlantic spotted dolphin, delfín manchado del Atlántico, ballenero (only in the NE of the Paria peninsula)]. Distribution in Venezuela: all coasts, islands and open sea (Romero *et al.*, 1991). Conservation Status: Insufficiently known, IUCN; Appendix II, CITES.

Only one incidental capture in a gillnet is reported in Venezuela (Agudo, 1990).

(11) *Pseudorca crassidens* (Owen 1846) (false killer whale, orca falsa). Distribution in Venezuela: western and eastern coasts and coastal islands (Romero *et al.*, 1991). Conservation status: Insufficiently known, IUCN; Appendix II, CITES (Klinowska, 1991).

This species is probably only rarely taken. The only reported capture follows accidental entanglement in a purse-seine tuna net (Agudo, 1995). It was harpooned by the crew of the fishing boat in order to disengage it from the net and was later found abandoned, moribund, floating at sea.

Incidental takes versus direct takes

Incidental takes (by netting) are well documented worldwide for many kinds of dolphins and account for substantial mortality. In Venezuela, it appears that intentional hunting may also be a major, but unappreciated, source of mortality.

Ranging habit and exploitation

We found that ten of the eleven species for which there are capture records are found coastally or in fresh water. The exception is *G. griseus*. Its only record of capture in Venezuela is of an animal harpooned after being netted accidentally.

The nine species for which there is no reported involvement in fisheries in Venezuela are primarily pelagic, with only three also ranging coastally. *Balaenoptera edeni* (Bryde's whale) is a large whale that would be very difficult to take from the small boats with the hand-thrown harpoons utilised by Venezuelan fishermen. *Stenella coeruleoalba* (striped dolphin) is coastal in some parts of the world, but all the records for Venezuela are pelagic, so it may not be vulnerable to exploitation. *Feresa attenuata* (pygmy killer whale) is rare in Venezuela with only one confirmed record for the country; thus its absence in records of capture is not surprising.

We conclude that Venezuelan fishermen exploit all the readily accessible species and show no significant preference for species associated with size although they may not be able to take very large animals.

Intensity of operations

In 1991, the Venezuelan government estimated that an annual total catch of 200 to 300 dolphins are killed every year (Chiappe, 1991), but there is no information presented on how that figure was arrived at. Other sources put the figure 25 to 70 times higher but again details of how the numbers were obtained are generally lacking (Anonymous, 1989; Environmental Investigation Agency, 1990, p.38; Gutkin, 1989; May, 1990, p.104).

However, the information we have obtained, although not sufficient to produce reliable national estimates, does suggest that catches might be substantial. For example, if half the fleet of 120 suitable vessels in El Morro de Puerto Santo hunt dolphins for half the year, taking no more than two dolphins each per month, this one fishing village would account for an annual catch of at least 720 dolphins. Agüero (1992) believes the number of small coastal boats may be up to twice the official figure of 6,200 vessels. Applying the conservative catch rates above suggests a total annual catch of at least 5,000 animals every year by artisanal, small-boat fisheries for food and bait.

Some other estimates are even larger. In 1989, Fundatrópico, a Venezuelan environmental organisation, estimated that 10,400 dolphins had been killed that year as a result of their use for bait by 26 large-scale commercial long-line fishing vessels operating off the coasts of

Venezuela. This was based on what they considered to be a conservative estimate of 50 dolphins killed per sortie and 8 sorties per year. However, it is not known whether dolphin meat was exclusively used for bait. In 1991, there were 53 long-line fishing vessels in Venezuela (Romero and Agudo, 1993). If the same assumptions are made, this yields an estimate of 21,200 animals used by large-scale commercial fisheries for bait. An unknown proportion of these can be assumed to have been purchased from the artisanal fishing sector.

Additional published estimations of catch levels for Venezuela include May (1990, p.104), of '7,000 dolphins of various species', 'between 6,000 and 7,000 dolphins per year' (Gutkin, 1989), '7,000' (Anonymous, 1989) and EIA (1990, p.38) of '6-7,000 for shark bait'.

Impact of the fishery

The only published remark concerning impact we uncovered is from Fiedler *et al.* (1947, p.79) who assert that 'the porpoises used for bait are becoming scarcer'. Nothing is known about the population status of the species involved in cetacean fisheries in Venezuela; therefore, there is no way quantitatively to ascertain the impact of the fisheries on them.

Recommendations for further research

A number of important pieces of information are needed for a better understanding of the extent and impact of dolphin fisheries in Venezuela (e.g. see Donovan, 1994): (1) population levels must be ascertained; (2) reliable estimates of the actual take must be obtained - this will require extensive monitoring of the fisheries, a formidable task, particularly given that they know the activity is illegal; (3) an understanding of the stock identity and movements of the animals involved; (4) an understanding of the population dynamics of the species involved.

CONCLUSIONS

Cetacean exploitation in Venezuela associated with intentional captures appears more widespread than commonly believed. The two most important uses of the product of these fisheries are as bait for shark fishing and human consumption. Harpooning by hand from small boats is the preferred method of capturing cetaceans by artisanal fishermen. The origins of the equipment can be traced back to pre-Columbian times and these tools remain largely unmodified today.

Eleven of the twenty cetacean species confirmed for Venezuela have been reported in some kind of record of exploitation. Fishermen hunt those cetaceans readily accessible to them, namely river dolphins and those that range coastally. There is no indication of preference for species based on size, although it is clear that the largest species cannot be handled by traditional means.

Fundamental research is needed to determine the impact of this fishery on species/populations involved.

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REFERENCES

- Unpublished or not readily available material**
- Alarcón, J. 1986. Letter to Odilio Arenas, Inspector del Trabajo. Cumaná, 10 July 1968. 2pp.
- American Journal. 1994. Killing of Dolphins. King's Productions. 402 E 76th St., New York, NY 10021. Videocassette.
- Anonymous. 1852-1853. Logbook of the Bark *Solon* of Westport, Massachusetts, July 9, 1852-October 15, 1853. Old Dartmouth Historical Society and Whaling Museum, New Bedford, Massachusetts.
- Anonymous. 1859-1860. Logbook of the Schooner *Rienzi* of Provincetown, Massachusetts, March 2, 1859-June 16, 1860. Mystic Seaport Museum, Mystic, Connecticut.
- Anonymous. 1870-1871. Logbook of the Schooner *Thrifter* of Boston, Massachusetts, November 29, 1870-April 9, 1871. Old Dartmouth Historical Society and Whaling Museum, New Bedford, Massachusetts.
- Anonymous. 1986. Crimen en el Parque Nacional Mochima. Siglo 21 Cumaná, Venezuela. 13 October 1986. [In Spanish].
- Anonymous. 1988. Denuncian delitos ecológicos en aves y mamíferos marinos. *El Nacional* (Caracas, Venezuela). 10 June 1988. [In Spanish].
- Anonymous. 1989. El MARNR lo confirma: matan siete mil delfines al año. *El Diario de Caracas* (Caracas, Venezuela). 12 August 1989. [In Spanish].
- Boher, S. and García, H. 1990. Un varamiento de la ballena jorobada *Megaptera novaeangliae* (Borowski, 1781) en la costa continental venezolana (CETACEA, BALAENOPTERIDAE). Caracas: Informe Técnico Profauna-Marnr. 11pp. [In Spanish].
- Brownell, R.L. 1983. Live-capture fisheries for small cetaceans in South American waters. Paper SC/35/SM30 presented to the IWC Scientific Committee, 1983 (unpublished). 4pp.
- Chiappe, G. 1991. Matanza de delfines niega el MAC. *El Universal* Caracas, Venezuela. 13 March 1991. [In Spanish].
- Cohen, E. 1994. Multaron con 50 mil bolívares a Aldemaro Romero e Ignacio Agudo. *El Nacional* (Caracas, Venezuela). 28 April 1994. [In Spanish].
- Flores, C. 1985a. Informe para el Director del Instituto oceanográfico de la Universidad de Oriente. Colegio de Oficiales de la Marina Mercante, Caracas. 5pp. [In Spanish].
- Flores, C. 1985b. Letter to Gustavo Paíño, Capitán de Puerto, Puerto Sucre. Cumaná, 9 de agosto de 1985. 2pp. [In Spanish].
- Gremone, C. 1979. Viaje a Puerto la Cruz, relacionado con la investigación de cetáceos. (Typewritten report to the Ministry of the Environment). 11 July 1979. 3pp+3 appendices. [In Spanish].
- Mendoza, M. 1989. Continúa la matanza de delfines en aguas venezolanas. *El Universal* (Caracas, Venezuela). 30 August 1989. [In Spanish].
- Mondolfi, E. 1981. A preliminary report of the marine mammals in Venezuelan waters. Paper presented at the seminar 'Cetacean Conservation and their Ecosystems in Latin America', Rosenstiel School of Marine and Atmospheric Sciences, Miami, Florida, June 1981 (unpublished). 10pp.
- Moreno, V. 1994. Denuncian matanzas de delfines en el Golfete de Santa Fe. *El Universal* (Caracas, Venezuela). 23 January 1994. [In Spanish].
- Notarbartolo di Sciara, G.N. 1979. Letter to Edgardo Mondolfi. 11 July 1979.
- Pérez, J.E. 1985. Télex to Fabio Alvino, Director Nacional de Pesca, Caracas. Télex Num. 0003 16:5QHRS/ACU. Cumaná. 3 January 1985. [In Spanish].
- Thalhofer, C. 1989. Letter to Ignacio Agudo. Garaúños, Estado Sucre, 18 April 1989.
- Venezuela. 1988. *Expediente Completo* (75 folios). Barco Tiburonero Cruzfer. [In Spanish].
- Published material**
- Adams, J.E. 1971. Historical geography of whaling in Bequia Island, West Indies. *Caribb. Stud.* 11:55-74.
- Agudo, A.I. 1990. Preliminary report on death of cetaceans in gillnets in northeastern Venezuelan waters. Paper presented to the IWC Symposium on Mortality of Cetaceans in Passive Fishing Nets and Traps, La Jolla, California, October 1990. p.1.
- Agudo, A.I. 1995. Varamientos de cetáceos mariños e de esteiro en Venezuela (Caribe sudoriental, América do Sur). *Eubalaena (Bol. Inf. CEMMA)* 6:7-22. [In Spanish].
- Agudo, A.I. and Romero, A. 1996. Catalogo dos cetaceos de Venezuela (América do Sur) depositados en museos e colecciones biológicas nacionais e extranjeiras. *Eubalaena (Bol. Inf. CEMMA)* 8:14-24. [In Spanish].
- Agudo, A.I., Viloria, A.L., Coty, J.R. and Acosta, R.J. 1994. Cetofauna (Mammalia: Cetacea) del Estado Zulia, Venezuela nor-occidental. *Anartia* 5:1-23. [In Spanish].
- Agüero, M. 1992. La pesca artesanal en América Latina: una visión panorámica. pp. 1-27. In: M. Agüero (ed.) *Contribuciones para el Estudio de la Pesca Artesanal en América Latina*. ICLARM, Manila, Philippines. 113pp. [In Spanish].
- Boede Wantzelius, E.O. 1990. Management of gastrointestinal problems in Orinoco river dolphins (*Inia geoffrensis*) kept in captivity at Aquarium J.V. Seijas, Venezuela. *Proc. Am. Assoc. Zoo Vet.* 1990:40-2.
- Breton, Y.D. 1973. A comparative study of rural fishing communities in eastern Venezuela: An anthropological explanation of economic specialization. Dissertation Thesis, Michigan State University. 328pp.
- Caldwell, D.K. and Caldwell, M.C. 1971. Porpoise fisheries in the southern Caribbean - present utilization and future potentials. *Proc. Gulf Caribb. Fish. Inst.* 32(7):195-206.
- Caldwell, D.K., Caldwell, M.C., Rathjen, W.F. and Sullivan, J.R. 1971. Cetaceans from the Lesser Antillean Island of St. Vincent. *Fish. Bull., US* 69(2):303-12.
- Caldwell, M.C., Caldwell, D.K. and Brill, R.L. 1989. *Inia geoffrensis* in captivity in the United States. *Occas. Pap. IUCN SSC* 3:35-41.
- Castelló, H.P. 1992. Mesa redonda: mortandad accidental y captura directa de delfines en costas sudamericanas. pp. 80-4. In: H.P. Castelló (ed.) *Anales III Reunión de Trabajo de Especialistas en Mamíferos Acuáticos de América del Sur*. Montevideo, Uruguay. 84pp. [In Spanish].
- Cervigón, F. and Velásquez, E. 1981. *Nombres Vernáculos de organismos Marinos del Estado Nueva Esparta*. Ed. Arte, Caracas. 52pp. [In Spanish].
- CITES. 1995. *CITES. Appendices I, II, III to the Convention on International Trade in Endangered Species of Wild Fauna and Flora*. US Fish and Wildlife Service, Washington, DC. 23pp.
- Collet, A. 1984. Live-capture of cetaceans for European institutions. *Rep. int. Whal. Commn* 34:603-7.
- Cooper, H. and Hedges, L.V. 1994. *The Handbook of Research Synthesis*. Russell Sage Foundation, New York. 573pp.
- De Barral, B.M. 1961. *Guarao Guarata. Lo que Cuentan los Indios Guaraos*. Gráficas Salesianas, Caracas. 351pp. [In Spanish].
- De Burgaña, J.M. 1941. *Contribución al Estudio de la Oceanografía en los Mares de Venezuela en sus Relaciones con la Pesca*. Ministerio de Agricultura y Cría, Caracas. 60pp. [In Spanish].

- Department of Commerce. 1973. Marine Mammal Protection Act. Report of the Secretary of Commerce. *Federal Register Notice* 38(147, part III):20564-601.
- Department of Commerce. 1974. Marine Mammal Protection Act. Report of the Secretary of Commerce. *Federal Register Notice* 39(122, part III):22896-932.
- Dollinger, P. 1985. *Mammalia*. Identification Manual. IUCN, Lausanne, Switzerland.
- Donovan, G.P. 1994. Developments on issues relating to the incidental catches of cetaceans since 1992 and the UNCED conference. *Rep. int. Whal. Commn* (special issue 15):609-14.
- Environmental Investigation Agency. 1990. *The Global War Against Small Cetaceans. A Report by the Environmental Investigation Agency*. Environmental Investigation Agency, London. 56pp.
- Ernst, A. 1884 (1988)-a. Catálogo de los productos venezolanos enviados a la exposición centenaria de algodón de Nueva Orleans. pp. 480-523. In: Vol. III. *Adolfo Ernst, Obras Completas*. Caracas. Ediciones de la Presidencia de la República. 562pp. [In Spanish].
- Ernst, A. 1884 (1986)-b. La Exposición Nacional de Venezuela en 1883. Grupo III: productos animales Clases 5a, 6a, 9na. pp. 302-8, 344. In: Vol. III. *Adolfo Ernst, Obras Completas*. Caracas. Ediciones de la Presidencia de la República. 702pp. [In Spanish].
- Fiedler, R.H., Lobell, M.J. and Lucas, C.R. 1947. The Fisheries of Fishery Resources of the Caribbean Area. Fishery leaflet 259. US Department of the Interior, Fish and Wildlife Service, Washington, DC. 20pp.
- Flórez, L., Prieto, M. and Bohórquez, O. 1992. Informe Nacional sobre la Situación de los Mamíferos Marinos de Colombia. Informes y Estudios del Programa de Mares Regionales del PNUMA no. 146. 19pp. [In Spanish].
- García, A. 1971. *Cuentos y Tradiciones de los Indios Guaraúnos*. Universidad Católica Andrés Bello, Caracas. 277pp. [In Spanish].
- Gaskin, D.E. and Smith, G.J.D. 1977. The small whale fishery of St. Lucia. *W.I. Rep. int. Whal. Commn* 27:493.
- Gewalt, W. 1978. Unsere tonina (*Inia geoffrensis* Blainville 1817) - Expedition 1975. *Zool. Garten*. 48:323-84. [In German]
- Giltj, F.S. 1780 (1965). Ensayo de Historia Americana o sea Historia Natural, Civil y Sacra de los Reinos y de las Provincias Españolas de Tierra Firme en la América Meridional. Rome. Reprinted by Academia Nacional de la Historia, Caracas. 3 vols. [In Spanish].
- Goodall, R.N.P. and Cameron, I.S. 1980. Exploitation of small cetaceans off southern South America. *Rep. int. Whal. Commn* 30:445-50.
- Goodall, R.N.P., Galeazzi, A.R. and Lichter, A.A. 1988. Exploitation of small cetaceans off Argentina 1979-1986. *Rep. int. Whal. Commn* 38:407-10.
- Gutkin, S. 1989. Fishermen in Venezuela accused of killing dolphins. *Los Angel. Times* November 7.
- Handley, C.O. 1976. Mammals of the Smithsonian Venezuelan Project. *Brigham Young Univ. Sci. Bull., Biol. Ser.* 20:1-89.
- Harrison, R.J. and Brownell, R.L. 1971. The gonads of the South American dolphins, *Inia geoffrensis*, *Pontoporia blainvillei*, and *Sotalia fluviatilis*. *J. Mammal.* 52:413-9.
- Holden, C. 1995. Portrait of a killing. *Science* 267:1426.
- IUCN. 1993. *IUCN Red List of Threatened Animals*. IUCN, Gland, Switzerland. 286pp.
- Jefferson, T.A., Leatherwood, S. and Webber, M.A. 1993. FAO Species identification Guide. p. 320. In: K.E. Carpenter, C. Sommer, A. Bogusch and A.-L. Agnalt (eds.) *Marine Mammals of the World*. FAO, Rome.
- Klinowska, M. (ed.). 1991. *Dolphins, Porpoises and Whales of the World. The IUCN Red Data Book*. IUCN, Gland, Switzerland and Cambridge, UK. viii + 429pp.
- Leatherwood, S. and Reeves, R.R. 1983. *The Sierra Club Handbook of Whales and Dolphins*. Sierra Club Books, San Francisco. xvii+302pp.
- Leatherwood, S. and Reeves, R.R. 1994. River dolphins: A review of activities and plans of the Cetacean Specialist Group. *Aquat. Mamm.* 20:137-54.
- Lescrauwaet, A.C. 1989. Dolphins as Chilean crab bait. *Whalewatcher* 23(4):9-10.
- Lien, J., Stenson, G.B., Carver, S. and Chardine, J. 1994. How many did you catch? The effect of methodology on bycatch reports obtained from fishermen. *Rep. int. Whal. Commn* (special issue 15):535-40.
- Maloney, N.J. 1967. Geomorphology of the Continental Margin of Venezuela. Part 2. Continental Terrace off Carupano. *Bol. Inst. Oceanogr. Univ. Oriente* 6:146-55.
- May, J. (ed.). 1990. *The Greenpeace Book of Dolphins*. Century Ltd, London, Sydney, Auckland, Johannesburg. 159pp.
- McCorkle, T. 1965. *Fajardo's People: Cultural Adjustments in Venezuela; and the Little Community in Latin American and North American contexts*. Ed. Sucre, Caracas. 164pp.
- Méndez Arocha, A. 1963. *La Pesca en Margarita*. Boca de Río, Margarita, Venezuela: Estación de Investigaciones Marinas de Margarita, Fundación La Salle de Ciencias Naturales. 267pp. [In Spanish].
- Mihara, T. and Brito León, A. 1970. Observaciones acerca de la Pesca de Tiburón con Palangre en el Oriente Venezolano (Proyecto de Investigación y Desarrollo Pesquero MAC-PNUD-FAO, Informe Técnico No. 4). Ministerio de Agricultura y Cría, Caracas.
- Mitchell, E.D. 1975. *IUCN Monograph*. No. 3. *Porpoise, Dolphin and Small Whale Fisheries of the World: Status and Problems*. International Union for Conservation of Nature and Natural Resources, Morges, Switzerland. 129pp.
- Mitchell, E. and Reeves, R.R. 1983. Catch history, abundance, and present status of northwest Atlantic humpback whales. *Rep. int. Whal. Commn* (special issue 5):153-212.
- Mondolfi, E. and Müller, K. 1979. Primer informe sobre los resultados obtenidos e investigaciones realizadas en caños del Golfo de Paria y el Delta del Orinoco. Proyecto Fudena Investigación y conservación del manatí en Venezuela, Caracas. 55pp. [In Spanish].
- Northridge, S.P. 1984. World review of interactions between marine mammals and fisheries. *FAO Fish. Rep.* 251:1-190.
- O'Shea, T.J., Correa-Viana, M., Ludlow, M.E. and Robinson, J.G. 1988. Distribution, status and traditional significance on the West Indian Manatee *Trichechus manatus* in Venezuela. *Biol. Conserv.* 46(4):281-302.
- Ostenrath, F. 1976. Some remarks on therapy of mycotic and bacteriological skin diseases in freshwater dolphins *Inia geoffrensis*. *Aquat. Mamm.* 4:49-55.
- Perrin, W.F. 1985. The former dolphin fishery at St. Helena. *Rep. int. Whal. Commn* 35:423-8.
- Perrin, W.F. 1988. *Dolphins, Porpoises, and Whales. An Action Plan for the Conservation of Biological Diversity: 1988-1992*. International Union for Conservation of Nature and Natural Resources, Gland, Switzerland. 28pp.
- Price, W.S. 1985. Whaling in the Caribbean: historical perspective and update. *Rep. int. Whal. Commn* 35:413-20.
- Rathjen, W.F. and Sullivan, J.R. 1970. West Indies Whaling. *Sea Frontiers* 16:130-7.
- Read, A.J., Van Waerebeek, K., Reyes, J.C., McKinnon, J.S. and Lehman, L.C. 1988. The exploitation of small cetaceans in coastal Peru. *Biol. Conserv.* 46:53-70.
- Reeves, R.R. 1988. Exploitation of cetaceans in St. Lucia, Lesser Antilles, January 1987. *Rep. int. Whal. Commn* 38:445-7.
- Reyes, J.C. 1992. Informe Nacional sobre la Situación de los Mamíferos Marinos en Perú. Informes y Estudios del Programa de Mares Regionales del PNUMA. Nairobi, Kenya: PNUMA. 21pp. [In Spanish].
- Rodríguez, E.R., Acosta, R., Pérez, C., Urdaneta, T., Parada, M., Cabezas, E.W., Fuenmayor, S., Arrieché, D., Gómez, L., Bong, J., Vilorio, A.L. and Duarte, M. 1993. *Orcinus orca* (Linnaeus), 1758 (CETACEA: DELPHINIDAE) en la costa norte del Estado Zulia, Venezuela. *Antartia* 4:1-8. [In Spanish].
- Romero, A. 1990. Iniciativas de manejo costero en Venezuela. pp. 203-24. In: Vol. 1. *El Manejo de Ambientes y Recursos Costeros de América Latina y el Caribe*. Senado de la Nación Argentina and Organization of American States, Buenos Aires, Argentina. 269pp. [In Spanish].
- Romero, A. 1992. *Auditoría Ambiental de Venezuela 1991*. Un Reporte sobre la Situación Ecológica de Venezuela hasta el 31 de diciembre de 1991. BIOMA, Caracas. 110pp. [In Spanish].
- Romero, A. and Agudo, A.I. 1993. La Situación de la Conservación de Cetáceos en Venezuela. Informe 1993. Bioma/Fundacetacea, Caracas. 51pp. [In Spanish].
- Romero, A., Mayayo, A. and Agudo, A.I. 1991. Los cetáceos recientes de Venezuela. *Mem. Soc. Cienc. Nat. La Salle* 51(135-136):169-80. [In Spanish].
- Rosenthal, M.C. 1994. The fugitive literature. pp. 85-94. In: H. Cooper and L.V. Hedges (eds.) *The Handbook of Research Synthesis*. Russell Sage Foundation, New York. 573pp.
- Rouse, I. and Cruxent, J.M. 1963. *Venezuelan Archeology*. Yale University Press, New Haven, Connecticut. 179pp.
- Ruddle, K. 1994. Local knowledge in the folk management of fisheries and coastal marine environments. pp. 161-206. In: C.L. Dyer and J.R. McGoodwin (eds.) *Folk Management in the World's Fisheries*. University Press of Colorado, Denver, Colorado. 347pp.

- Ruddle, K. and Chesterfield, R. 1977. *Educatiion for Traditional Food Procurement in the Orinoco Delta*. University of California Press, Berkeley, California. 172pp.
- Sanoja, M. 1989. Origins of cultivation around the Gulf of Paria, northeastern Venezuela. *Natl Geogr. Res.* 5:446-58.
- Suárez, M.M. and Bethencourt, C. 1994. *La Pesca Artesanal en la Costa Caribe de Venezuela*. Fundación Biggott, Caracas. 270pp.
- Townsend, C.H. 1935. The distribution of certain whales as shown by logbook records of American whaleships. *Zoologica (NY)* 19(1-2):1-50+6maps.
- Trebbau, P. 1975. Measurements and some observations of the freshwater dolphin, *Inia geoffrensis*, in the Apure river, Venezuela. *Zool. Garten.* 45:153-67.
- Van Bree, P.J.H. and Trebbau, P. 1973. Sobre algunas anomalías del esqueleto de la tonina de agua dulce *Inia geoffrensis* (de Blainville, 1817) (Cetacea, Platanistidae). *Bol. Acad. Cienc. Fís. Mat. Natur.* 33:57-63. [In Spanish].
- Van Halewijn, R. and Van Bree, P.J.H. 1972. On the occurrence of the common dolphin, *Delphinus delphis*, and the spinner dolphin, *Stenella longirostris*, off the coast of Venezuela. *Invest. Cetacea* 4:187-8.
- Van Waerebeek, K. 1990. Preliminary notes on the existence of a dolphin by-catch off French Guiana. *Aquat. Mamm.* 16(2):71-2.
- Van Waerebeek, K. and Reyes, J.C. 1990. Catch of small cetaceans at Pucusana port, central Peru, during 1987. *Biol. Conserv.* 51(1):15-22.
- Van Waerebeek, K. and Reyes, J.C. 1994. Post-ban small cetacean takes off Peru: A review. *Rep. int. Whal. Commn* (special issue 15):503-20.
- Vidal, O. 1992. Los Mamíferos marinos del Océano Pacífico sudeste (Panamá, Colombia, Ecuador, Perú y Chile): Diagnóstico regional. Informes y Estudios del Programa de Mares Regionales del PNUMA No. 142. PNUMA, Nairobi, Kenya. 26pp. [In Spanish].
- Vidal, O., Van Waerebeek, K. and Findley, L.T. 1994. Cetaceans and gillnet fisheries in Mexico, Central America and the wider Caribbean: a preliminary review. *Rep. int. Whal. Commn* (special issue 15):221-33.
- Wilbert, J. 1970. *Folk Literature of the Warao Indians. Narrative Material and Motif Content. Latin American Studies*. University of California, Los Angeles, California. 614pp.
- Wilkinson, L. and Hill, M. 1994. *SYSTAT for DOS: Using SYSTAT, Version 6 Edition*. SYSTAT, Inc, Evanston, IL. 871pp.
- Zavala-González, A., Urban-Ramirez, J. and Esquivel-Macías, C. 1994. A note on artisanal fisheries interactions with small cetaceans in Mexico. *Rep. int. Whal. Commn* (special issue 15):235-8.