CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES OF WILD FAUNA AND FLORA

Sixth Meeting of the Conference of the Parties

Ottawa (Canada), 12 to 24 July 1987

Interpretation and Implementation of the Convention

THE BIOLOGICAL AND TRADE STATUS OF CHELONIA MYDAS AND ERETMOCHELYS IMBRICATA

1. Recognizing that the exploitation of sea turtles for international trade was, and is, a highly controversial subject which had been debated at the fifth meeting of the Conference of the Parties, and that much of the debate suffered from a lack of detailed information on and understanding of the subject, the Secretariat developed a project to assist the Conference of the Parties in its deliberations on the issue through the provision of an objective summary of available information.

2. The Government of Japan generously provided full funding for the project and this enabled the Secretariat to contract the IUCN Conservation Monitoring Centre (CMC) to conduct the global survey of the status of green turtles and hawksbill turtles in the wild and in trade. The Secretariat is grateful to Japan for financial support and to the IUCN/CMC for their excellent, comprehensive and detailed report.

3. The whole IUCN/CMC report in draft form and in English only, will be distributed to heads of Delegation in Ottawa. Additional copies will be available to other interested participants at the cost of reproduction. The Secretariat will publish the final version of the report as soon as possible after the meeting.

4. Annex 1 to this document is an outline summary of the IUCN/CMC report and is provided as an indication of the contents of that report.

5. Annexes 2 and 3 to this document are summaries of the assessments provided by IUCN/CMC of the three proposals to amend the CITES appendices which relate to sea turtles and are under consideration at this meeting. Annexed to Annexes 2 and 3 are the full (English language only) texts of the assessments.

6. The Secretariat hopes that provision of these documents and the whole IUCN/CMC report will assist the Conference of the Parties to decide on a policy with respect to sea turtle conservation and, in particular, whether exploitation of wild populations can be justified, and whether ranching or farming of green turtles and/or hawksbill turtles should be agreed, in principle, to be beneficial and therefore to meet with CITES approval.

7. The annexes to this document, and the IUCN/CMC report, represent the views of the authors and not necessarily those of the Secretariat.

THE BIOLOGICAL AND TRADE STATUS OF CHELONIA MYDAS AND ERETMOCHELYS IMBRICATA

INTRODUCTION

The present study has been undertaken by the IUCN Conservation Monitoring Centre, under contract to the Secretariat of CITES, between 1 July 1986 and 30 April 1987. The primary objectives of the project were as follows:

(i) To collect and collate the best available data relating to the status and distribution of significant populations of Chelonia mydas and Eretmochelys imbricata, assess trends in the size of each such population, and identify the reasons for such trends where possible.

(ii) To examine the best available data relating to the trade in the two species, including their parts and derivatives, and so far as possible assess the impact of such trade on populations.

(iii) To make recommendations for consideration by CITES Parties for each population, relating to its overall management, to endeavour to ensure its continuance at an optimum level, and to the extent to which any exploitation by farming, ranching or culling is consistent with such management.

SEA TURTLE SYSTEMATICS

The few superficial morphological characters that have been employed in sea turtle systematics may be poor indicators of genetic variation in the group. The specific and infra-specific taxonomy of sea turtles, and of the Chelonia mydas complex in particular, provides an inadequate basis for the formulation of management plans designed to maintain maximum genetic diversity.

SEA TURTLE BIOLOGY

Estimating population size

With very few exceptions, only parameters (number of nests, number of emerging females) that can be measured on the nesting beach can be used to estimate population size. The population that can be assessed is only the segment of the mature female population that is nesting in any given season. Because, when females re-migrate, they do so at two, three or four year intervals, it is not possible reliably to estimate the total number of mature females.

In the case of C. mydas, the number of females emerging at a given nesting beach can vary markedly from year to year, by an order of magnitude or more. This may reflect conditions on the feeding ground, i.e., the number of females that have been able to prepare for egg-laying.

Whilst C. mydas often nests in aggregations on restricted lengths of beach, and sometimes with a well-defined peak nesting period, E. imbricata tends to nest singly or in small numbers at scattered sites, in some cases over an extended and poorly-defined season. Nesting numbers of the latter species are accordingly very much more difficult to monitor.

For these reasons, 'management' of sea turtles will bear little resemblance to 'management' of, for example, terrestrial ungulates, where in some cases virtually the entire local population can be enumerated, aged, sexed, and the reproductive value of individual animals assessed.

Philopatry and gene flow

The Green Turtle is characterised by long-distance migrations between feeding grounds and nesting beaches. Tagging programmes have demonstrated that females tend to return to the same nesting beach on each re-nesting within a season and on each re-migration they make. This is the main basis for the view prevailing among sea turtle biologists that each nesting population is "a separate reproductive unit that does not demographically reinforce any other".

Some evidence of imperfect philopatry exists, most notably concerning a female tagged while nesting on Tromelin and recovered nine years later on a beach on Europa. There is almost no evidence concerning male movements, and no evidence whatsoever that female or male turtles return to their natal beach to breed. It may be that gene flow between populations is less insignificant than is generally thought to be the case.

Although the Hawksbill may be largely sedentary, and a degree of philopatry has been demonstrated, a number of long-distance movements are known, and the extent of philopatry is poorly-known.

Maturation period

Green Turtles at some localities have been shown to require a period of 25-50 years to attain maturity; Hawksbills are not known to be significantly different, but if, as has been suggested, the delayed maturation time in C. mydas is due to the species' strict herbivory and consequent nutrient limitation, E. imbricata might be expected to mature somewhat earlier.

The practical significance of late maturation is that present population numbers, and trends therein, reflect the numbers nesting some 25-50 years in the past, and that the effects of some forms of exploitation or some conservation measures could equally take some 25-50 years to become evident. In one sense, late maturation can be said to buffer populations from over-exploitation, but in another, it can be said to encourage it, since its effects may barely become evident during the lifespan of the human generation responsible.

CONSERVATION STATUS

A large proportion, although not a majority, of C. mydas nesting populations is known or reportedly depleted or in decline; decline is well documented in only a minority of cases. Decline in most instances is attributed largely or in part to exploitation. A small number of populations are known to have been extirpated, mostly on islands after human colonisation. As in other respects, E. imbricata is more poorly-known. No populations are known to have been extirpated, and although many are suspected to be depleted or declining, this can be well-documented in only a few cases. The overall rarity of the species in comparison with C. mydas may be a natural feature of the species, or possibly a legacy of several centuries of exploitation for tortoiseshell.

The following Tables summarise select population data derived from Tables 149 and 150. It must be recognised that their compilation necessitated considerable simplification of situations that are complex and often poorly-known, and the making of numerous value-judgements, few of which might

be universally agreed upon. The intention is simply to provide a broad perspective on world populations of the Chelonia mydas complex and Eretmochelys imbricata. The term "geopolitical units" includes all areas separately itemised in Tables 149 and 150; thus, for example, the Pacific and Gulf/Caribbean coasts of Mexico are treated separately, as are mainland India and the island territories of India. Whilst this is intended to increase precision, and the number of such units will be closer to the total number of nesting populations than would the number of countries in which the species nest, considerable bias remains; Indonesia, for example is not sub-divided.

Table 157. Summary of selected data on sea turtle populations. In item 1 below, the upper figure indicates the number of units known to have regular breeding by the species (all those represented by '1' to '5' in column 1 of Tables 149 and 150), the lower figure (in parentheses) in addition takes account of all sites where nesting is certain but at an unknown level, or possible but unconfirmed (all those units represented by '?' in the Tables cited). Whilst the great majority of '?' populations are likely to be small, a very few, eg. Eretmochelys in Madagascar, are suspected to be of regional or world importance. The number of 'significant' populations will thus be greater than the upper figure but considerably less than the lower figure. The "indication of total annual nesting numbers" is no more than an indication; these are order of magnitude approximations from the data available, not rigorously derived estimates. A "major" population here is, for C. mydas, one known or strongly suspected to have between 1,000 and 5,000 (or more) females nesting annually, and for E. imbricata, one with 100-500 (or more).

	C. mydas	E. imbricata
1. Number of geopolitical units with breeding populations (Total units 185)	85 (140)	54 (116)
2. Indication of annual nesting numbers	150,000	30,000
3. Number of geopolitical units with major populations[1]	22	22
4. Number of geopolitical units with large populations not thought to be significantly depleted[2]	6-10?	?
5. Number suspected to be depleted or in decline (exclusive of 6, below)	41	36
6. Number with decline well-documented	16	4
7. Number (of 5+6) with decline largely or in part attributable to exploitation	42 73.5%	29 72.5%
8. Number of geopolitical units with breeding populations effectively extirpated	6	none known

Note[1]: see Table 163. Note[2]: for C. mydas these would include Queensland, Western Australia, Europa, Tromelin, Democratic Yemen, Galapagos, possibly also New Caledonia (d'Entrecasteux group), Oman, Pakistan and perhaps others such as Suriname and Ascension. Insufficient information is available for Eretmochelys to suggest which, if any, populations may fall into this category.

Table 162. Number of geopolitical units with breeding populations falling into each size class, summarised from Table 149 and 150. 0 = no nesting known and significant nesting unlikely, ? = nesting certain or possible but no further data. For C. mydas, 1 = up to 250 females nesting annually, 2 = 250-1,000, 3 = 1,000-5,000, 4 = 5,000-10,000, 5 = more than 10,000. Numbers separated by oblique = population intermediate. For Eretmochelys, the numerical limits of classes 1-5 are an order of magnitude lower.

Size class	0	?	0/1	1	1/2	2	2/3	3	3/4	4	4/5	5
C. mydas	34	56	10	39	13	10	6	8	2	3	2	2
E. imbricata	59	63	9	11	12	8	1	13	4	3	0	2

Table 163. Summary of 'major' populations, in the case of C. mydas, with more than 1,000 females nesting annually, in the case of E. imbricata, with more than 100.

Chelonia mydas

Class 3 (1,000-5,000): Ascension, Comores, Ecuador: Galapagos, Saudi Arabia: Gulf (?), Seychelles, Suriname, Pakistan, Phillipines. Note should also be taken of the following 'borderline' populations, and those of uncertain size but probably within this range: Equatorial Guinea: Bioko (?), Malaysia: West, Malaysia: Sabah, Maldives, Mexico: Pacific, Papua New Guinea, Reunion: Tromelin.

Class 3/4: Reunion: Europa, Somalia (?).

Class 4 (5,000-10,000): Western Australia, New Caledonia, Oman.

Class 4/5: Democratic Yemen, Costa Rica.

Class 5 (more than 10,000): Queensland, Indonesia.

Eretmochelys imbricata

Class 3 (100-500): Brazil (?), B.I.O.T., Dominican Republic, Egypt: Red Sea, Equatorial Guinea: Bioko (?), Grenada (?), India: Andaman & Nicobar Is., Malaysia: Sabah, Maldives, Oman, Saudi Arabia: Red Sea, Sudan, Turks & Caicos. The following borderline population should also be noted: Malaysia (West).

Class 3/4: Islamic Republic of Iran, Jamaica, Mexico: Gulf & Caribbean, Democratic Yemen.

Class 4 (500-1,000): Queensland, Western Australia, Solomon Is.

Class 5 (more than 1,000): Indonesia, Seychelles.

FORMS OF TURTLE EXPLOITATION

Egg harvest

Turtle egg collection is practised by many littoral peoples but its effect on nesting populations can only be assessed when harvest records have been maintained, typically in connection with the lease or sale of collection rights (and in all such cases harvest is atypically intense). The egg harvest on Diamond Island (Burma) has one of the longest and most detailed histories of all turtle 'fisheries', with data available for 1883-1898 and 1977-1982. During this period egg production (mainly C. mydas) fell from around 2,000,000 to around 200,000, indicating that, in response to an annual egg harvest of over 90%, nesting numbers declined by an order of magnitude, or only about 2% annually. Adult turtles were not regularly fished in Burmese waters, and similarly slow rates of decline are evident at other sites (Sabah, Sarawak, etc.) where similar conditions obtained.

One inference of this is that sea turtles suffer very high, and possibly density-dependent, hatchling and post-hatchling mortality; there is some observational evidence of this. It can be argued that collection of eggs, or of hatchlings, constitutes a simple diversion of losses that the population would in any case sustain from natural factors. This would appear to be supported by the fact that a near-100% annual egg harvest carried on for over a century can result in only a 2-3% annual decline in nesting, and suggests that a small egg harvest may well be sustainable in the long term, in the absence of other adverse factors. However, the long maturation period of C. mydas means that high-intensity destructive harvesting of eggs is economically preferable to sustained harvesting at a lower level, and this may explain why commercial egg harvesting has almost universally resulted in the depletion of breeding populations.

Turtle harvest

Where information is available, it is evident that commercial harvest of turtles turned on the nesting beach, or fished immediately offshore, has resulted in the decline of turtle populations, sometimes rapidly, and sometimes leading to extirpation of the local nesting population. Several documented examples suggest that this may be generally applicable, and it is to be expected if, as seems to be the case, natural mortality of mature turtles is very low. Although a large turtle population may be represented by a relatively small number of female turtles on the nest beach, it is a simple and efficient method of harvesting to take each female that emerges to nest, and this will equally be the most efficient method of depleting, and probably eventually exterminating, the population.

The impact of fisheries that take turtles at sea is not easy to assess. When, as in south-west Madagascar, the harvest appears to be mainly for subsistence purposes, little or no evidence for rapid depletion of target populations may be evident; in others of a more commercial nature, as in the Papua New Guinea harvest of Torres Straits turtles, the intensity of harvest can give cause for concern. If turtles taken at sea include a significant proportion of sub-adults and males in addition to females, and as the efficiency of harvesting is usually less than operates on the nest beach, such fisheries are likely to have a less immediate and severe impact on turtle populations. However, as it is not possible to assess turtle populations at sea, and as turtles regularly forage a long distance from their nest sites, it is virtually impossible to monitor any offshore fishery adequately in such a way as to ensure that it does not adversely affect the population.

Commercial turtle fisheries have been responsible for all of the documented extinctions of turtle populations, and they are thus rightly seen as more immediately damaging than subsistence harvests. However, it is possible to infer from the general lack of mainland C. mydas rookeries, except where the coast is poorly accessible or where religious practices inhibit turtle consumption, that subsistence harvest over past centuries may have extirpated some former colonies, and may have had as significant an effect as the recent development of commercial fisheries.

Ranching

Ranching involves the collection of eggs or young turtles from the wild and rearing them in captivity for the remainder of their life. To the extent that such collection simply replaces factors leading to natural mortality, it will have little or no perceptible effect on population numbers. It is preferable to closed-cycle captive-breeding inasmuch as it necessitates the maintenance of wild turtle populations, but potentially damaging because it involves some, albeit very small, offtake from the wild.

The suggested difficulties of commercial ranching include: the necessity to restrict the commercial forces, including economies of scale, that might lead to excessive collection of new stock from the wild, and the necessity to control the extent to which legal trade in ranched products might lead to increased illegal trade. Adequate marking procedures are critical to the latter. A small number of cases, all revealed through CITES Annual Reports, demonstrate that the existence of legal supplies of turtle products has been used to conceal illegal trade.

Captive-breeding

Although the setting up of closed-cycle farms to supply turtle products independently of wild populations has often been proposed, the practical difficulties of reliably producing adequate numbers of turtles have not been overcome. As yet, no turtle conceived in captivity has itself bred in captivity. Whilst independence from wild populations has been a goal of captive-breeding operations, it has been pointed out that ranching schemes may be preferable because they would have an interest in maintaining a healthy wild population as a source of stock.

INTERNATIONAL TRADE

Chelonia mydas

The Green Turtle entered international trade during the period of European colonial expansion in the 17th century, initially as live turtles, later in the form of dried calipee (shell cartilage used in soup manufacture) and most recently as frozen meat. Europe derived supplies from the Caribbean and the Indian Ocean, North America from the Caribbean and Latin America. International trade in edible C. mydas products is now at a relatively low level, probably due to the effects of CITES, and besides regional trade carried on by fishermen, has mainly involved meat from Cayman Turtle Farm and the Reunion ranch imported into the UK and France for soup production. Turtle skin, raw or tanned, is the other main commercial product of C. mydas. Whether the prime cause of turtle harvest, or an adjunct to meat trade, the turtle leather trade has been developed since the 1960s, with Japan, France and Italy taking most of the world production. Imports to Japan rose from 1977 to a peak of 20 t in 1982 and then declined somewhat due to better implementation of CITES; similarly imports to Europe have fallen after the withdrawal of

reservations held by France and Italy. Raw shell of C. mydas is of little value, but substantial numbers of stuffed turtles or polished carapaces are in trade, with very large numbers going to Japan.

Implementation of CITES controls appears to be in part responsible for the decline in world trade volume in C. mydas products, and the uniform implementation by E.E.C. countries, which led to the withdrawal of reservations formerly held by France and Italy, has been particularly important. Whilst international trade now presents little threat to C. mydas populations, a number of exceptions give cause for concern: the export of leather from Mexico, Panama and Indonesia; the export of eggs from Indonesia and the Philippines; the export of stuffed turtles from Indonesia in commercial quantities, and as tourist items in a number of countries.

Eretmochelys imbricata

The Hawksbill has been traded for shell ('tortoiseshell') since classical times, and more recently there has been a rapidly expanding trade in whole stuffed turtles, generally sub-adults, often for the tourist trade. From the last century until recent decades the main markets for tortoiseshell were in Europe and North America, where it was used in a variety of luxury and decorative goods. The demand for shell dropped for a period after the advent of plastics only to rise again steeply from the 1970s onward due to rising consumption in Japan. Japan now accounts for the bulk of the imports of tortoiseshell in world trade.

Very large quantities of E. imbricata shell still enter international trade; whilst imports to North America and Europe are now insignificant, due largely to implementation of CITES, trade to the Far East and to Japan in particular has expanded rapidly. Although Japan imposed a voluntary quota of 30 t of raw bekko (tortoiseshell) annually, this still represents a far greater level of trade than had been carried out before the unprecedented import peaks recorded in 1973 and 1979. During the early 1980s, around half of Japan's imports were derived from CITES Party states; but since 1985, increasing quantities of shell have been imported from non-Party states, notably Cuba, Haiti, Jamaica, Maldives, Solomons and Singapore. It thus appears that CITES has not caused Japan to curtail its imports, but to look to other source countries (although some shell is likely to be derived from the same populations exploited by previous exporters). The main countries which continued to export tortoiseshell after acceding to CITES are: Nicaragua, Panama, Belize, Kenya, the United Republic of Tanzania, the Philippines and Indonesia, although volumes from some of these have declined recently. Exports from Belize increased markedly in 1985 and 1986, and there is evidence that Japanese Customs statistics seriously underestimate the real volume of shell imported from Belize.

The Japanese import of tortoiseshell is an immediate threat to Hawksbill populations and accounts for at least 40,000 Hawksbills a year; the only way of reducing this threat would be for Japan to markedly reduce its consumption of shell. Whilst much emphasis has been placed on the cultural impoverishment that would result from restricting the traditional use of bekko in Japan, the volume of bekko now consumed is far above traditional levels and much effort has gone into developing new markets for bekko jewellery among younger age groups. The import of Hawksbill shell to other countries in the Far East, notably Taiwan and the Republic of Korea should also be curtailed.

TURTLE CONSERVATION

The 1980 World Conservation Strategy recognised that natural resources always have, and always must be, exploited to contribute to the survival of the human population. The use of natural resources, such as sea turtles, thus needs no justification and there can be no grounds for attempting to curtail sustainable use of turtle resources. However, history and what is known of present turtle populations have shown that long-term exploitation of turtles, particularly the mass harvest of females on their nesting beach, tends to result in population decline and can end in local extirpations. What is necessary, therefore, is to avoid the abuse of natural resources.

Although turtle products can, and in some places still do, provide an important element in the diet, culture, and economy of littoral peoples, it appears that in many cases today turtles are of very low nutritional and economic importance in relation to other foodstuffs. If maximum profitability was the sole concern, theory suggests that it would be better to exploit turtles to the maximum today and divert the revenue into other operations tomorrow. Turtle conservation may thus be better justified by stress on non-commercial and non-utilitarian motives than simplistic economic arguments.

Turtles are like the large whales; their biology makes them unsuitable for sustainable commercial utilisation unless strong coercive measures are implemented to prevent market forces driving them to extinction.

Table 149. Chelonia mydas nesting populations: summary of distribution, size, trends and exploitation. For Key to symbols, see below.

	Population				Exploitation				
	1	2	3	4	5	6	7	8	9
	Nest	Nos	Trend	Effect	Adult	Nos	Egg	Int.	Trend
ALBANIA	0	-	-	-	-	-	-	-	-
ALGERIA	?	-	-	-	-	-	-	-	-
AMERICAN SAMOA	1-	-	d ?	-	M	50	?	-	-
ANGOLA	(1)	-	d ?	-	?	-	?	-	-
ANGUILLA	0/1	-	-	-	?	-	-	-	i ?
ANTIGUA & BARBUDA	1	39+	-	-	M/H	200	-	-	-
ARUBA	0/1	-	d	-	M	200	-	i	-
ASCENSION	3	1.6-3k	s ?	-	0	-	0	(E)	D
AUSTRALIA:									
QUEENSLAND	5+	40k	s	-	H	5-8k	L	-	-
N. TERRITORY	(1)	-	-	-	M/H	2k	?	-	-
W. AUSTRALIA	4+	-	-	-	L	100?	?	-	D
ISLAND TERR.	(1)	-	-	-	-	-	-	-	-
AZORES	?	-	-	-	-	-	-	-	-
BAHAMAS	?	-	-	-	M/H	-	?	-	-
BAHRAIN	0	-	-	-	0?	-	-	i	-
BANGLADESH	?	-	-	-	L?	-	H	-	-
BARBADOS	(1/2)	-	d	-	L	-	?	-	d
BELIZE	1-	20	d	-	M	350	M	-	-
BENIN	?	-	-	-	-	-	-	-	-
BERMUDA	0	-	Ex	X	-	-	-	-	-
BRAZIL	(2+)	-	d	-	H	5k+	?	-	s
B.I.O.T.	1/2	300	-	-	0	-	0	(e)	D
BRIT. VIRGIN IS.	1	50-100	-	-	H	700	?	-	-
BRUNEI	0	-	-	-	-	-	-	i	-
BURMA	(2)	-	D	X	L	100?	vH	-	d
CAMBODIA	?	-	-	-	?	-	?	-	-
CAMEROON	?	-	-	-	-	-	-	-	-
CANARY ISLANDS	0	-	-	-	-	-	-	-	-
CAPE VERDE IS	(1) ?	-	-	-	-	-	-	-	-
CAYMAN ISLANDS	0	-	Ex	X	-	-	-	-	-
CHILE	?	-	-	-	L	-	0?	-	-
CHINA	(1/2-)	-	d	x	H	1k+	?	-	d ?
COLOMBIA:									
PACIFIC	?	-	-	-	?	-	-	-	-
CARIBBEAN	1	-	D	x	H	2.5-3k	M	i	-
COMORO ISLANDS	3	1.8+k	d	x	M	200?	0?	-	-
CONGO	?	-	-	-	-	-	-	-	-
COOK ISLANDS	?	-	d	x	?	-	M	-	-
COSTA RICA:									
PACIFIC	?	-	-	-	L	-	H	-	-
CARIBBEAN	4/5	5-50k	s ?	-	M/H	-	M	(E)	D
CUBA	?	-	d ?	-	H	3k+	L	-	d
CYPRUS	1-	-	d ?	-	0	-	0	-	-
DJIBOUTI	?	-	-	-	?	-	?	-	-
DOMINICA	0/1	-	-	-	?	-	?	-	-
DOMINICAN REP.	1/2	160-360	d	x	MH	500+	-	e	-
ECUADOR:									
MAINLAND	1-	-	-	-	L	-	vL	e	-
GALAPAGOS	3	1-3.5k	-	-	vL	-	0?	-	D

EGYPT:									
MEDITERRANEAN	?				?				
RED SEA	1	100			ML	300?	?		
EL SALVADOR	?			d	L		H		
EQUAT. GUINEA:									
MAINLAND	?								
BIOKO	(2/3)		d	x	H	2-2.5k	vH	(E)	
ETHIOPIA	(1)				M/H				
FEDERATED STATES									
OF MICRONESIA	(1)		d	x	L		?		
FIJI	(1)		d ?	x	M	300+	M?	et	I
FRENCH GUIANA	1	100			L	50?	L		
FR. POLYNESIA	2	400-800	D	x	L		L	t	D?
GABON	?				?				
GAMBIA	?								
GHANA	?				?		?		
GIBRALTAR	0								
GREECE	0								
GRENADA	1	150-250			H	150	H	t	
GUADELOUPE	?				?				
GUAM	1-		d ?		0		0		
GUATEMALA:									
PACIFIC	?				vL		H		
CARIBBEAN	?				?		?		
GUINEA	?								
GUINEA-BISSAU	?								
GUYANA	(1)		d ?		H		vH		
HAITI	?				?				
HAWAII	1	180	D-s ?	X	vL		0		D
HONDURAS:									
PACIFIC	?		d	x					
CARIBBEAN	?				MH				
HONG KONG	0		Ex ?						
INDIA:									
MAINLAND	1/2				M	3k+	M/H	e	
ANDAMANS									
& NICOBARS	1-				M		H	(e)	
LAKSHADWEEP	1-				H		H		
INDONESIA	5+	25-35k	D	X	vH	25k+	vH	E	I
IRAN	1/2	150-500			vL		M		
IRAQ	?								
ISRAEL	0 ?		Ex ?		L		L	(E)	d
ITALY	0								
IVORY COAST	?				?				
JAMAICA	1	100			H		H		
JAPAN	1+	200+	D	x				I	
JORDAN	0								
KENYA	1	100-200	d	x	M/H		H	(E)	d
KIRIBATI	(2)				?		?		
KUWAIT	1-	40-			0?		0?	i	
LEBANON	0								
LIBERIA	?				M				
LIBYA	0 ?								
MACAO	0								
MADAGASCAR	(1/2)		d	x	H	7k?	M		
MADEIRA	?								

MALAYSIA:										
W. MALAYSIA	2/3	ca 1k	d/s ?		vL		vH			
SABAH	2+	800-1k	D	X	vL		vH	I	D	
SARAWAK	2+	ca 750	D	X	vL		vH	I	D	
MALDIVES	2/3	.8-1.3k	D	X	MH	1.5 k	M			
MALTA	0									
MARSHALL ISLANDS	(1)		d ?		?		?	T		
MARTINIQUE	0				M/H		?	i		
MAURITANIA	(1)				M/H					
MAURITIUS:										
MAURITIUS	0		Ex							
RODRIGUES	0		Ex							
ST BRANDON	1/2	300	d	x	M/H	300+	?			
MAYOTTE	2	600-	d	x	H					
MEXICO:										
PACIFIC	2/3	ca 1k	D	X	vH		H	E	d	
GULF/CARIBBEAN	2		d	x	H	400?	H			
MONACO	0									
MONTSERRAT	0/1									
MOROCCO	?									
MOZAMBIQUE	1	200	d	x	H		M/H			
NAMIBIA	0									
NAURU	0 ?									
NETH. ANTILLES										
LEEWARD	1-		d	x	L					
WINDWARD	0/1		d		L		L	i		
NEW CALEDONIA	(4)									
NEW ZEALAND & IS.	0									
NICARAGUA:										
PACIFIC	?				L		H			
CARIBBEAN	0 ?				M	720?	H	(E)	D	
NIGERIA	?									
NIUE	?									
NORTHERN MARIANAS	1-				M?			t	i	
OMAN	4	6k			M/H	1k?	M	e	s?	
PAKISTAN	3+				L		L	e		
PALAU REPUBLIC	(1/2)		d	x	LM		M/H	t		
PANAMA:										
PACIFIC	(1)		d		L		L	E		
CARIBBEAN	?				HM		L	E		
PAPUA NEW GUINEA	(2/3)		d	x	M	5k+	M	t	I	
PERU	(1-)				M	2-3k	?		s?	
PHILIPPINES	3		D	X	H		M	E	D?	
PITCAIRN ISLANDS	0									
PORTUGAL	0									
PUERTO RICO	0/1	4			MH		MH			
QATAR	?				ML		M			
REUNION:										
REUNION	0		Ex	X						
EUROPA	3-4	2-11k	s ?		0		*	(E)	D	
TROMELIN	2/3	.7-1.3k	s ?		0		*		s	
OTHER IS	1		i ?		?					
SAO TOME & PRINCIPE	? +				M/H		M/H			
SAUDI ARABIA:										
RED SEA	1/2				L		LM		i?	
GULF	3- ?				L		L			
SENEGAL	(1)		d		H		?			
SEYCHELLES	3	3-4.7k	D	X	M	500+	L	(E)	d	

SIERRA LEONE	?								
SINGAPORE	0							IE	
SOLOMON ISLANDS	1+				?		H		
SOMALIA	(3/4)		d	x	H	4k?	?	(E)	
SOUTH AFRICA	0								
SPAIN	0								
SRI LANKA	(1)		d	x	H	3-5k	vH		
ST HELENA	0								
ST KITTS, NEVIS	?				L	20-40	L		
ST LUCIA	0/1		d		?		?	(E)	
ST VINCENT	0/1		d		?				
SUDAN	?								
SURINAME	3	1.5-2k	s/i		L		H		D
SYRIA	0 ?								
TAIWAN	?								
TANZANIA	1/2	200-300	d	x	M/H	500?	0?		d
THAILAND	2		D	X	?		vH		d
TOGO	?								
TOKELAU ISLANDS	?		d	x	?		?		
TONGA	?		d	x	?		?		
TRINIDAD & TOBAGO	0/1				H	500?	?		
TUNISIA	?								
TURKEY	(2)		D	X	L		?	(E)	d
TURKS AND CAICOS	1	45-105			L				
TUVALU	?								
U.A.E.	?		d	x	L		M/H		
UNITED STATES	1	182	D-i ?	X	0		0	(I)	D
U.S. MISC. PACIFIC IS.	?								
U.S. VIRGIN IS.	?				?				
URUGUAY	0								
VANUATU	(1/2)				M/H	30-60	M/H	t	i?
VENEZUELA:									
AVES I.	1/2	200-300	D	X	0?		0?	(E)	D
MAINLAND	0/1				M/H		M/H		
VIET NAM	? +				?				
WALLIS & HORN	?								
WESTERN SAHARA	?								
WESTERN SAMOA	0/?				M				
YEMEN (NORTH)	?				L		M		
YEMEN (SOUTH)	4/5	10k			L?		L	(E)	D
ZAIRE	?								

Key.

Column 1. Size class of nesting population (females per year)

0 = no nesting known and significant nesting unlikely; 1 = up to 250 females nesting annually, 2 = 250-1,000, 3 = 1,000-5,000, 4 = 5,000-10,000, 5 = more than 10,000. Ex = local population extirpated or virtually so.

? = nesting certain or possible, but no further data and impossible to place in size class; most such cases are suspected to involve low or very low nesting numbers; ? + = as last, but suspected to be an important site.

Numbers separated by oblique = population size intermediate; 0/1 = nesting virtually insignificant. Numbers 1-4 with '-' appended = near low limit of size class; with '+' = near upper limit. Number not in parentheses = relatively firm estimate; number in parentheses = inferred from few data; with ? appended = marked uncertainty.

Column 2. Numerical estimate of annual nesting numbers

Only estimates given in primary sources or others considered reliable are given. 'k' = 1,000's. Appended '-' indicates number is upper limit, '+' indicates lower limit. See country accounts for further information.

Column 3. Apparent trend in nesting numbers

This is intended to give a broad indication of trends in recent decades. D = population depleted or declining, based on relatively firm evidence; d = population suspected to be depleted or declining, but without firm evidence; s = nesting numbers apparently stable for the period for which data are available (this may mask inferred underlying demographic trends and thus does not necessarily indicate a stable population); i = increasing; d/s = sources disagree or evidence conflicting; '?' appended indicates uncertainty. It has not been possible adequately to represent local or short-term fluctuations, and only rarely to distinguish historical trends from those apparent in recent years. In the latter case, d-s would represent evidence for a decline in numbers followed by stability.

Column 4. Effect of exploitation

X = exploitation is firmly implicated as a major cause of documented or suspected population decline; x = exploitation appears to be a cause of decline, or has been so cited, but without firm evidence, or is one among several possible causes.

Column 5. Level of exploitation of adults

0 = none, L = low, M = moderate, H = high, ? = believed to occur, level uncertain.

Column 6. Quantitative assessment of adult harvest

k = 1,000s.

Column 7. Level of egg harvest

0 = none, L = low, M = moderate, H = high, ? = believed to occur, level uncertain. vH = 90-100% harvest, * = hatchlings removed for ranch.

Column 8. International trade

E = export, I = import, T = tourist trade; lower-case letters imply trade of lesser importance; parentheses imply past trade, no longer operating.

Column 9. Trends in levels of exploitation

D = decline caused by protection measures; d = decline caused mainly by decrease in turtle abundance; i = increase; s = harvest level believed to have remained more or less constant.

Table 150. Eretmochelys imbricata nesting populations: summary of distribution, size, trends and exploitation. For Key to symbols, see below.

	Population				Exploitation				
	1 Nest	2 Nos	3 Trend	4 Effect	5 Adult	6 Nos	7 Egg	8 Int.	9 Trend
ALBANIA	0	-	-	-	-	-	-	-	-
ALGERIA	0	-	-	-	-	-	-	-	-
AMERICAN SAMOA	?	-	d ?	-	?	-	?	-	i?
ANGOLA	0	-	-	-	-	-	-	-	-
ANGUILLA	?	-	d ?	?-	L	-	-	-	-
ANTIGUA & BARBUDA	2	76 +	-	-	H	250	-	et	-
ARUBA	0/1	-	d ?	-	?	-	-	-	-
ASCENSION	0	-	-	-	-	-	-	-	-
AUSTRALIA:									
QUEENSLAND	(4+) ?	-	-	-	L	-	H	(E)	-
N. TERRITORY	?	-	-	-	-	-	-	-	-
W. AUSTRALIA	(4) ?	-	-	-	?	-	?	-	-
ISLAND TERR.	?	-	-	-	-	-	-	-	-
AZORES	0	-	-	-	-	-	-	-	-
BAHAMAS	(2)	-	-	-	H	-	?	e	-
BAHRAIN	0	-	-	-	-	-	-	-	-
BANGLADESH	?	-	-	-	-	-	-	-	-
BARBADOS	0/1	-	-	-	L	-	?	e	d
BELIZE	2-	-	-	-	H	360	M	E	I
BENIN	0	-	-	-	-	-	-	-	-
BERMUDA	0	-	-	-	-	-	-	-	-
BRAZIL	(3)	-	-	-	M/H	1k+	?	-	-
B.I.O.T.	3	300	-	-	0	-	0	(e)	D
BRIT. VIRGIN IS.	2	25-75	-	-	M/H	400	H	t	-
BRUNEI	0	-	-	-	-	-	-	-	-
BURMA	(2) ?	-	d	x	?	-	vH	e?	s
CAMBODIA	? +	-	-	-	?	-	?	(e)	-
CAMEROON	?	-	-	-	-	-	-	-	-
CANARY ISLANDS	0	-	-	-	-	-	-	-	-
CAPE VERDE IS	?	-	-	-	M	-	M/H	-	-
CAYMAN ISLANDS	-	-	-	-	M/H	-	-	E	D?
CHILE	0	-	-	-	-	-	-	-	-
CHINA	0 ?	-	-	-	?	-	I ?	-	-
COLOMBIA:									
PACIFIC	?	-	-	-	-	-	-	-	-
CARIBBEAN	(2) ?	-	D	X	M/H	.3-1k	?	e	-
COMORO ISLANDS	1/2	50 -	-	-	?	-	?	e	-
CONGO	0	-	-	-	-	-	-	-	-
COOK ISLANDS	?	-	-	-	?	-	?	-	-
COSTA RICA:									
PACIFIC	?	-	-	-	-	-	-	-	-
CARIBBEAN	(1/2)	-	D	X	?	-	L	e	D?
CUBA	?	-	-	-	H	3k+	L	E	I
CYPRUS	0	-	-	-	-	-	-	-	-
DJIBOUTI	?	-	-	-	?	-	?	-	-
DOMINICA	(1)	-	-	-	?	-	-	e	-
DOMINICAN REP.	3 +	240-600	d	x	?	-	-	E	-
ECUADOR:									
MAINLAND	(1)	-	-	-	L	-	L	-	-
GALAPAGOS	0	-	-	-	0	-	0	-	-

EGYPT:									
MEDITERRANEAN	0	-	-	-	-	-	-	-	-
RED SEA	3	200-500	-	-	?	-	L	-	-
EL SALVADOR	?	-	-	-	ML	-	H	-	-
EQUAT. GUINEA:									
MAINLAND	?	-	-	-	-	-	-	-	-
BIOKO	(3)	-	d	x	H	-	vH	e?	-
ETHIOPIA	?	-	-	-	?	-	-	-	-
FEDERATED STATES OF MICRONESIA	(1/2)	-	D	X	L	-	?	T	-
FIJI	?	-	d	x	M	-	?	ITe	i
FRENCH GUIANA	0/1	-	d ?	-	L	-	-	-	-
FR. POLYNESIA	?	-	-	-	L	-	-	-	-
GABON	?	-	-	-	?	-	-	-	-
GAMBIA	0	-	-	-	?	-	-	t?	-
GHANA	?	-	-	-	-	-	-	-	-
GIBRALTAR	0	-	-	-	-	-	-	-	-
GREECE	0	-	-	-	-	-	-	-	-
GRENADA	(3) ?	-	-	-	H	200+	H	t	-
GUADELOUPE	?	-	-	-	?	-	-	e?	-
GUAM	0/1	-	-	-	-	-	-	-	-
GUATEMALA:									
PACIFIC	0 ?	-	-	-	-	-	-	-	-
CARIBBEAN	?	-	-	-	?	-	?	-	-
GUINEA	?	-	-	-	?	-	-	-	-
GUINEA-BISSAU	?	-	-	-	-	-	-	-	-
GUYANA	(1)	-	d ?	-	H	-	vH	-	-
HAITI	?	-	-	-	H	-	-	E	I
HAWAII	(1+)	-	-	-	0	-	0	-	-
HONDURAS:									
PACIFIC	?	-	d ?	x	-	-	-	E	-
CARIBBEAN	?	-	-	-	MH	-	-	-	-
HONG KONG	0	-	-	-	-	-	-	IE	-
INDIA:									
MAINLAND	0/1	-	-	-	?	-	L	(e)	D
ANDAMANS & NICOBARS	3	-	-	-	M	-	H	-	-
LAKSHADWEEP	?	-	-	-	H	-	H	e	-
INDONESIA	5++	-	d	?	vH	-	vH	E	I
IRAN	3/4	300-1 K	-	-	L	-	M	-	-
IRAQ	0	-	-	-	-	-	-	-	-
ISRAEL	0	-	-	-	-	-	-	-	-
ITALY	0	-	-	-	-	-	-	-	-
IVORY COAST	0	-	-	-	?	-	-	-	-
JAMAICA	(3/4)?	300 ?	-	-	H	-	H	E	-
JAPAN	?	-	-	-	-	-	-	I	-
JORDAN	0	-	-	-	-	-	-	-	-
KENYA	2	50	d	x	H	-	?	E	i
KIRIBATI	?	-	-	-	?	-	?	-	-
KUWAIT	?	-	-	-	0	-	0	-	-
LEBANON	0	-	-	-	-	-	-	-	-
LIBERIA	0	-	-	-	-	-	-	-	-
LIBYA	0	-	-	-	-	-	-	-	-
MACAO	0	-	-	-	-	-	-	-	-
MADAGASCAR	? ++	-	d-s?	X	H	3k	M	ET	d
MADEIRA	0	-	-	-	-	-	-	-	-

MALAYSIA:									
W. MALAYSIA	2/3	-	d ?	x	L	-	vH	-	-
SABAH	3-	-	d/s ?	x	L	-	H	(E)	-
SARAWAK	(1) ?	-	d ?	x	L	-	H	i	-
MALDIVES	3	100-500	d	x	H	5k	M	E	I
MALTA	0	-	-	-	-	-	-	-	-
MARSHALL ISLANDS	?	-	d ?	-	?	-	?	Ti	-
MARTINIQUE	?	-	-	-	?	-	?	-	-
MAURITANIA	?	-	-	-	-	-	-	-	-
MAURITIUS:									
MAURITIUS	0	-	?	-	-	-	-	-	-
RODRIGUES	0	-	?	-	-	-	-	-	-
ST BRANDON	0	-	?	-	L	-	-	-	-
MAYOTTE	1-	-	-	-	-	-	-	-	-
MEXICO:									
PACIFIC	?	-	d	x	L	-	-	-	-
GULF/CARIBBEAN	3/4	480+88	d	x	M	-	?	-	-
MONACO	0	-	-	-	-	-	-	-	-
MONTSERRAT	0/1	-	-	-	?	-	-	-	-
MOROCCO	?	-	-	-	-	-	-	-	-
MOZAMBIQUE	? +	-	-	-	M/H	-	M/H	-	-
NAMIBIA	0	-	-	-	-	-	-	-	-
NAURU	0 ?	-	-	-	-	-	-	-	-
NETH. ANTILLES									
LEEWARD	1 ?	-	d	x	L	-	-	t	-
WINDWARD	0/1	-	d	-	-	-	-	-	-
NEW CALEDONIA	?	-	-	-	-	-	-	-	-
NEW ZEALAND & IS.	0	-	-	-	-	-	-	-	-
NICARAGUA:									
PACIFIC	?	-	-	-	L	-	?	-	-
CARIBBEAN	(1/2)	-	d	x	?H	-	vH	E	d?
NIGERIA	0	-	-	-	-	-	-	-	-
NIUE	?	-	-	-	-	-	-	-	-
NORTHERN MARIANAS	0	-	-	-	?	-	L	t	i
OMAN	3+	400	-	-	vL	-	M/L	-	-
PAKISTAN	0	-	-	-	-	-	-	-	-
PALAU REPUBLIC	?	-	d/s	x	L	-	H	T	i
PANAMA:									
PACIFIC	?	-	-	-	-	-	-	-	-
CARIBBEAN	(1/2)	-	d	x	H	-	?	E	-
PAPUA NEW GUINEA	? +	-	d ?	x	L	-	M	t(E)	-
PERU	0	-	-	-	-	-	-	-	-
PHILIPPINES	(1/2)	-	d	x	H	-	M	E	-
PITCAIRN ISLANDS	0	-	-	-	-	-	-	-	-
PORTUGAL	0	-	-	-	-	-	-	-	-
PUERTO RICO	1/2	22 +	-	-	MH	-	MH	-	-
QATAR	(1)	-	d	-	?	-	?	-	-
REUNION:									
REUNION	0	-	?	-	-	-	-	-	-
EUROPA	0	-	-	-	-	-	-	-	-
TROMELIN	0	-	-	-	-	-	-	-	-
OTHER IS	1	-	-	-	-	-	-	-	-
SAO TOME & PRINCIPE	? +	-	-	-	H	-	M/H	E	-
SAUDI ARABIA:									
RED SEA	3	-	-	-	L	-	L	-	-
GULF	?	-	-	-	L	-	L	i	-
SENEGAL	?	-	-	-	H	-	?	t	-
SEYCHELLES	5	1-1.8 K	d	X	H	500	L	E	D

SIERRA LEONE	?	-	-	-	-	-	-	-	-
SINGAPORE	0	-	-	-	-	-	-	EI	-
SOLOMON ISLANDS	4 -	-	D	X	?	-	H	E	i
SOMALIA	?	-	-	-	?	-	?	-	-
SOUTH AFRICA	0	-	-	-	-	-	-	-	-
SPAIN	0	-	-	-	-	-	-	-	-
SRI LANKA	?	-	d	x	?	-	vH	-	-
ST HELENA	0	-	-	-	-	-	-	-	-
ST KITTS, NEVIS	?	-	-	-	L	-	L	e?	-
ST LUCIA	(1)	-	d	-	?	-	L	E	-
ST VINCENT	(1/2)	-	d	x	L	-	L	-	-
SUDAN	3 +	-	d ?	x	-	-	-	-	-
SURINAME	1	-	-	-	0	-	L	-	-
SYRIA	0	-	-	-	-	-	-	-	-
TAIWAN	?	-	-	-	-	-	-	-	-
TANZANIA	2-	50	d	x	?	-	?	EI	-
THAILAND	(1/2)-	-	d	-	?	-	vH	e?	d
TOGO	0	-	-	-	-	-	-	-	-
TOKELAU ISLANDS	?	-	-	-	?	-	?	-	-
TONGA	?	-	-	-	?	-	?	-	-
TRINIDAD & TOBAGO	?	-	-	-	H	-	?	e	-
TUNISIA	?	-	-	-	-	-	-	-	-
TURKEY	0	-	-	-	-	-	-	-	-
TURKS AND CAICOS	3	125-275	-	-	-	-	-	e	-
TUVALU	0 ?	-	-	-	-	-	-	-	-
U.A.E.	?	-	-	-	?	-	?	-	-
UNITED STATES	0/1	2	-	-	-	-	-	-	-
U.S. MISC. PACIFIC IS.	?	-	-	-	-	-	-	-	-
U.S. VIRGIN IS.	1/2	25	-	-	?	-	-	-	-
URUGUAY	0	-	-	-	M	30-60	M	-	-
VANUATU	?	-	-	-	-	-	-	-	-
VENEZUELA:									
ISLANDS	(1/2)?	-	-	-	-	-	-	-	-
MAINLAND	0/1	-	-	-	L	-	L	-	-
VIET NAM	? +	-	-	-	?	-	?	-	-
WALLIS & HORN	?	-	-	-	-	-	-	-	-
WESTERN SAHARA	?	-	-	-	-	-	-	-	-
WESTERN SAMOA	1/2	-	d	x	H	-	H	-	d
YEMEN (NORTH)	?	-	-	-	L	-	?	-	-
YEMEN (SOUTH)	3/4	500	-	-	L	-	L	-	-
ZAIRE	0	-	-	-	-	-	-	-	-

Key.

Column 1. Size class of nesting population (females per year)

0 = no nesting known and significant nesting unlikely; 1 = up to 25 females nesting per year, 2 = 25-100, 3 = 100-500, 4 = 500-1,000, 5 = more than 1,000. Ex = local population extirpated or virtually so. Note: the numerical limits of these size classes are an order of magnitude smaller that for C. mydas (Table 149).

Numbers separated by oblique = population size intermediate; 0/1 = virtually no nesting. Numbers 1-4 with '-' appended = near low limit of size class; with '+' = near upper limit. Number not in parentheses = relatively firm estimate; number in parentheses = inferred from few data; with ? appended = marked uncertainty.

'?' = nesting certain or possible, but no further data, and impossible to place in size class; most such cases are suspected to involve low or very low nesting numbers; '? +' = as last, but suspected to be an important site (or '++' = very important).

Column 2. Numerical estimate of annual nesting numbers

Only firm estimates from primary or otherwise reliable sources are given. 'K' = 1,000's. Appended '-' indicates number is upper limit, '+' indicates lower limit. See country accounts for further information.

Column 3. Apparent trend in nesting numbers

This is intended to give a broad indication of trends in recent decades. D = population depleted or declining, based on relatively firm evidence; d = population suspected to be depleted or declining, but without firm evidence; s = nesting numbers apparently stable for the period for which data are available (this may mask inferred underlying demographic trends and thus does not necessarily indicate a stable population); i = increasing; d/s = sources disagree or evidence conflicting; '?' appended indicates uncertainty. It has not been possible adequately to represent local or short-term fluctuations, and only rarely to distinguish historical trends from those apparent in recent years. In the latter case, d-s would represent evidence for a decline in numbers followed by stability.

Column 4. Effect of exploitation

X = exploitation is firmly implicated as a major cause of documented or suspected population decline; x = exploitation appears to be a cause of decline, or has been so cited, but without firm evidence, or is one among several possible causes.

Column 5. Level of exploitation of adults

0 = none, L+ low, M = moderate, H = high, ? = believed to occur, level uncertain.

Column 6. Quantitative assessment of adult harvest

k = 1,000s.

Column 7. Level of egg harvest

0 = none, L+ low, M = moderate, H = high, ? = believed to occur, level uncertain. vH = 90-100% harvest.

Column 8. International trade

E = export, I = import, T = tourist trade; lower-case letters imply trade of lesser importance; parentheses imply past trade, no longer operating.

Column 9. Trends in levels of exploitation

D = decline caused by protection measures; d = decline caused mainly by decrease in turtle abundance; i = increase; s = harvest level believed to have remained more or less constant.

The Biological and Trade Status of Chelonia mydas and Erethochelys imbricata

ASSESSMENT OF THE PROPOSALS TO TRANSFER THE INDONESIAN POPULATIONS OF CHELONIA MYDAS AND ERETMOCHELYS IMBRICATA FROM APPENDIX I TO APPENDIX II

This document has been prepared by the IUCN Conservation Monitoring Centre.

1. The proposals give no information on the size of Indonesian populations despite the fact that much survey work has been carried out in recent years, and many useful data are available as a result.

2. The proposals give no indication of population trends, and thus demonstrate no evidence of recovery of populations. The available evidence shows that numbers of nesting C. mydas have been maintained at some sites in recent years, but have been declining severely at several others, and stocks are thought generally to be declining in the country. Less quantified information is available for E. imbricata, but, based mainly on inference and anecdotal evidence, stocks are thought similarly to be declining.

3. The potential for commercial trade is very high, and there is clear evidence that commercial interests have allowed the trade restrictions intended under CITES to be circumvented since Indonesia's accession.

4. There are good indications that the authorities have shown increased resolve to control the illegal trade that has existed in recent years and increased commitment to management of sea turtle populations.

5. Whatever beneficial management practices for sea turtles that the present proposals might entail, they do not in any respect whatsoever meet the criteria (Conf. 1.1 and 1.2) laid down for the transfer of populations from Appendix I to Appendix II, and the proposals should thus be rejected on this occasion.

Assessment of the proposals to transfer the Indonesian populations of Chelonia mydas and Eretmochelys imbricata from Appendix I to Appendix II

The Republic of Indonesia has submitted two proposals concerning sea turtles to the 6th meeting of the Conference of the Parties to CITES. The two proposals are for the transfer of Indonesian populations of Chelonia mydas and Eretmochelys imbricata from Appendix I to Appendix II.

The stated aim of both proposals is to phase out the current trade in turtles harvested from the wild and eventually replace it with controlled trade in captive-reared specimens. Legal export, by members of the Indonesia Fauna and Flora Trade Association (IFFTA), will be within quotas "strictly controlled by PHPA". The major management prescriptions, common to both proposals, are to:

(i) reduce legal egg harvest to 30% of the production of each population (each "major" population, in the case of the E. imbricata proposal);

(ii) supply demand for turtle products from captive-reared (ranched) stock derived from the 30% legal egg harvest.

The E. imbricata proposal states that egg collection will be under PHPA supervision, and that any of the quota remaining may be used for consumption; presumably this would be the case for C. mydas also, although it is not so specified. The 70% of eggs not harvested "will remain protected" (C. mydas proposal); the E. imbricata proposal specifies that protection will be in situ or in hatcheries.

Additional measures comprise:

(iii) prohibition of turtle harvest within a certain distance of the nesting beach; "within 20 km of any nesting beach" in the case of C. mydas, "within 10 km of any major nesting beach" in the case of E. imbricata;

(iv) control of turtle trade by licensing (domestic trade is specified in the C. mydas proposal);

(v) prohibition of sale of turtle meat in public eating places (C. mydas proposal only);

(vi) limit turtles landed at Bali to a curved carapace length of between 60 and 85 cm (C. mydas proposal only).

These proposals will be considered from two points of view: firstly, to what extent do they constitute a useful outline management programme for Indonesian turtle populations; secondly, to what extent do they fulfil the criteria defined by CITES for the transfer of populations from Appendix I to Appendix II?

Whilst the 'Berne Criteria' (Conf. 1.1 and 1.2) are accepted as the ordinary basis for amendments to the appendices of CITES, the fifth meeting of the Conference of the Parties evolved a set of 'Special Criteria' (Conf. 5.21) to act as a temporary means of allowing species incorrectly listed in Appendix I to be transferred to Appendix II, and to be traded in under a quota system.

In addition, the third meeting of the Conference of the Parties adopted a Resolution on Ranching (Conf. 3.15), which made provision for the transfer from Appendix I to Appendix II of populations considered no longer to be endangered and to allow trade in captive-reared specimens derived therefrom.

Because no reference is made in the Indonesian proposals to Conf. 5.21 or Conf. 3.15, it is here assumed that the proposals are being made in relation to the Berne Criteria alone, and, with regard to CITES, they will be assessed on that basis.

Do the proposals include beneficial management elements?

Recent reviewers of sea turtle conservation and management in Indonesia (Anon, 1984c; Schulz, 1984, 1987) have been unanimous in recognising excessive egg harvest as a major cause of decline and the most pervasive primary threat to nesting populations. When, as in many parts of Indonesia, a near complete harvest of eggs is combined with intense hunting of turtles, populations are likely to decline to virtual insignificance; recruitment to the mature population may already be critically low at some sites. In these circumstances, a reduction in egg harvest to 30% of eggs laid, and a prohibition on the taking of turtles in the region of the nesting beach, would, if carried out, constitute two of the most important management steps that could be taken; both these measures are incorporated in the Indonesian proposals.

With regard to C. mydas in particular, recent analysts (Anon, 1984c; Schulz, 1984) have clearly defined the acute threat posed by the Bali turtle trade to populations of this species that lie within reach of the Bali trade network; this comprises almost the entire territory of Indonesia. The Indonesian C. mydas proposal incorporates three (probably the three most important) of the several recommendations made in Anon (1984c) in respect of the Bali trade, specifically: a ban on turtle hunting near nesting beaches, a ban on sale of turtle meat at public eating places, and a ban on harvest of C. mydas below 60 and above 85 cm curved carapace length. Other suggestions, not incorporated, were: a ban on the penning of turtles prior to shipment or sale, a ban on turtle slaughterers owning turtle boats (designed to prevent a wealthy few monopolising the trade), a ban on trade of this species through Ujung Pandang (an export centre), a quota for numbers used for traditional religious ceremonies, and a procedural requirement that all turtles landed at Bali come to a single site where a rigorous monitoring programme be operated.

Overlooking, for the moment, the exceptional difficulties faced in enforcing the control required throughout Indonesian territory, the proposals clearly incorporate many of the basic conservation measures necessary to counter the negative pressures that have been exerted on Indonesian sea turtle populations in recent decades. The practical and bureaucratic problems involved may not be quite as insuperable as might be suspected; Schulz (1987) notes his impression that local government officials are now in general more aware of 'the sea turtle problem', also the evidence of more effective control of the export trade by PHPA, and of increasing committment to training in turtle management practices.

Do the proposals meet the Berne Criteria?

The Berne Criteria, as embodied in documents Conf. 1.1 and 1.2, state that transfer of populations from Appendix I to Appendix II requires:

> "...positive scientific evidence that the plant or animal can withstand the exploitation resulting from the removal of protection...Such evidence should include at least a well documented population survey, an indication

of the population trend of the species, showing recovery sufficient to justify deletion, and an analysis of the potential for commercial trade in the species or population".

The wording of the last sentence quoted above, from Conf 1.2, is ambiguous. While the entire paragraph from which it is extracted is apparently concerned with criteria for deletion or transfer, the sentence quoted actually specifies the kinds of evidence that must be presented to justify deletion alone; the implication, not explicit, seems to be that the same evidence must be provided for transfer of species or populations. We have taken the wording in this latter sense, presuming it to be the sense intended.

The specified minimal requirements of Conf 1.2 will be considered in turn, taking both proposals together.

"a well documented population survey"

Under the 'Population' section, the C. mydas proposal states "the size and location of each population in Indonesia is not known". This is followed by one sentence giving an estimate of total breeding female numbers and a list of the principal breeding sites. The E. imbricata proposal states only "exact numbers unknown".

A number of surveys have been carried out, which in general, but not exclusively, attempt to assess the approximate size and relative importance of nesting populations by means of available egg collection figures; however, apart from the single sentence mentioned above, the results of these surveys are not presented in the proposals. The source of the information in the sentence that is presented is not cited. In our opinion the proposals do not include sufficient evidence of a well documented population survey; this is despite the fact that survey evidence, mainly carried out as part of the recently-concluded IUCN/WWF Project 3108, is actually available. None of the reports from this project (prepared for the PHPA) (see Schulz, 1984; Salm and Halim, 1984; Anon, 1984c) is cited in the proposals, although the estimate of total breeding females given in the C. mydas document appears to be derived from the project's work.

"an indication of the population trend...showing recovery..."

The available evidence (reviewed in the INDONESIA account appended) indicates that populations of C. mydas and E. imbricata in Indonesia are, in general, declining, although numbers appear to have been maintained at some sites in recent years. For the former species, the evidence is as well-quantified, comprehensive and compelling as might reasonably be expected; for the latter, it is based mainly on inference and anecdotal evidence, and is accordingly less conclusive. There is no evidence whatsoever for an increase in nesting numbers in any population of either species.

The Indonesian proposals provide no indication of population trends, and no suggestion of recovery of depleted populations.

"an analysis of the potential for commercial trade..."

Both proposals review briefly the existing utilisation of, and trade in, C. mydas and E. imbricata. According to the proposals there were 'legal' international exports in 1985 of 7609 E. imbricata plus 8,000 kg of shell (probably representing over 13,000 individuals in total), and 11,264 specimens of C. mydas (presumably mainly stuffed animals). As both species are at

present on Appendix I, no exports of such a clearly commercial nature can be regarded as 'legal' under CITES regulations. Although the proposals record significantly lower numbers in earlier years, trade volumes are clearly high, and almost certainly too high for such harvests to be sustainable, given the evidence for declining turtle populations in Indonesia. Indonesia acceded to CITES at the end of 1978 and substantial quantities of turtle products have been exported since 1980. The issuing of a valid export permit by PHPA (the CITES Management Authority in Indonesia) would imply, given the terms of the Convention, that the export is not for primarily commercial purposes and that PHPA considers such exports not to be detrimental to the survival of the species concerned. The evidence available suggests that neither condition has been met. It would appear that the potential for commercial trade is extremely high, and that in practice, commercial interests have allowed the trade controls intended under CITES to be circumvented.

Both proposals put forward a number of considerations, almost identical in each case, as justification for the suggested amendments to the appendices. These, quoted from the Chelonia mydas proposal, are listed below (original wording retained but some spellings changed where clearly in error), along with comments thereon.

(i) "The reason of the inclusion of the species into Appendix I was mainly to avoid further exploitation in the wild."

No comment.

(ii) "There are strong indications that continuous harvests from the wild still operating illegally and the evidences that a number of specimens are still taken might be an indication that the wild population is able to tolerate a certain degree of harvest."

The critical word here is "tolerate". Harvesting would theoretically be possible until virtually no turtles are left, but a population in decline can not be said to be tolerating harvest. "A certain degree" of harvest might be possible, but it is suggested only that, given the evidence for extirpation and depletion of Indonesian nesting populations, a harvest even approaching its present level cannot be sustainable in the long term. It should also be noted that populations nesting outside Indonesian territory are being harvested in Indonesian waters, and so possible deleterious effects of harvesting would be spread over a number of populations breeding in neighbouring countries and would be correspondingly difficult to discern.

(iii) "Several habitats of the species are already protected under the status of Conservation areas".

The C. mydas proposal states that there are nest beaches within 21 protected areas; however, of these only P. Sangalaki (in the Berau area of north-east Kalimantan) and Sukamade beach (in Meru Betiri N.P.) are known to be major nest beaches; protection was reported to be non-existent at the former in 1984, but commendably good at the latter (Schulz, 1984, 1987). Similarly, very few of the sites mentioned for E. imbricata are known to be of major importance for the species. There is an urgent need to exert management control over all sites that have been identified as major nest sites. Certain foraging grounds appear to be within protected areas, but the relative importance of these is not clear.

(iv) "The total ban on its harvest from the wild so far could not support the main goal of its previous inclusion into Appendix I".

No comment.

(v) "A limited and controlled harvest by down-listing the species into Appendix II has a better chance to reduce the ongoing uncontrolled harvests".

Indonesia has continued to export large quantities of sea turtle products, both illegal, and 'legal' with PHPA permits, since its accession to CITES in 1978. In essence, the international trade has been almost uncontrolled - although significant advances have been made in very recent years, as Schulz (1987) stresses - and it is rather difficult to envisage how formally relaxing harvest and trade restraints will actually reduce the impact on wild turtle populations, given that it has been impossible to police the present partial restrictions.

(vi) "The mentioned measures obviously will gain at least two benefits i.e. financial benefit for the proponent (which until recently was taken only by illicit traders) and a wider public support toward the conservation of the species and other conservation efforts in the country".

Significant financial benefit may well accrue to the proponent, although without a financial analysis of the costs involved in monitoring of nest beaches by PHPA, and in enforcement of the licensed trade system proposed, the magnitude of this cannot be assessed. The extent of public support for the proposals is also difficult to predict, without information on the nature of their involvement.

Additional comments

The key to the feasibility of the proposed management regime, in essence common to both proposals, is the ability of the PHPA to restrict the proportion of eggs harvested to 30 % of the total production, and adequately to control export of turtle products. There are subsidiary requirements to prevent hunting of turtles within a given distance of the nesting beach, and, in the case of C. mydas alone, to limit the size range of turtles landed at Bali and to prohibit sale of meat in public eating places.

An objective assessment of the situation prevailing in the recent past leads to serious doubts as to the ability of the authorities to exercise the necessary controls. Both proposals state "Indonesia is a large country with 13,667 islands and long, open, maritime boundaries" and both admit "Total control over all islands and all of the maritime boundary is near impossible. Hence smuggling is rife and a difficult problem to solve" (quoted from C. mydas proposal). Neither proposal gives any indication of how PHPA will be able to exert effective control over egg harvesting in these very difficult circumstances. The fact that, according to all recent evidence (Schulz, 1984, 1987) egg harvest is near 100% throughout Indonesia would make its reduction to 30% an exceedingly difficult task, even without the geographic problems involved.

It is possible that the intention is to so restrict egg harvest only on certain beaches, and, presumably, to allow harvest to continue on others. The E. imbricata proposal does indeed state that the 30% quota will operate on "major" beaches, but no such specification is made for C. mydas; given the diffuse nesting habits of E. imbricata, it would be very difficult to define 'major' beaches, although considerably easier in the case of C. mydas.

Egg harvesting provides both a valuable food resource to local people, and a source of revenue to the local administration from the leasing of collection rights. Such local interests would presumably conflict to a great extent with PHPA requirements. The potential problems are well illustrated by the fact that, according to Schulz (1984), the egg contractor at Pangumbahan is sufficiently powerful to be able to restrict access by PHPA staff to the nesting beach. Similarly, although Pulau Sangalaki has been a Wildlife Reserve since 1982, the first PHPA official was only posted there in late 1984, at which time he had no transportation and no power; the local administration continued to lease egg collection rights without regard for the Central Government legislation (Schulz, 1984). Further, some of the past irregularities in turtle trade have seemingly been attributable to complicity between PHPA staff and exporters (Anon, 1984c).

Although, according to both proposals, legalised international trade will be restricted to quotas "strictly enforced" by PHPA, no details are provided of how quotas will be set, nor of how PHPA procedures will be upgraded to allow full control to be exercised.

Many of the mature turtles harvested within Indonesian territory will certainly be turtles that breed elsewhere but utilise foraging grounds in Indonesian waters. Turtles tagged on beaches in Australia, Papua New Guinea and Sabah have been killed in Indonesia (turtles from Sarawak have reportedly also been recorded). The Australian nesting populations of C. mydas include the largest remaining anywhere in the world, yet some Australian populations are probably being harvested to excess by fisheries operating on their feeding grounds in Indonesia (also in Papua New Guinea, Vanuatu and New Caledonia) (Limpus and Fleay, 1983). The international background to the Indonesian turtle fishery, although far from being well-quantified, is certainly significant and should be taken into consideration along with management options for populations actually nesting in Indonesia.

The ranching operations proposed appear in principle to provide a satisfactory means for supply of turtle products to the export trade, although it is impossible adequately to assess their feasibility in the absence of information on a number of critical parameters. These include: the means to be taken to enforce the 30% egg harvest; the number, location and planned management of the beaches from which eggs will be collected; the planned operation of the licensing and quota systems specified; and the time scale involved in replacing the current wild harvest with captive-reared stock.

Recommendations

Overall, it is clear that, whatever beneficial management practices they might entail for turtle populations, the present proposals by the Republic of Indonesia for the transfer of their populations of C. mydas and E. imbricata from Appendix I to Appendix II of CITES do not in any respect meet the criteria (Conf. 1.1 and 1.2) laid down for such transfers to be adopted, and should thus be rejected on this occasion.

In order for adequate assessment to be made, future proposals should contain the following elements:

> A suitable presentation of the results of fieldwork already undertaken, combined with results of work that should be carried out in parts of the country at present inadequately covered, together adequately summarising information on the distribution and relative importance of nesting sites of the species concerned.

A discussion of the means to be taken to implement the suggested reduction of egg harvest to 30%, together with evidence of a management plan for nesting beaches on which egg harvesting will take place.

A discussion of the ranching, licensing and quota systems proposed, with details of husbandry techniques, planned productivity, enforcement plans and means of setting quotas, and a time schedule for the substitution of wild caught turtles by ranched stock.

The Biological and Trade Status of Chelonia mydas and Erethochelys imbricata

ASSESSMENT OF THE PROPOSAL TO TRANSFER THE POPULATIONS OF CHELONIA MYDAS OF EUROPA AND TROMELIN FROM APPENDIX I TO APPENDIX II

This document has been prepared by the IUCN Conservation Monitoring Centre.

1. No transfer of the C. mydas populations of Europa and Tromelin to CITES Appendix II can be contemplated unless the islands are included in the territory covered by the French approval of CITES.

2. The C. mydas populations of Europa and Tromelin are large, probably stable and well protected on the breeding grounds. The only significant threat to them is from exploitation on the feeding grounds off Madagascar and Mauritius.

3. The removal of hatchlings for the ranch appears to have no significant impact on the turtle population. It is probably the least damaging form of turtle exploitation yet devised.

4. The ranching operation has few significant direct benefits to the wild turtle populations, and few can be envisaged, because they are already well protected. It is important that this should not, per se, be used as an argument for rejecting the ranching proposal.

5. The chief detrimental effects of allowing trade in ranched products appear to be the increased complication of implementing CITES controls, as it would set a precedent in introducing the only legal supply of turtle products. It is therefore necessary that very strict control sould be assured.

6. There are strong indications that the current level of control of trade in turtle products in France as a whole is far from adequate. Of particular concern are the continued legal harvests of turtles in the Franch Caribbean Departments; the widespread illegal trade in imported turtle products; the continuing officially sanctioned import of E. imbricata shell; and serious apparent errors in the CITES Annual Reports.

7. Provided that markets within the EEC can be supplied, there is little economic justification for requesting transfer to Appendix II, as it will not be possible to supply ranched products to Japan unless France intends to disregard the recommendations of Resolution Conf. 5.16.

Assessment of the proposal to transfer the populations of Chelonia mydas of Europa and Tromelin from Appendix I to Appendix II

Conf. 3.15 sets out the conditions under which local populations of Appendix I species which are being ranched can be transferred to Appendix II. The proposal will be assessed on this basis.

In order to be eligible for transfer, the population must "occur within the jurisdiction of Parties" and must be "deemed by the Parties to be no longer endangered and to benefit by ranching".

The question of jurisdiction is important, because although Europa and Tromelin are undoubtedly controlled and administered by France, a Party to CITES, they appear not to be covered by the French approval of CITES. Thus it would theoretically be possible for turtles to be exported to countries not Party to CITES without contravening the Convention, although there is no indication that this might be contemplated, and it would be illegal under the local legislation currently in force (Arrêté No. 1989/DG/01, 1983). Furthermore, even if the proposal to transfer the C. mydas populations of Europa and Tromelin to Appendix II were to be successful, it would not be possible to import hatchlings to Réunion under the terms of Resolution 5.16, which recommends that Parties do not accept an import of a product unit of a ranched population from non-Party states. It may be that this is a trivial point resulting from a simple omission when France approved CITES, but the long-term future of the islands has a bearing on the conservation of turtles. The islands belong to a group, geographically spread out around the coasts of Madagascar, but politically united under the title of the Iles Eparses.

Another problem concerns the status under E.E.C. legislation: the Iles Eparses are not part of the Department of Reunion and are therefore not in the E.E.C. Since 1 January 1984, it has been illegal under E.E.C. Regulation 3626/82 to import CITES Appendix I material to the E.E.C. for commercial purposes. It would therefore appear that all import of hatchlings from the Iles Eparses to Réunion from 1984 onwards has been in contravention of this regulation.

To demand that turtle populations be "no longer endangered" is akin to asking the question "when did you stop beating your wife?" It begs the question that the populations were endangered at one stage. In the case of Tromelin, this is far from certain. As far as is known, the nesting population has never been exploited except by occasional shipwrecked sailors. The island is extremely remote, exposed and difficult to land on. However, turtles nesting on Tromelin are known to migrate to feeding grounds off Madagascar, Mauritius and St. Brandon, all of which are subject to fairly severe turtle hunting, and so the population is exploited, but the effect of this is not known. Nesting numbers on Tromelin have only been monitored since 1973 and, allowing for the normal fluctuations in numbers, no trends are discernable. In fact, the nesting density is so high that it would be possible to argue that the use of the nesting beaches is approaching capacity in peak years, suggesting that little, if any, population decline has taken place. Assuming that protection will continue to be given to Tromelin, and that the effects of ranching will not be detrimental (see below), the chief continuing threat to the population is the exploitation on the feeding grounds. The current effects of this may not be very great, but it is not possible to guarantee that levels of exploitation may not be stepped up in future.

In the case of Europa, the island is less remote and there is a short history of turtle exploitation in the early decades of this century and the latter part of the last, though the extent or effect of this is not fully known. Nesting numbers have been monitored since 1973 and have fluctuated very widely. Once again, it is not possible to discern any short-term trends, although Pritchard (1982c) concluded that it was probably recovering, and included it as the first of only three populations of C. mydas which fell into this category. King (1982) singled out the populations of Europa, Tromelin and the Iles Glorieuses as three out of only four C. mydas populations "not now declining, and which seem not to be threatened with extinction". Hughes (1971b) reported that "not inconsiderable" numbers of nests were destroyed by females nesting later in the season, and interpreted this as an indication that the population was at capacity and might even benefit from exploitation. However he admitted that it had not proved feasible to estimate the number of nests destroyed. Fretey (1976) reported a lower level of nest destruction which he considered less significant. As with Tromelin, the females which nest on Europa are known to migrate to feed off Madagascar, Mauritius and Mozambique, where they are hunted. Hunting off Madagascar is entirely for subsistence use and local trade, and this has probably been taking place for centuries. Although its effects cannot be assessed, there are no indications that it is exerting undue pressure on the nesting populations of Europa and Tromelin; in general, hunting of turtles at sea tends to be less deleterious than hunting on, or just off, the nesting beaches.

The extent to which the nesting populations of Europa and Tromelin can be considered isolated management units has considerable bearing on the validity of this proposal. The migratory nature of the turtles and their exploitation on the feeding grounds has already been discussed, but interchange in breeding populations also needs to be assessed. Previous tagging returns in other parts of the world have failed to demonstrate any interchange between different nesting populations of C. mydas, leading Carr and Stancyk (1975) to conclude that "each nesting colony is therefore a separate reproductive unit that does not demographically reinforce any other. Protection for the Tortuguero population, for example, has no beneficial effect whatever on that at Ascension Island, or any other colony." If this is correct, then improved protection on Europa and Tromelin will have no effect in reinforcing turtle populations elsewhere in the Indian Ocean, and the nesting populations can be treated as separate management units, provided the effects of exploitation on the feeding grounds are monitored. Serological studies of Western Atlantic Green Turtles by Smith et al. (19??) support this view, and caused them to recommend that "from a management point of view, sea turtles should be viewed as a series of populations". However, some short-distance shifts are known, and recent tagging work at the Iles Eparses has demonstrated that a female, first tagged nesting on Tromelin in 1973, was recovered nesting on Europa nine years later (Le Gall and Hughes, in press). This is the only recorded instance of a long-distance shift in breeding site for any marine turtle and, if it is more than an isolated phenomenon, it has profound implications for turtle conservation. It implies that the populations nesting on the Iles Eparses might serve as a reservoir which could naturally repopulate depleted nesting populations elsewhere in the region. The frequency of such interchange between nesting populations requires further investigation, but is probably sufficiently low to be able to treat local nesting populations separately.

The other requirements of Conf. 3.15, for the transfer of populations to Appendix II are effectively covered under six headings, which must be addressed in the proposal and which will here be considered in turn:

i) evidence that the taking from the wild shall have no significant detrimental impact on wild populations.

The proposal does contain some relevant evidence, but the significance of the direct impact rests on three factors: the mode of collection of hatchlings, the quantities collected, and the likelihood that the regulations on collection will be observed.

The only form of collection which is permitted is the collection of hatchlings which emerge during the hours of daylight. Such hatchlings, it is argued, suffer near-total predation by frigate-birds Fregata, and only those hatchlings which emerge at night escape without human intervention. It is difficult for one who has not witnessed the emergence of hatchlings and the resultant frigate predation to assess the validity of this claim, because there appear to be few quantified scientific observations on which to base a judgement. Hughes (1971b) reported 100% mortality in a batch of 133 hatchlings which emerged while he was watching and concluded that "only groups emerging very close to the sea, or in conjunction with another nest, or nests, can avoid, or partly avoid, the frigates". Fretey (1976) considered that on Europa "more than 99% of the young turtles are thus destroyed during the summer" but thought that frigate predation was less (20-50%) during the winter. The normal collection procedure is to locate the emerging hatchlings by means of a gathering flock of frigate-birds, and as the collection is carried out exclusively during the summer months, it seems reasonable to conclude that it has no perceptible effect on natural turtle recruitment, provided it is carried out according to the regulations laid down. This form of exploitation is probably the least damaging way of taking turtles from the wild that has yet been devised. Mrosovsky (1983) pointed out that a certain percentage of turtle eggs could safely be harvested, particularly if an attempt were made to harvest "doomed" nests laid too close to the sea. However, a small percentage of even supposedly doomed nests may survive, whereas it appears that none of the hatchlings emerging by day in the summer would naturally reach the sea.

The quantities of hatchlings collected is essentially irrelevant assuming that none would naturally survive. However, the total numbers collected have so far represented only between 1 and 6% of the estimated hatchling production on Tromelin and less than 1.1% on Europa (Table 5 of the proposal). The table does contain a serious bureaucratic error as it indicates that the total collection for 1981-82 was only 5062, while Table 7 indicates that the farm received 10,705 hatchlings in the same year. The quantities of hatchlings collected are so small that they would probably have no detectable effect on turtle recruitment even if they were randomly collected throughout the 24 hours. The proposal states that the maximum permitted offtake will not exceed 15,000 hatchlings a year. If such an offtake were to coincide with a low nesting year (producing about 2 million hatchlings), it would constitute less than 1% of the total hatchling production, assuming that the harvest were spread between Europa and Tromelin. The practice in recent years appears to have been to collect most of the hatchlings from Tromelin, primarily for logistic reasons. Frazier (1984) commented that this was not appropriate in view of the much larger nesting population on Europa, and suggested that the collection quotas be set separately for the two islands.

The effectiveness of strict regulations on the collection of hatchlings depends on how well they are enforced. At the moment, protection on the Iles Eparses appears to be exemplary, due chiefly to the fact that they are only populated by military and meteorological personnel and visited only by official aircraft. All collection is carried out under the control of the station commander by station personnel who are entirely separate from the farm, and who therefore have no reason to contravene the regulations.

Many of the general problems associated with the disputed stimulation or suppression of trade in wild turtle products by ranched supplies have been discussed earlier, but there are several points specific to the French proposal which must be examined. Green Turtles have many different commercial products, and it is necessary to assess each one independently. Meat is both the main product by weight and also the most difficult to transport and handle as it requires chilling or other forms of preservation. On Réunion itself there was very little existing market for turtle meat prior to the introduction of farmed products, simply because there were very few turtles caught. Only very occasionally was a turtle caught accidentally by a fisherman, and some of these may have been sold to hotels. To a restaurateur or hotelier, one of the chief attractions of farmed turtle meat is the continuity of supply and consistent quality. The only advantage of buying a poached turtle, if one could be obtained, might be a slightly lower price. However the supply of farmed meat is so large in relation to the possible supply of wild animals that it is most unlikely to pose any increased threat to wild turtles around Réunion. A possible, more important threat might be the introduction of turtle meat to international tourists who had previously never tasted it. They might then be more inclined to demand turtle meat when visiting other countries which allowed a wild harvest of turtles. Conversely, if ranched turtle products were adequately marked, and the marking were to be combined with a public education programme, then this might have a beneficial effect in making tourists aware of the need to avoid buying wild turtle products.

The question of exported turtle meat is more difficult to assess as there are far more variables involved. On a global scale, it is clear that the Réunion ranch on its own, will never make a significant impact on reducing the demand for wild turtle meat because the total quantity of wild meat consumed is several orders of magnitude greater than the potential supply of ranched product. However this is too simplistic a view as most turtle meat consumed never reaches the commercial domestic market, let alone the export market. It should be noted that the export of all edible animal products is generally better controlled than for non-edible material because it is usually subject to veterinary or public health control in addition to any measures implemented under CITES.

Turtle shell is the other main product of the ranch on Réunion, either in the form of whole, polished carapaces, or for use as a raw material in the manufacture of jewellery or other decorative objects. The whole carapaces undoubtedly supply the same type of market as the carapaces of wild turtles (both C. mydas and Eretmochelys imbricata), although they are distinguishable from both to the trained eye. At present, carapaces are sold mainly individually to tourists, who often then export them when they return home. There are two defects in the current implementation of the regulations which give cause for concern: the first is that French Customs do not control the import or export of personal possessions valued at less than FF1000, in spite of their obligations under CITES to do so.

The transfer of ranched populations to Appendix II without thereby endangering wild populations remaining on Appendix I depends largely on the ability to control trade adequately under CITES. There are strong indications that the degree of control on trade in turtle products in France may not be adequate to ensure this:

1. The Overseas Departments of France, Réunion, Guadeloupe, Martinique and French Guiana, are the only territories included within the EEC where C. mydas and E. imbricata occur regularly, and hunting of wild turtles is permitted for a least part of the year in the Caribbean

Departments. France therefore represents the only legal source of wild turtle products within the EEC. It has repeatedly been stressed that the Overseas Departments of France are politically part of France and that import controls do not operate between Departments. Martinique and Réunion therefore bear the same political relationship to each other as two mainland Departments. Under these circumstances there must be a danger of confusing ranch-reared and wild-caught turtle products legally acquired within France. The standards of control of trade in wildlife in French Guiana are said to be abysmal (Villalba Macias, 1987), and Martinique was reported to have the highest level of turtle exploitation anywhere in the Lesser Antilles (Carr et al., 1982).

2. In spite of having withdrawn its reservations on sea turtles on 1.01.1984, CITES Annual Reports indicate that France has continued to import wild-caught turtle shell as follows:

1984	E. imbricata	215 kg shell from Cuba
1985	Cheloniidae	30 kg shell from Haiti
	E. imbricata	75 kg shell from Cuba
		60 kg shell from Fiji
		40 kg shell from Tanzania

Much of this shell is used in the manufacture of spectacle frames and jewellery which is freely on sale in France (Le Serrec, 1987). The shell was apparently granted import permits on the "paramedical" grounds because it is used to make frames which are non-allergenic (Blanchard, pers comm.). This is not a valid excuse under the terms of CITES (and a similar excuse could be applied to allow trade in rhino horn).

3. There are substantial quantities of manufactured turtle products imported to France, mainly from the Far East, which are not recorded in the French CITES Annual Report and are freely on sale in French shops (Le Serrec, 1987). Stuffed E. imbricata and lampshades made from C. mydas shell imported from the Orient were even on sale in Réunion in January 1987 along with E. imbricata jewellery imported from Madagascar. The import and sale of such material is illegal under Arrêté No. 1985/DAE/CE 1983; the authorities were aware of the sale, but claimed that no action could be taken as the Arrêté contained no sanctions which could be applied against traders (Salvadori, pers. comm.). Some of the Oriental products were said to have been imported to Réunion from Metropolitan France, and thus could not be detained by Customs Authorities in Réunion.

4. The French CITES Annual Report for 1985 indicates the export to Japan and Australia of turtle soup made from C. mydas meat, said to have originated in the UK, probably here meant to indicate the Cayman Islands. The tins of soup, manufactured in France and also on sale in Paris, bear no indication on their labels of the origin of the turtles. The Cayman Islands have reported exporting no turtle meat to France, although some could have entered via the UK. The main company which makes turtle soup in France, Rougier, claims that all of the turtle meat used comes from Réunion (Le Serrec, 1987) and that none has been imported from the Cayman Islands since 1979. Rougier reports that during 1985 it exported soup to Austria and Japan. The French CITES Annual Report would therefore appear to contain an omission if not a deliberate falsification. There is no evidence that any turtle soup was imported to Australia, and it seems likely that the French

export report confused the ISO code for Australia (AU) with that for Austria (AT). Until the ranching proposal has been accepted, the Réunion turtles remain in Appendix I, and therefore cannot legally be exported; it is therefore possible that the origin was declared as UK, indicating "Cayman Islands" as this was thought to be the only "legal" source of C. mydas. The Cayman Turtle Farm is not an approved captive-breeding operation registered as such with the CITES Secretariat. Therefore any import of meat to the E.E.C. from the Cayman Islands contravenes CITES Resolution Conf. 4.15. Thus, even if the soup really was made from Cayman Island turtles, its export would still contravene CITES.

5. French Customs regulations do not permit the control of personal items having a value of less than FF 1000. This means that tourists returning to France with products made from sea turtles cannot be detained, no attempt is made to control or monitor the export of small tourist items from Réunion, and no E.E.C Certificates are issued for such items. Under the present conditions, this possibly stimulates a demand amongst tourists for carapaces, which is known to threaten turtle populations elsewhere in the world, and increases the difficulties of Customs authorities in importing countries in controlling the import of wild-caught turtle carapaces. French tourists were mentioned as being one of the few European nationalities still to be buying turtle souvenirs in Indonesia (Schulz, 1987).

ii) An assessment of the likelihood of the biological and economic success of the operation.

The proposal does contain an assessment of both biological and economic success. On the biological side, the ranch has been operating since 1978 with relatively few technical problems. There has been little disease except in 1981, and in other years the annual mortality has not been high in comparison with most commercial intensive farming operations. The proposal states that most of the mortality occurs in the first year of life; in the years in which hatchlings have been obtained, the mortality, expressed as a percentage of the number of hatchlings acquired, has varied from 77% in 1981 to 7% in 1984 (Table 7 of the proposal). Some of the reported "losses" actually represent selective killing of slow-growing and under-performing turtles; so the unintentional mortality is lower. The ranch has experienced problems with dermal necroses, but the cause of at least some of these has been traced to nutrition, and has been partially corrected. The remaining necroses are less extensive than those previously reported and do not appear to be contributing significantly to mortality of the older animals. They do reduce the value of the leather, which would have a bearing on the economic success, but for the fact that the leather is not at present used.

The economic success of the farm is assessed in the proposal chiefly by means of three tables (8, 9 and 10). It is difficult to evaluate these satisfactorily, but the farm appears to have made a profit in 1985 and 1986, mainly by diversifying its activities to include the admission of tourists. Without this source of income, it is estimated that the farm could break even at an annual production of 75 t and run at a profit of 12% of its gross turnover at full capacity of 150 t a year. The latter figure is mainly attributable to the sale of 450 kg of top-quality shell. The thick shell which can be obtained from farmed C. mydas is comparable in quality to that of E. imbricata, and might to some extent replace its market.

iii) Assurance that the operation shall be carried out at all stages in a humane (non-cruel) manner.

The proposal does contain such an assurance. One of the chief objections on this point to the proposal presented to the 1985 CITES conference concerned the dermal necroses. This subject has been discussed above, and the problem appears to have been substantially reduced by research into the formulation of new diets. The research is continuing and further progress is to be expected. As regards other aspects of the husbandry at the farm and the conditions of slaughter, the turtle ranching operation appears to conform to the standards generally accepted for modern intensive agriculture. It would be hypocritical to oppose the proposal on these grounds.

iv) Assurance that the operation will be beneficial to the wild population through reintroduction or in other ways.

[An earlier paragraph in Conf. 3.15 stipulates that "the operation must be primarily beneficial to the conservation of the local population (i.e., where applicable, contribute to its increase in the wild)". These two requirements will be considered together.]

The proposal lists seven ways in which the ranching operation benefits the local [turtle] population. These will be discussed in turn:

1. Return of doomed females to the sea.

   Although this is a natural form of mortality, it can be very substantial. Hughes (1970) recorded that at least 50 turtles perished on the rocky lower margin of Europa beaches during his survey between 5 November and 20 December, although he implied that most of these had finished nesting. The saving of females which have become disorientated can undoubtedly be beneficial, and was recognised as the most important of such measures by several of the commentators in the Annex to the 1985 ranching proposal. Unfortunately, the exact value of this measure is difficult to quantify, as systematic records have not been kept. Table 6 of the proposal contains records of the numbers of females saved, but the figures for 1984 and 1985 are very low and are said to be incomplete. It should be pointed out that the return of mature females to the sea is a strenuous activity which appeared to be willingly carried out by the Meteorological staff at Tromelin.

2. The release of hatchlings at night.

   Prior to the submission of the 1985 proposal, there was a systematic policy of collecting hatchlings which emerged during the day, and thus protecting them from frigate predation. Half of the hatchlings would be retained for the ranch and half would be released during the hours of darkness. This policy almost certainly results in increased hatchling survival, but its value is chiefly cosmetic, the number of hatchlings thus saved being tiny in comparison to the amount of work involved. In the wake of the disappointment following the rejection of the 1985 ranching proposal, this practice appears to have been allowed to drop in 1985 (Table 6 of the proposal). Higher numbers were again saved in 1986, but the number of hatchlings released on Tromelin was only 33% of the number removed for the farm, although proportionately

more hatchlings were released on Europa. If the policy of releasing half of the hatchlings were strictly adhered to, it would ensure that no more than 50% of the hatchlings emerging by day were taken for the ranch.

3. Elimination of rats.

The elimination of rats on Tromelin was largely effected by the passage of severe cyclone which completely inundated the island in 1986. Since then, very few rats have been seen, and the eradication programme has been suspended. If the eradication programme could be intensified at this stage, it is possible that it could be successful. When the island was visited by a panel of experts in 1984, several of them commented on the quantity of rubbish that had been allowed to accumulate around the station. A visit in January 1987 showed that substantial progress had been achieved in tidying up the island, the only rubbish visible being confined to a dump at the end farthest from the station. Household rubbish was apparently burnt or routinely removed from the island by the supply aircraft, but no attempt seemed to have been made to remove the backlog of larger items accumulated in the dump.

4. Installation of a deflector for the lighthouse on Tromelin.

The proposal states that a deflector has been fitted, but this is misleading. A deflector has indeed been fitted, but when inspected in January 1987 it was so low that it was completely ineffective, the shadow that it cast extending barely 17 m from the foot of the buildings. The main nesting beach was still fully exposed to the beam from the lighthouse.

5. Education programme for tourists.

6. Distribution of a poster and educative video.

One of the most striking features of a visit to Réunion, and in particular the turtle ranch, is the almost complete lack of educative material explaining the globally endangered status of sea turtles or the need to avoid buying wild-caught turtle products. The ranch has a shop and reception centre where tourists are admitted, and although a diligent search revealed a pamphlet about turtle conservation kept behind the reception desk, there were no posters explaining about the status of wild turtles, nor any indication that all of the turtle products on sale had come from ranch-reared rather than wild turtles. The only visible attempt at education was the showing of a video in one of the out-buildings which tourists visited on a tour of the external facilities of the ranch. There is indeed great scope for public education on turtle conservation in Réunion, and the manager of the ranch expressed an interest in funding the production of educative posters and other material which could be displayed at the ranch, at the airport and at commercial outlets, such as restaurants and gift shops, where turtle products are sold. If such an education programme could be stimulated and possibly funded by the ranch it would certainly be beneficial. It is merely surprising that so little attempt had previously been made, in spite of the two proposals that had previously been submitted to CITES.

7. Development of research programmes on turtles in the Indian Ocean.

A considerable amount of research has recently been undertaken on sea turtles in the region, and several important papers published which have substantially added to our knowledge of turtle biology. It would be possible to argue that such research would have been undertaken irrespective of the ranch, but realistically it is clear that the existence of the ranch, and particularly the interest generated by the CITES proposals, has stimulated the supply of research funds for this subject. This is probably the most beneficial effect of the ranching operation to turtle conservation. If the ranching proposal were to be rejected again, it is highly likely that funds allocated for turtle research would be curtailed, simply because of the lack of commercial incentive. There are already signs of a restriction in research funds. All of the research is carried out by IFREMER, a Government institute which works on four-year budgeting periods. Most of the intensive surveying of turtle populations on Europa and Tromelin was carried out from 1981 to 1984, but the current research allocation does not permit the stationing of research personnel on the islands, and consequently subsequent censuses of nesting tracks has been carried out by meteorological personnel. Frazier (1984) suggested that the ranch should be made to pay a licence fee for each hatchling removed from the islands, which could then be specifically allocated for turtle research, thereby ensuring continuity of funding, but this suggestion does not appear to have been taken up.

To these benefits outlined above should be added the effect of substituting farmed turtle products for wild products in national or international markets. This argument has previously been discussed, and will not be considered further.

There is a negative side to the potential benefits of the ranch: the question of what would be the result of rejecting the proposal. The probable interruption of research funding has already been mentioned, but there are other likely effects of the inevitable disapointment. After the 2nd propsal was rejected in 1985, there are signs that some conservation work on the Iles Eparses was discontinued, in particular the release of hatchlings during darkness. All steps to mark ranched turtle products were dropped, and there are some indications that the same might happen again (see below). It is not conceivable that the Protected status of the Iles Eparses would be relaxed while French administration continues, indeed to threaten such a step would be thinly veiled blackmail; however, other conclusions might be reached if France were ever to cede sovereignty of the islands.

In conclusion, it can be seen that the ranching operation on Réunion has very few demonstrated direct or indirect benefits to the wild turtle population, although the rescue of disorientated females is potentially of some significance. To those not familiar with turtle conservation problems, it might seem odd that there is no release programme, other than the short-term protection of hatchlings, for augmenting wild turtle populations as stipulated in Conf. 3.15. The reason for this is not so much a lack of will but a lack of concensus. The release of turtles is almost as controversial a subject as that of ranching itself. The value of headstarting of hatchlings is considered to be "questionable" as it "offers the very real possibility of lowering rather than raising the chances for success" (Ehrenfeld,

1982), and the long-distance transport of turtles to re-establish extinct or severely depleted turtle populations, detrimental to the genetic integrity of the local turtles. In the face of such uncertainty it is usually considered safer to refrain from the more manipulative techniques in turtle conservation. The real reason why the ranch does not benefit local turtle populations to any greater extent is because the conservation of turtles on Europa and Tromelin is already very good, and it is therefore difficult to find ways of improving it. If the lack of significant benefit is used as an excuse for rejecting the ranching proposal, then France will effectively be being penalised for protecting its turtles too well. The consequence of this would be that countries which intended to exploit their turtle populations by ranching in the future should not instigate total protection immediately as this would prevent them from implementing significant improvements later that would allow them to comply with the requirements of Conf. 3.15. It is clearly against the spirit of CITES to prevent the exploitation of a well-protected population on the grounds that it could not be benefitted further.

v) A description of the methods to be used to identify the products through marking and/or documentation.

[An earlier paragraph in Conf. 3.15 contains the requirement that "the products of the operation must be adequately identified and documented to ensure that they can be readily distinguished from products of Appendix I populations". These two requirements will be considered together.]

If these two requirements are interpreted to mean that products must be adequately identified after the ranching proposal has been accepted, then further discussion on this point is superfluous, as the CITES TEC Meeting has already discussed and approved the proposed measures for marking turtle products. However, it should be pointed out that marking procedures were discussed and outlined at the 5th meeting of the Conference of the Parties to CITES, but none has been implemented. When the ranch was visited in January 1987, there was an astonishing lack of practical steps taken to differentiate the ranched products from those of wild-caught turtles. At the farm shop itself, there was no notice to this effect, and the only indication was on tins of turtle meat and turtle soup, which had "produit de l'élevage" printed in letters so minute as to be barely legible even at close range. Three shops selling carved shell products were visited, but only one of these had notices indicating that the stock was from farm-reared animals. These notices were small, typewritten and inconspicuous. When questioned as to whether any of the customers ever asked about the source of the shell, the shop-owner replied that they were sometimes curious to know why her jewellery was so much more expensive than the Madagascan Hawksbill shell jewellery that was illegally on sale elsewhere on the island. Many restaurants had turtle meat on their menus, but none of these had any indication of the source of the meat. The only products that were seen to be clearly marked were the smoked meat products prepared at the local smokehouse. The proprietor indicated that this was because they were exported to Metropolitan France where customers wanted to be assured that the meat was of farmed origin. In January, 1987, plans to introduce a marking system, as outlined by the proposal document, were well advanced, but there was some confusion as to when the scheme was to begin. One informant said it was to start in February, while others indicated that it would not be put into operation until

after the CITES approval had been given, pointing out that the logo chosen for the marking contained the words that CITES approval had been given.

vi) Assurance that the criteria continue to be met, with records open to scrutiny by the Secretariat, and that the Management Authority shall include in its reports to the Secretariat sufficient detail concerning the status of its population and concerning the performance of any ranching operation to satisfy the Parties that these criteria continue to be met.

The proposal does contain an undertaking from the Management Authority to this effect.

Justification

The primary justification for applying for transfer to Appendix II appears to be to allow access to overseas markets for turtle products. It is argued that this will increase the trade volume, possibly give higher prices for certain products, and will thereby interest some major manufacturers in handling and processing the products of the ranch. The proposal states that local demand for turtle products greatly exceeded the ranch production of 30 t in 1985, and that it was estimated to be able to sell an annual total of 75 t locally and in Metropolitan France. At this level, the ranch would be profitable, even without the tourist income. Although it is not explicitly stated, it is assumed that a production of 150 t a year, with the ranch at full capacity, would require overseas sales.

Traditionally the main markets for meat products have been in Europe and North America. Since the implementation of EEC Regulation 2636/82 in 1984, the trade in products within the EEC has not been subject to CITES controls, as it is not regarded as international trade. Thus it is not necessary to transfer the population to Appendix II in order to sell products within the EEC. Some European countries, notably F.R. Germany and Denmark, have announced the intention of prohibiting imports of turtle products from Réunion, although this appears to be in contravention of EEC trade regulations. It has been argued that transfer of the turtle populations to Appendix II would persuade them to relax this stand, although the correct implementation of European trade measures should have the same effect. The American market is closed as a result of the Endangered Species Act (E.S.A.) which takes stricter measures than CITES and is independent of it. Even if the ranching proposal were accepted, it would still be necessary to relax the E.S.A. before exports to the USA could take place. In view of the history of the listing of C. mydas on the E.S.A. in relation to Cayman Turtle Farm, it is far from certain that any relaxation would take place.

Japan has always been the chief market for turtle shell, and its dealers have certainly shown an interest in the high quality C. mydas shell which is produced on Réunion as a substitute for the shell of E. imbricata which they currently use. However, if the ranching proposal were to be accepted, the implementation of Resolution Conf. 5.16 would prevent France from exporting shell to Japan unless it could be persuaded to withdraw its reservation on C. mydas. In the absence of any assurance from Japan to this effect, it would be unwise to rely on the availability of this market.

It therefore seems that the acceptance of the ranching proposal would confer few, if any, advantages in terms of access to known, legal overseas markets.

CONCLUSIONS

On biological grounds, the conduct of the ranching operation for Chelonia mydas in Réunion appears to meet all the required criteria of Conf. 3.15. The collection of hatchlings from Europa and Tromelin appears to cause no significant harm to the wild populations and to be controlled conscientiously and effectively. The only way in which the operation may have a detrimental effect on wild turtle populations would be in impeding the control of or stimulating the trade in wild turtle products. Both of these possibilities could be prevented by the correct implementation of CITES controls, and it is therefore of considerable concern that there appear to be serious shortcomings in the protection and control of trade in wild turtles in France.

References

Anon. (1984c). Sea turtle trade in Indonesia. Report prepared for the Directorate of Nature Conservation Directorate-General of Forest Protection and Nature Conservation by the IUCN/WWF Marine Conservation Project in collaboration with the Subdirectorate of Marine Conservation, PHPA.

Carr, A., Meylan, A., Mortimer, J., Bjorndal, K., and Carr, T. (1982). Preliminary survey of marine turtle populations and habitats in the western Atlantic. Interim Report to National Marine Fisheries Service. Contract NA80-FA-C-00071. NOAA Technical Memorandum NMFS-SEFC.

Carr, A.F. and Stancyk, S.E. (1975). Observations on the ecology and survival outlook of the Hawksbill turtle. Biol. Consv. 8 :161-172.

Ehrenfeld, D. (1982). Options and limitations in the conservation of sea turtles. In, Bjorndal, K. (Ed.). The Biology and Conservation of Sea Turtles. Smithsonian Institute Press, Washington, D.C. (Papers presented at the World Conference on Sea Turtle conservation, Nov. 26-30, 1979, Washington D.C.

Frazier, J. (1984). Evaluation of the ranching of Chelonia mydas on La Réunion (20-26 March). Annex to Proposal presented to the 5th Meeting of the Conference of the Parties to CITES.

Fretey, J. (1976). Les tortues marines de Guyane Française. Le Courier de la Nature. 41 (January/February).

Hughes, G.R. (1970). Preliminary report to the Southern Africa Wildlife Foundation (W.W.F.) on the status of sea turtles in south-east Africa. Section 2: Madagascar and the Mascarenes. Part (1) Europa Island. Part (2) South and South-west Madagascar.

Hughes, G.R. (1971b). Sea Turtles - A Case Study for Marine Conservation in South East Africa. In: Proceedings Symposium on Nature Conservation as a Form of Land Use, Gorongosa National Park, Moçambique, 13-17 September 1971. Southern African Regional Commission for the Conservation and Utilization of the Soil.

Le Gall, J.-Y., and Hughes, G.R. (in press). Migrations de la tortue verte Chelonia mydas dans l'Océan Indien Sud-Ouest observées à partir des marquages sur les sites de pontes Europa et Tromelin (1970-1985).

Le Serrec, G. (1987). Importations et commercialisations des produits a base de tortues marines en France. Rapport TRAFFIC(France) No. 1.

Mrosovsky, N. (1983). Conserving Sea Turtles. The British Herpetological Society, London. 170pp.

Salm, R.V. and Halim, I.M. (1984). Marine Conservation Data Atlas. Prepared for the survival of Indonesia's seas and coasts.

Schulz, J.P. (1984). Turtle Conservation Strategy in Indonesia. IUCN/WWF Report.

Schulz, J.P. (1987). Status of and trade in Chelonia mydas and Eretmochelys imbricata in Indonesia. Consultancy report prepared for IUCN Conservation Monitoring Centre.

Smith, M.H., Hillestad, H.O., Manlove, M.N., Straney, D.O., and Dean, J.M. (1977). Management implications of genetic variability in Loggerhead and Green Sea Turtle. Proc. XIII the Congress of Game Biologists: 302-312.

Villalba-Macias, J.S. (1987). French Guiana. Unpublished report by TRAFFIC(Sudamerica).