APPLICATION TO REGISTER A CAPTIVE BREEDING OPERATION INVOLVING *Chelonia mydas* ON GRAND CAYMAN, CAYMAN ISLANDS

Class:	Reptilia
Order:	Testudinata
Family:	*Cheloniidae*
Genus:	*Chelonia*
Species:	*mydas*
Common Name(s);	Green Sea Turtle, Green Turtle

View of the pre-Hurricane Michelle breeding pond showing the in-water and beach divisions that separated the founder stock and F_1 breeding turtles, artificial nesting beach on left, hatchery and fibreglass tanks in background, and hatchling tanks in foreground.

Submitted by the CITES Management Authority of
the United Kingdom of Great Britain and Northern Ireland
pursuant to Resolution Conference 11.14

Executive Summary

The Cayman Islands are an Overseas Territory of the United Kingdom of Great Britain and Northern Ireland, and comprise three inhabited islands, Grand Cayman, Little Cayman and Cayman Brac. The Cayman Turtle Farm is located on Grand Cayman.

The United Kingdom extended its ratification of the Convention on International Trade in Endangered Species of Wild Fauna and Flora ("the Convention") to the Cayman Islands on 7 February 1979. The application of the Convention to the Cayman Islands became effective on 8 May 1979.

The Cayman Turtle Farm (1983) Ltd. was founded with approximately 208 wild-caught adult turtles and close to 500,000 eggs collected from Ascension Island, Costa Rica, Guyana, Mexico, and Suriname during the period 1968-1978

The Fifth Meeting of the Conference of the Parties to the Convention (Buenos Aires, 1985) considered and rejected a proposal to transfer, from Appendix I to Appendix II, the captive population of *Chelonia mydas* pursuant to Resolution Conf 3.15 on ranching.

Since that time, the Cayman Turtle Farm pursued its breeding program and now fully satisfies the requirements of Resolution Conf 10.16 (Rev) that enables specimens of *C. mydas* derived from the Farm's breeding program to be defined as bred in captivity.

Namely:

- the operation was founded on legally acquired stock from Costa Rica, Suriname, Guyana, Mexico and Ascension Island – see Section 4;
- the founding stock was obtained with no demonstrated adverse affect on the survival of the wild population(s) – see Section 4.1;
- F_2 generation offspring was first produced in a controlled environment in 1989; and
- the operation has been maintained without augmentation from the wild since 1978.

In 1983 the operation was scaled back and the principal purpose of the Cayman Turtle Farm became the captive breeding of *Chelonia mydas* for tourism and the preservation of Caymanian tradition of consuming turtle meat.

The purpose of this registration proposal, which concerns carapaces only, is to allow tourists that visit the Cayman Turtle Farm to export carapaces. These are a valuable part of captive-bred green turtles that are currently being destroyed and which represent a waste of a valuable resource. The carapaces represents a by-product of turtles slaughtered for meat production or derived from on-farm mortality.

Each carapace processed for sale will bear a permanently fixed metallic label with Farm's logo, the ISO country code for the Cayman Islands, a unique number and year of production. It will also be accompanied by a CITES permit with a digital photograph of the carapace bearing the unique serial number.

All species of marine turtles are protected under Caymanian law. CITES is implemented by the Cayman Islands through the *Endangered Species Protection and Propagation Law of 1978*. This legislation is in the process of being repealed and replaced by the *Endangered Species (Trade and Transport) Law*.

The application is submitted by the Management Authority of the United Kingdom of Great Britain and Northern Ireland, on behalf of the Cayman Islands, pursuant to Resolution Conf 11.14. The supporting information follows the same sequence of paragraph numbering as that of Annex 1 of the Resolution.

1. Name of Operation

Cayman Turtle Farm (1983) Ltd.; owned by the Cayman Islands Government and operated as a private company. Its operation is administered by the Ministry of Tourism, Environment, Development and Commerce through a Board of Directors appointed by the Governor.

The name and address of the manager of the Cayman Turtle Farm is:

Mr Kenneth HYDES
Managing director
PO Box 645GT
Cayman Islands BWI
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e-mail: kh_ctfl@candw.ky

2. Date of Establishment

1968.

3. Species Bred

Green turtle, *Chelonia mydas* (Linnaeus, 1758).

Chronology of Significant Events in the History of Cayman Turtle Farm

1968	Operation commenced as a private company under the name Mariculture Ltd.
1968-1978	Legal acquisition of founder stock (eggs and live turtles) from various sources.
1973	First production of eggs in captivity by wild-caught females.
1975	First farm-reared turtles (collected as eggs from the wild) mature and lay eggs in captivity. CITES came into affect with *Chelonia mydas* included in Appendix-II. US market closed for all turtle products. Mariculture Ltd. goes into receivership. Operation purchased by another group of investors and renamed Cayman Turtle Farm Ltd.
1977	*Chelonia mydas* transferred from Appendix-II to Appendix-I of CITES (14 February 1977).
1978	Farm achieves egg "self-sufficiency" through on-farm egg production derived from breeding by farm-reared and wild-caught females.
1980	Farm implemented a program to reduce the size of its herd in eventual preparation to cease operating.
1983	Cayman Islands Government purchase 'down-sized' farm and operates as Cayman Turtle Farm (1983) Ltd. to: - promote tourism as principal source of revenue; - produce turtle meat to supply the local market; and - release turtles into Caymanian waters. First production of eggs by first generation turtles on the Farm.
1985	Down-listing/ranching proposal for the population of *Chelonia mydas* captive on the Farm rejected by the fifth meeting of the Conference of the Parties (Buenos Aires, Argentina).
1989	First production of captive-bred second-generation hatchlings.
1998	All exports ceased.
2001	Decision to seek CITES registration of the Farm as captive breeding operation. Farm infrastructure badly damaged by Hurricane Michelle resulting in the loss of 78% of the breeding herd.
2002	Construction of post Michelle re-development plans underway.

4. Parental Breeding Stock and Legality of Acquisition

On 4 November 2001, the infrastructure of the Cayman Turtle Farm sustained major damages as a result of Hurricane Michelle. Immediately prior to Hurricane Michelle, the parental breeding herd comprised 182 founder[1] animals, 132 first generation breeders and 41 large immature first generation animals as shown in the pre-Michelle section of Table 1. The post-Michelle breeding herd at the Farm comprised 34 founder stock, 47 first generation animals, and 6 animals which had lost their tags. If these "lost tag" animals cannot be precisely identified, they will be classified as "unknown" and treated as founder stock and not F1.

Table 1 - Numbers and origin of Breeding Stock (pre- and post Michelle)

Origin	pre-Michelle (Oct.2001)			post-Michelle (Dec.2001)		
	males	females	Total	males	females	total
wild-caught adults	16	47	63	-	8	8
wild-caught adults (Mexico)	8	76	84	2	12	14
farm-reared stock (wild-collected eggs)	10	25	35	4	8	12
founder stock subtotal	**34**	**148**	**182**	**6**	**28**	**34**
captive born (F_1) breeders	54	78	132	11	23	34
immature F_1 retained for breeding	6	35	41	4	9	13
no tags	-	-	-	3	3	6
TOTAL	**94**	**261**	**355**	**24**	**63**	**87**

The Farm was founded on wild-caught adult turtles and eggs collected from various locations in the Caribbean Region and Atlantic Ocean from 1968 to 1978. Details of the acquisition of these animals, which comprise the "founder" stock of the Cayman Turtle Farm, are provided below. The majority of the founder stock constitute pre-Convention animals as the collections occurred before the Convention came into force in 1975. The remainder of the founder stock were derived from countries before they, or the Cayman Islands, had acceded to the Convention. The various countries acceded to the Convention as follows: CR-1975; GY-1977; KY-1979; NI-1977; MX-1991 and SR.-1981

The first stock introduced to the farm in 1968 (to become part of the founder parental stock) was 350 juveniles (1-2 years of age), provided from the Caribbean Conservation Corporation. These animals were collected as eggs in Costa Rica and raised experimentally with a view to repopulating the Caribbean Region (Fosdick and Fosdick 1974). These animals constituted the first captive raised founder stock at the Farm.

Sixty (60) animals were obtained as adults or subadults between 1968 and 1973 from Costa Rica, Suriname, Guyana and Ascension Island. Because of difficulties experienced in capturing sufficient numbers of males in the vicinity of the nesting beaches, during the period September 1970 to May 1971, the Farm purchased 31 green turtles (24 females and 7 males) from Caymanian boats fishing the Mosquito Keys off eastern Nicaragua (Ulrich & Owens, 1974). One hundred and seventeen (117) sub-adult and adult animals were also obtained from Mexico in 1976-1977.

The remainder of the founder stock was derived from eggs collected from Suriname, Costa Rica, Guyana, Ascension Island, from 1968-1978. Records of numbers of eggs obtained are incomplete and are summarized in Table 2. A significant proportion of the original founder stock (derived from wild-collected eggs) was processed for meat between 1980 and 1983, as part of the Farm's policy of 'down-sizing' its stock holdings in preparation for closing due to market closure.

[1] The captive parental stock refers to all breeding animals regardless of their origin. The proposal differentiates between animals that represent the stock (wild-collected eggs and wild-caught adults) upon which the Farm as founded (founder stock) and subsequent F_1 animals that have matured and been incorporated into the captive parental breeding herd.

Table 2 - Known numbers of eggs collected from the wild (after Simon, 1975 and Fosdick & Fosdick, 1994)

Year	Location	No. of eggs collected	No. & Percentage viable eggs
1968	Costa Rica (Tortuguero)	15,000	7,500 hatchlings
1969	Ascension Is	15,000	?
1969	Costa Rica (Tortuguero)	15,000	?
1970	Ascension Is	15,000	?
1970	Costa Rica (Tortuguero)	15,000	?
1970	Guyana (Shell Beach)	5,000	?
1970	Suriname	24,000	?
1971	Suriname	30,000	14,346 (47.8)
1972	Ascension Is	16,746	9,032 (53.9)
1972	Suriname	29,582	14,235 (48.1)
1972	Costa Rica (Tortuguero)	14,928	11,260 (75.4)
1973	Ascension Is	19,105	14,818 (77.6)
1973	Suriname	63,404	49,342 (77.8)
1973	Costa Rica (Tortuguero)	14,803	11,864 (80.4)
1974	Ascension Is	19,814	?
1974	Suriname	60,650	?
1976	Suriname	42,830	?
1977	Suriname	33,609	?
1978	Suriname	28,173	?
TOTAL		**477,644 minimum**	**124,897 minimum**

Footnotes
? - Records of the quantities of eggs collected during these expeditions are not available.

5.1 Legality of Acquisition of Founder Stock

All eggs and animals were obtained legally with the authorization and, in some instances, assistance of the government authorities of Costa Rica, Ascension Island, Guyana and Suriname (Simon, 1975). Eggs obtained were transported to facilities on Grand Cayman and incubated artificially. In accordance with separate agreements established with each source country, 1 % of the resulting hatchlings were returned (as one-year old animals) for subsequent release at the collection sites (section 17, Table 4). During this time, in addition to the return of hatchlings, some source countries received equipment and training to initiate *in situ* head-starting conservation programs. One hundred and seventeen (117) sub-adult and adult animals were also purchased from Mexico in 1976-1977 (Wood and Wood 1980).

Although some correspondence remains from this period, no receipts or permits are presently available to support the legitimacy of these activities. Many of the personnel associated with this phase of the Farm's development are either deceased or are otherwise unable to be contacted for verification. However, letters have been written to each country seeking their assistance in this matter. Only Ascension Island has replied at the time of preparation of this document (Annex 3).

5.2 Non-detriment Considerations

An important element of establishing captive breeding status, under Resolution Conf 10.16 (Rev), concerns whether or not the manner in which the founder stock was obtained had a detrimental affect on the wild population(s). Although the establishment of the Farm was based on the wild collection of approximately 500,000 eggs from several geographically separate rookeries, Ascension Island and Tortuguero Beach, Costa Rica, were important sites from which significant numbers of eggs were obtained (see Table 2). Subsequent monitoring of nesting females at these locations indicates that both populations of nesting females were able to sustain the removal of eggs and adults by Mariculture Ltd without any adverse impact.

Following the Farm's egg collecting activities, Mortimer and Carr (1984, 1987) conducted an intensive research on the reproductive ecology and behaviour of *Chelonia mydas* on Ascension Island. These authors, together with Bowen *et al*. (1989), confirmed earlier work of Carr *et al*. (1974) that green turtles move easily between beaches on Ascension Island. The nesting

population of *Chelonia mydas* on Ascension Island can therefore be considered a single unit. More recently, Godley *et al*. (2001), using survey methodology comparable to that used by Mortimer and Carr (1987), estimated a total of 36,036 marine turtle nesting activities over the entire 1998/1999 season. This estimate represents a two- to three-fold increase in nesting activity over Mortimer and Carr's estimates in the 1970s. Clearly, the collection of 85,665 eggs had no adverse impact on the viability of the Ascension Island nesting population of *Chelonia mydas*.

The population of *Chelonia mydas* nesting at Tortuguero, Costa Rica, is the largest in the Atlantic by at least an order of magnitude (Lahanas *et al*. 1998). In a recent analysis of twenty-five years of nesting surveys undertaken on Tortuguero Beach from 1971 to 1996, Bjorndal *et al*. (1999) concluded that, despite high interannual variation in nesting emergence estimates, the data demonstrated an increase in average nesting activity over the period. The upward trend of the *Chelonia mydas* population using Tortuguero Beach suggests that the removal of approximately 75,000 *Chelonia mydas* eggs over a 5-year period 1968-1973, and the removal of 17 females, has had no detrimental affect on the viability of the nesting population using this beach.

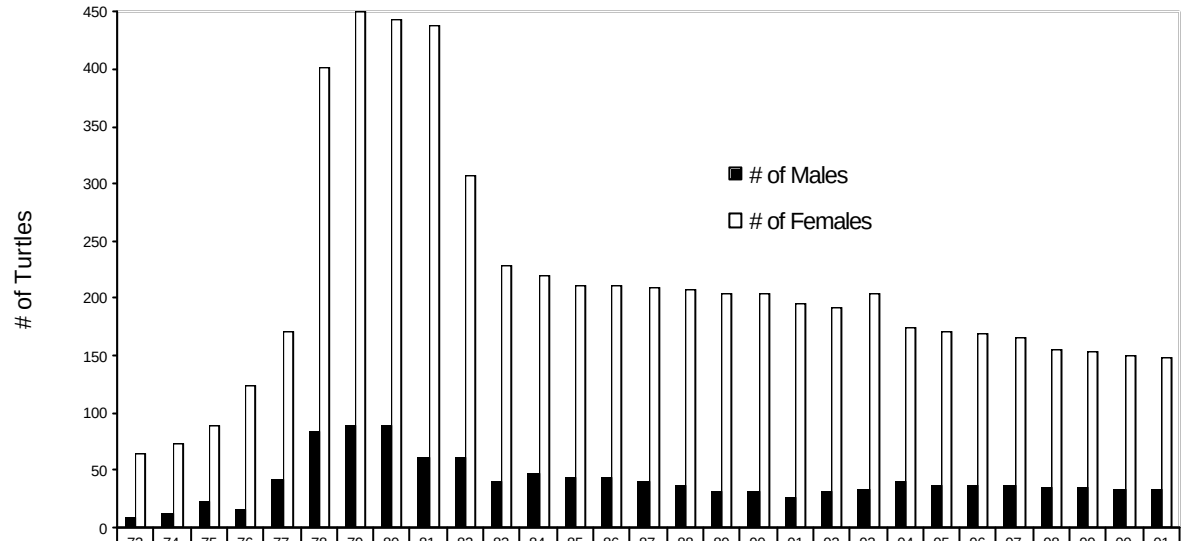
The removal of eggs from nesting beaches in Suriname was restricted to what were considered at the time to be "doomed eggs", namely eggs inundated by high tides. Subsequent work has shown that this may not be the case but hatch rates can be depressed significantly as a result (Whitmore and Dutton 1985). These collections were undertaken in accordance with a ranching program that was being administered by the Government of Suriname and submitted to (but rejected by) the fifth meeting of the Conference of the Parties to the Convention (Buenos Aires, 1985). At the time, the authorities in Suriname were collecting 300,000 eggs *per annum* for sale and consumption in Suriname (Schulz, 1975). Thus, no more eggs were collected than would have been taken anyhow and purchases of eggs assisted conservation programmes funded by these sales. Monitoring data show no significant trend in numbers of green turtle nests and the population is considered to be stable at 5,000 nests *per annum* (Hilterman, 2001). Therefore, these collections have had no deleterious effect on the population.

There was a single collection of 5,000 eggs and 17 adults from Shell Beach, Guyana in 1970 (Simon 1975, Simon *et al*. 1975). From these references it can be concluded that this comprised eggs that would have been consumed by local indigenous peoples. Assuming that one egg in a thousand survives to adulthood, the number of eggs taken in Guyana is equivalent to only 5 adults. Although data from systematic monitoring are not available, it now appears that numbers of green turtles are now greatly reduced there compared to their status in the 1960s (Pritchard, 2000). Given the conclusions of Simon, it is unlikely that the collection of 500 eggs and 17 adults were responsible for the decline of stocks there. No mitigation measures were possible or attempted.

Adult turtles only were collected from Mexico. Although data on the former abundance of green turtles on the Caribbean coast of Mexico are limited, recent work (Arenas *et al*., 2000) indicates that numbers of nesting green turtles in Yucatan have increased since 1979. A detrimental impact of collection of founder stock accordingly seems unlikely.

Adult animals (31) were also purchased from Caymanian fishermen believed to have been fishing the Mosquito Keys (Ulrich & Owens 1974). Whilst the precise locations of capture are not known from these animals, given that 90% of the green turtles foraging off the coast at Nicaragua originate at Tortuguero and trends there are upwards (see above), it would also appear that this collection has had no impact on the nesting populations.

Figure 1 - Annual Numbers of Male and Female Founder Stock



Year	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01
# of Males	10	13	22	17	42	84	90	90	62	62	41	48	45	44	41	38	32	32	26	32	34	41	38	38	37	35	35	34	34
# of Females	65	75	89	125	172	401	450	442	437	306	228	219	212	212	210	208	204	204	195	191	205	174	171	169	165	156	155	150	148

Figure 1, present the chronology of establishing the captive population of founding parental animals. The initial build-up of parental animals during the early years of the Farm's operation represents founder stock (acquired as eggs collected from the wild) that matured and became incorporated into the breeding herd. The Cayman Islands Government purchased the Farm in 1983 after the previous owners had initiated a program to reduce the size of the breeding herd because of the absence of significant trade. The Cayman Islands Government maintained the reduction program to minimize operational costs.

6. Operations located in non-range States

Not applicable, Cayman Islands is a range state.

7. Current Stock

The captive population of green turtles (excluding the parental and F_1 generation breeding stock) on the Farm, as at 31 December 2001, is 14,054 (see Table 3). An additional unknown, but significant, number of >1 year-old turtles are temporarily contained in a large saltwater pond elsewhere on the island. These animals were rescued on 4 November during the height of Hurricane Michelle and moved to a more secure location. This stock, which is being maintained and fed, will be retrieved, inventoried and accommodated in new facilities being constructed under the re-development plans for the Farm.

Table 3 - Present[1] numbers of immature and non-breeding *Chelonia mydas*

Year of Birth (Age Cohort)	Number
1995 (6 years)	334
1996 (5 years)	1,520
1997 (4 years)	1,675
1998 (3 years)	2,379
1999 (2 years)	4,903
2000 (1 year)	1,953
2001 (hatchlings)	491
Quarantined animals	799
TOTAL	**14,054**

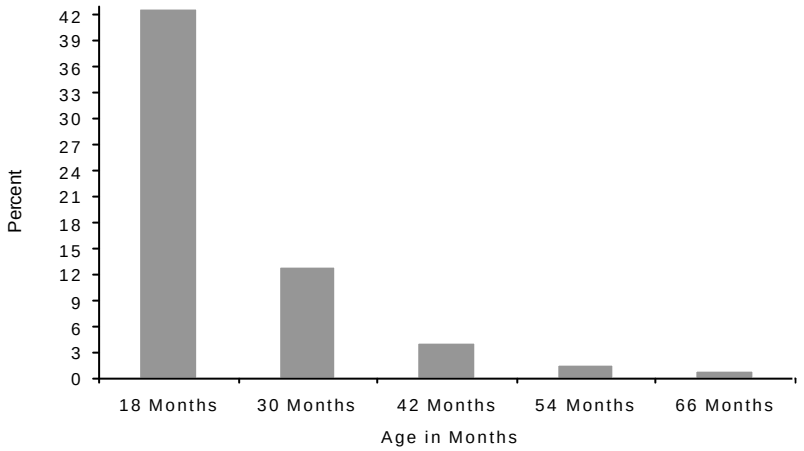
Footnote[1] the numbers presented represent animals remaining at the Farm after Hurricane "Michelle"

Animals aged between 4-6 years are processed for meat or selected for inclusion into the breeding herd. The numbers of immature turtles presented in Table 3 represent a mixture of F_1 and F_2 progeny. It is not possible to differentiate between male and female *Chelonia mydas* at these ages. Male green turtle may not begin to grow longer tails until after they are 5 to 6 years old.

8. Percentage Mortalities

The mortality rates of F_1 captive-bred animals, over their first 5-years of life at the Cayman Turtle Farm, over a 10-year period (1991-2000) are summarized in Figure 2. The mortality rate during the first 18 months of life, although appearing high, is substantially less than is generally considered to occur in the wild (>95 %, Bjorndal, 1980), but constitutes an area of captive production that will receive further research.

Figure 2 – Percentage Mortality Rates of Immature F_1 Generation *Chelonia mydas*



Age from Hatching	18 months	30 months	42 months	54 months	66months
Percentage Mortality	42.6	13.0	4.1	1.7	0.9

9. Production of Second Generation Offspring

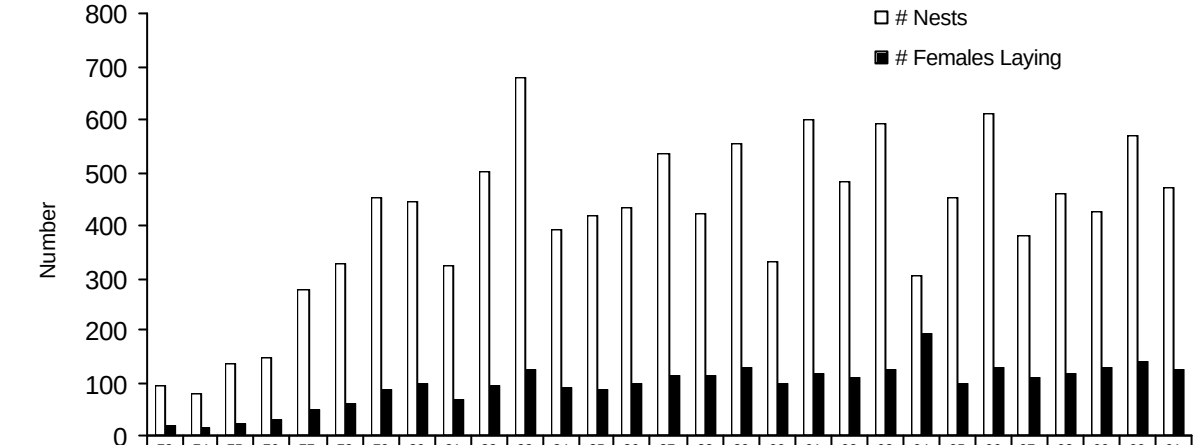
This Section outlines the breeding performance of founder stock that produced F_1 generation turtles in 1973, and the subsequent growth and breeding history of these animals that, in 1989, resulted in the successful production of F_2 generation animals. As indicated in Section 14, all the wild-caught adults were given an individual number. All subsequent animals that were included in the parental stock (*e.g*. farm-reared animals derived from eggs collected in the wild) were similarly identified. As a consequence, it has been possible to document the reproductive performance of each female in the breeding pond.

The first on-farm captive production occurred in 1973 by a wild-caught female from Costa Rica. The first production of hatchlings by known age, farm-reared green turtles occurred in 1975. The above progeny can, therefore, be defined as F_1 captive-bred generation. All reproduction takes place in the breeding pond. In 1981, the first large immature F_1 animals were placed in an enclosure in the breeding pond separated from the parental stock by fence that continues from the water through the beach. In other words, founder stock were only able to mate with other founder stock and F_1 animals could only mate with F_1 animals. All animals in the breeding pond are collectively referred to as the "breeding herd".

Although F_2 eggs were produced on the Farm since 1983, it was not until 1989 that the Cayman Turtle Farm first succeeded in producing captive-bred F_2 generation hatchling *Chelonia mydas.* The following series of four histograms and accompanying data demonstrate the reproductive histories of the founder parental stock and F_1 generation animals that have led to the Farm's

production of F_2 generation captive-bred offspring. An additional histogram is presented that demonstrates the growth of F_1 animals to reproductive maturity.

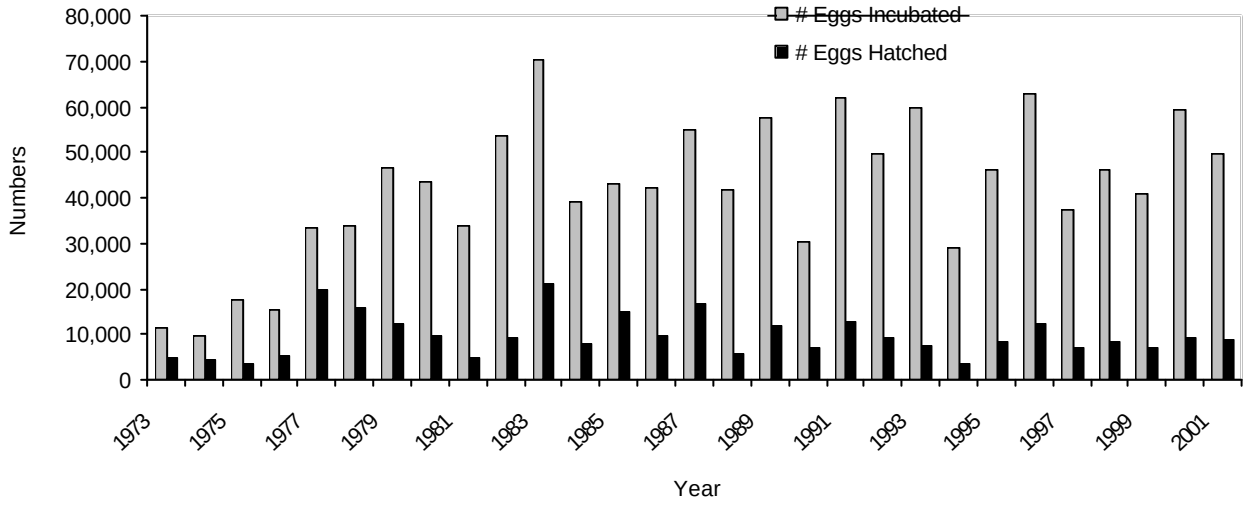
Figure 3 - Founder Female Nesting Performance



year	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01
# Nests	93	80	134	149	281	328	454	446	325	503	679	391	418	433	535	424	556	331	601	484	592	306	454	613	382	461	425	568	472
# Females Laying	19	14	21	29	48	61	88	97	68	95	124	89	87	100	113	112	130	97	118	111	124	193	98	128	109	117	130	139	126

Figure 3 presents the history of *Chelonia mydas* founder stock nesting on the artificial beach within the breeding pond. The increasing numbers of early nests and nesting animals shown in Figure 3 reflects a combination of; i) increasing numbers of wild-caught females adapting to and reproducing in the artificial breeding pond, and ii) farm-reared animals reaching maturity. The mean nesting cycle of the captive colony of Chelonia mydas at the Cayman Turtle Farm is 1.6 years (Wood & Wood, 1980).

Figure 4 - Production of Eggs and Hatchlings by Parental Founder Stock Females



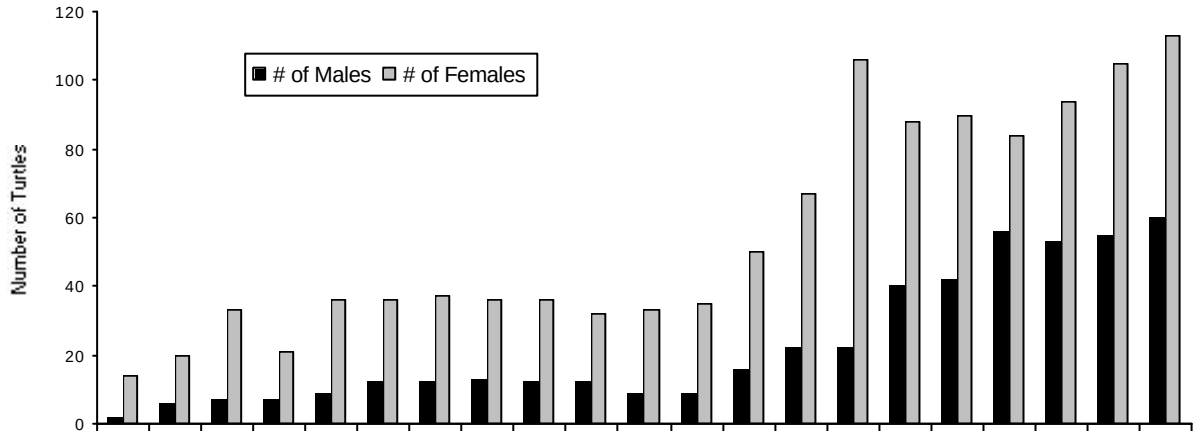
Year	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
# of eggs	11385	9634	17427	15189	32234	34023	46537	43593	33557	52349
# neonates	4905	4384	3563	5283	18907	15780	12283	9577	4994	9053
Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
# eggs	70500	39029	43146	42315	54967	41845	57706	30477	62086	49595
# neonates	20867	7701	14947	9650	16749	5745	12087	6942	12867	9314
Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	
# eggs	59660	28797	46280	62800	37339	46328	40917	59278	49583	
# neonates	7265	3300	8530	12477	7023	8176	6994	9312	8827	

Figure 4 and the above table present the number of eggs and resulting F_1 hatchlings that were derived from the nests shown in Figure 3. The increasing egg production in the late 1970s - early 1980s reflects a similar trend during the same period towards increasing numbers of nests and nesting females and may be explained in the same way as Figure 3 (i.e. an increasing number of females reaching reproductive maturity). One female, hatched and reared in captivity from a wild-collected egg, commenced producing eggs in 1975 as an 8-year old animal. However, based on further observations, production of offspring at this age was very unusual. Regular production of eggs by farm-reared females typically occurs when the animals had attained 8-9 years of age (Wood & Wood 1980)

Egg mortality, although appearing high, may be explained by age-dependent variations in the fertility and productivity of individual females. Differences in the ratio of sexes in the breeding pond and the mating times of each female will influence overall productivity. The aggregate figures will therefore be affected by which turtles are mature or laying, and by the individual productivity of the particular animal in a given year.

In 1981 sixteen (16) large immature F_1 turtles (2 males & 14 females), aged 5-8 years were incorporated into the breeding herd. The weights of females ranged from 120-300lbs (mean=179.7lbs) and males from 145-225lbs (mean=181.3lbs). During the period 1981-2000 additional F_1 animals, in varying numbers, were added to the breeding herd. Figure 5 and the accompanying table show the chronology, from 1981-2001, of establishing and managing the captive population of F_1 generation breeding adults.

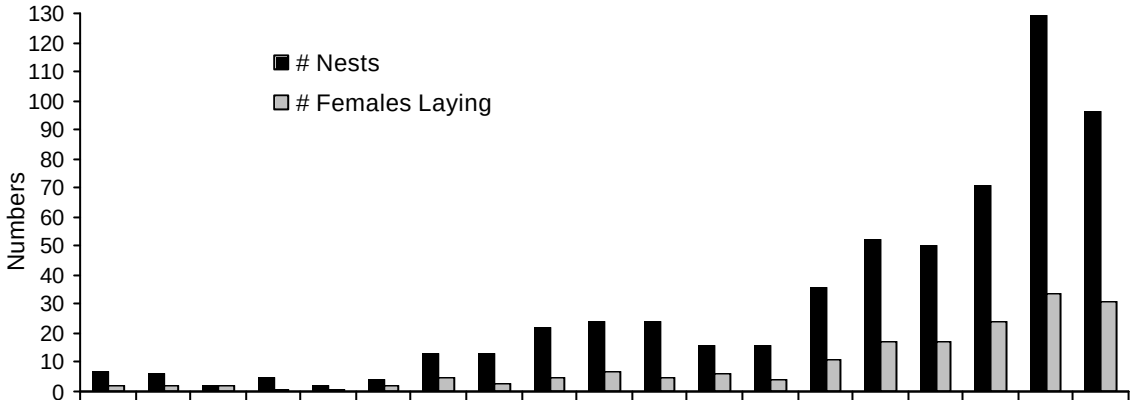
Figure 5 - Numbers of Male and Female F_1 Generation Breeders



Year	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01
# of Males	2	6	7	7	9	12	12	13	12	12	9	9	16	22	22	40	42	56	53	55	60
# of Females	14	20	33	21	36	36	37	36	36	32	33	35	50	67	106	88	90	84	94	105	113

The internal barrier in the breeding pond and across the beach separates parental animals from F_1 animals (see Section 16.1). Further to this, all animals that are placed into the breeding pond are individually identified with numbered tags (section 14), thereby enabling the breeding performance of individual females (parental and F_1 generation) to be monitored. During annual inventories, first generation males and females are selected and marked as potential future breeders when they are 4-6 year old animals. Animals not selected as future breeders are slaughtered for meat. The foregoing management arrangements enable the production of F_2 generation offspring to be accurately documented with a high degree of confidence.

Figure 6 shows the pattern from 1983-2001 of F_1 generation *Chelonia mydas* reaching reproductive maturity and commencing to construct nests on the artificial beach in the breeding pond. Figure 7 shows the numbers of eggs produced each year and the resulting F_2 generation neonates.

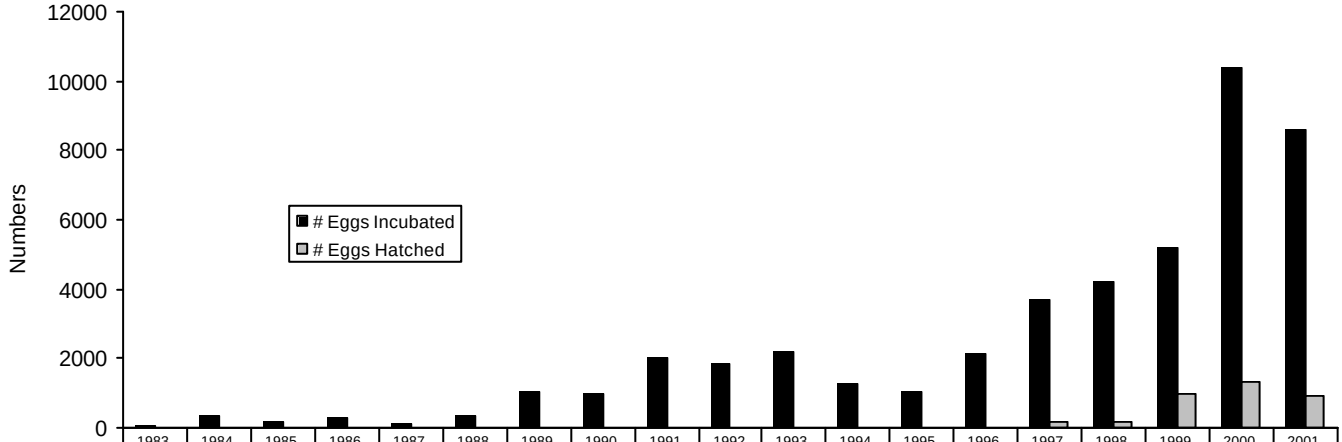


Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
# Nests	7	6	2	5	2	4	13	13	22	24	24	16	16	36	52	50	71	129	96
# Females Laying	2	2	2	1	1	2	5	3	5	7	5	6	4	11	17	17	24	34	31

Figure 6 - F_1 Generation Nesting History

The first F_1 generation female commenced nesting in 1983 when seven nests were constructed by two different females. Since that time, the number of nests and the number of nesting females have generally increased annually to the 2001 reproductive season (see Figure 6). The mean minimum age to first egg laying exhibited by the thirty-one (31) F_1 females, that have attained reproductive maturity, is 16 years (range 7-26 years).

In a pattern similar to that exhibited by the parental stock (see Figure 4), the numbers of F_1 eggs incubated also increased over time (see Figure 7). However it was not until the1989 season that sixteen (16) F_2 hatchlings were produced. Since that time, apart from a hiatus during 1993-1996, F_2 hatchlings have been produced annually, in generally increasing numbers. The F_2 animals, produced at the Farm are maintained in a similar manner and exhibit similar weight gains and growth as their F1 predecessors.



	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
# Eggs Incubated	42	347	189	297	113	326	1050	957	2024	1828	2203	1284	1047	2160	3664	4197	5202	10375	8586
# Eggs Hatched	0	0	0	0	0	0	16	0	0	9	0	0	0	0	184	198	978	1325	942

Figure 7 - Egg and Hatchling Production by F_1 Generation Females

Although the numbers of F_1 eggs produced have been generally increasing annually, the percentage that hatch to produce F_2 generation hatchlings, *albeit* increasing, has remained low. The low hatching success of eggs derived from F_1 breeders may be a consequence of immature females laying infertile eggs. However, the consistently low hatching success in both the parental and F_1 generation breeding stock may be indicative of inappropriate incubation techniques. In the absence of any substantial export market for many years, the research budget was greatly

reduced. Furthermore, production levels achieved have more than adequately enabled the Farm to meet local demand for meat. However, in an effort to maximize production and minimize unnecessary wastage, this aspect of the Farm's production has been identified as a priority area for future research.

Figure 8 – F_1 Generation Growth Rates Against Time

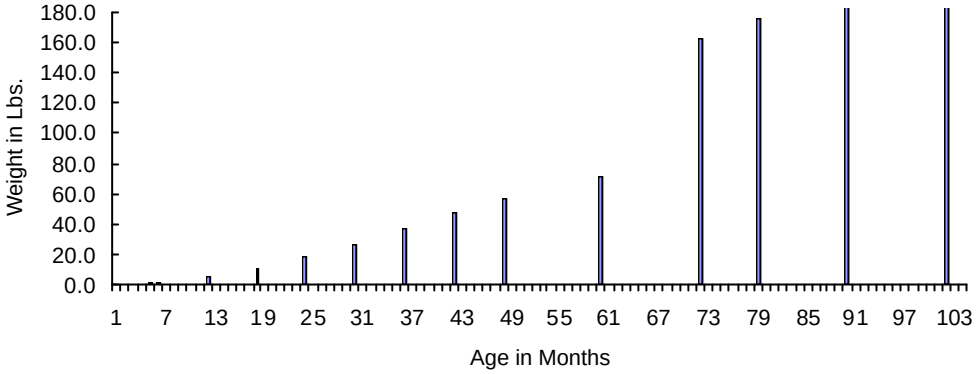


Figure 8 displays the growth rates of first generation *Chelonia mydas*. The data presented represent the mean weight (in lbs) of all turtles taken at various times during their early-life maintenance in the grow-out pens and later when animals are housed in the breeding pond. During their time in the grow-out pens (0-72months), animals exhibit very close to a linear growth rate against time. Animals are processed as 4-6 year olds for meat or selected as future breeding stock (48-76 months) at which time animals are placed into the breeding pond. The columns at the far right (72-103 months) represent the age of earliest nesting by F_1 females and shows the transition from immature stock to young adults. The corresponding weights represent the mean weights of all animals, including males, in each age cohort. Animals selected as future breeders appear to exhibit an accelerated growth rate in the breeding pond.

10. Production of First Generation – Management same as F_2 Production Elsewhere

Not applicable, the Cayman Turtle Farm is the only operation involving marine turtles that has achieved the captive production of second-generation animals (see previous Section).

11. Past, Present and Expected Annual Production

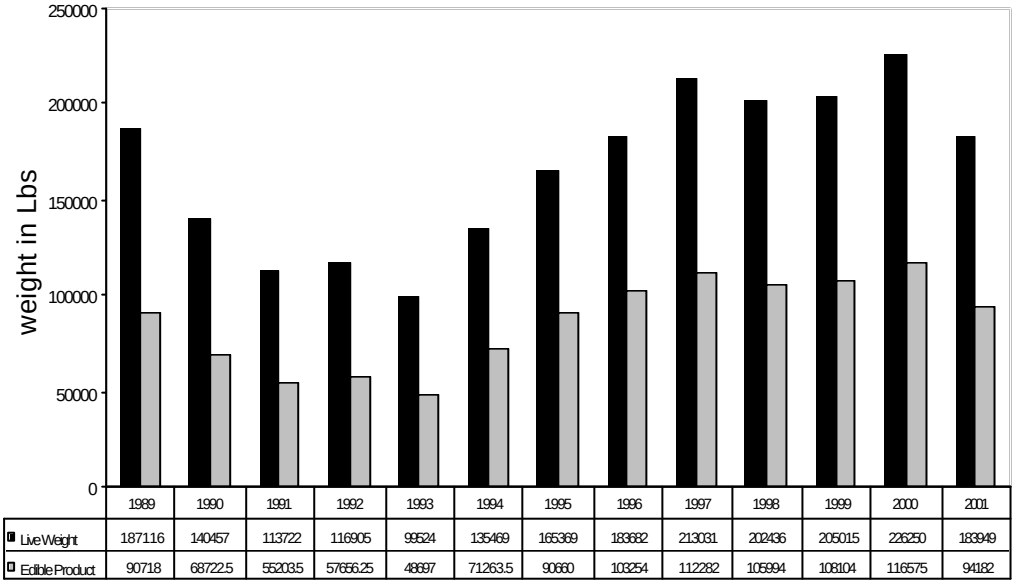
The first captive production of eggs by a wild-caught female occurred in 1973. The first captive production of eggs by a farm-raised, known-age female (obtained from a wild collected egg) occurred in 1975. The past breeding performance and annual production of offspring have been presented in detail in Section 9 as evidence of the Farm's overall ability to successfully husband and breed large numbers of *Chelonia mydas* in a controlled environment to the second generation.

As a consequence of the losses suffered from Hurricane Michelle, particularly the loss of 78% of the breeding herd, egg production for the next 10 years will be significantly lower than the levels achieved in the years prior to 4 November 2001. As a result of Hurricane Michelle, facilities at the Farm are being re-constructed, including a new breeding pond, (see Section 16.11). Following completion of the new breeding pond, the remaining breeding herd will be augmented with a selection of large F_1 subadult animals. This new stock will take several years to attain reproductive maturity. The process of increasing the number of turtles on the Farm to pre-Michelle levels will necessitate mixing F_1 generation breeders with parental breeders. However, all breeding animals are individually marked and easily identifiable. The Farm will continue to breed in a manner that has been demonstrated to be capable of producing second-generation offspring in a controlled environment. The Farm can separate founder and F_1 breeding stock when the desired stock level is attained.

In the absence of significant commercial exports of products derived from captive-bred green turtles by the Cayman Turtle Farm, management has been directed to tourism and the production of meat for local consumption within the Cayman Islands. The slaughter process results in approximately 50% of the live weight of an animal being wasted. Prior to Hurricane Michelle, approximately 2,500 carapaces were produced each year as by-product of meat production. With the exception of a small number of carapaces, approximately 3%, retained for sale in the Cayman Islands, this part of the animal is destroyed and disposed of together with the offal. Because of the absence of any legal export market for carapaces, approximately 2,400 are destroyed each year. Some carapaces from normal mortality may also be suitable for preparation as souvenirs but are discarded also. The fundamental purpose of the present proposal is to provide a mechanism, within the legal framework of the Convention, that enables the Cayman Turtle Farm to utilize, in a productive manner, a component of turtles that has, in the past, been discarded.

Figure 9 shows the live weight (in lbs) production of turtles and edible product (meat and plastrons) derived from animals slaughtered at the Farm during the period 1989-2001.

Figure 9 – Live Weight Production and Edible Products



	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Live Weight	187116	140457	113722	116905	99524	135469	165369	183682	213031	202436	205015	226250	183949
Edible Product	90718	68722.5	55203.5	57656.25	48697	71263.5	90660	103254	112282	105994	108104	116575	94182

As the emphasis in the immediate future will be on replacing animals lost to Hurricane “Michelle” and augmenting the breeding herd with suitable F_1 animals, the quantity of immature turtles slaughtered for local consumption, will be consequently be less than the production levels that have been achieved during the 1990s.

12. Assessment of Future Augmentation Needs.

The need to augment the captive population with new wild-caught animals or eggs will not be necessary for many years, if at all. The founder stock, collected as eggs or adults over the period 1968-1978, was obtained from geographically wide number of sources (Ascension Island, Guyana, Suriname, Costa Rica and Mexico). Although not yet verified by DNA analyses, the founder parental stock is believed to comprise animals from genetically different populations. Given the geographic extent of the origin of the founder stock, genetic mixing has occurred from the outset of the Farm’s breeding program. As a consequence, the potential for inbreeding or any other genetically influenced deleterious affects of the closed-cycle captive-breeding program is believed to be minimal. In the event that indicators of inbreeding (*e.g*. deformities, reduced fecundity) are detected in the future, that cannot unequivocally be attributed to management procedures, the Farm will pursue appropriate genetic studies to guide parental pairing that maintains an efficient production system and avoids deleterious inbreeding.

Original females (wild-caught animals and farm-reared from eggs collected from the wild) that first bred at the Farm remain reproductively active to the 2001 season – after a period of nearly thirty

years in captivity. Female green turtles exhibit an extended reproductive longevity. Over the reproductive life of a female, it has the potential to produce many thousands of progeny. This characteristic of green turtles, further reduces the risk of inbreeding and the need for augmentation.

13. Type of Product to be Exported

Prior to the reduction in the number of animals on the Farm, large quantities of shell, leather, oil and meat were exported for commercial purposes. Following the reduction of the holding stock there have been fewer products to export and this all ceased in 1998. Since 1983 the operation of the Farm has been directed primarily to tourism, the production of meat for local consumption and the release of juvenile turtles for re-stocking Caymanian waters. With the exception of a small number of carapaces processed for sale locally, all carapaces (dorsal shell) have been destroyed. All other edible parts of the animals slaughtered are fully utilized as food on the Island.

The annual destruction of several thousands of carapaces represents a significant waste of an otherwise valuable resource that is capable of generating substantial foreign revenue for the Territory. A CITES registration of the Farm will permit the captive breeding operation to sell processed carapaces to tourists as well as undertake commercial exports. The proposal, if accepted, will permit the Farm to utilize a valuable part of the farmed resource that is presently being destroyed.

Carapaces processed for sale as tourist souvenirs or commercial export will only be available through the Farm's retail shop that is located within the Farm complex. All will be marked in a manner that is both tamper-proof and clearly identifies the product as being derived from the Farm (see Section 14).

The past and present commercial viability of the Farm has been, and continues to be, almost entirely dependent on tourism. CITES registration of the breeding operation will provide an important and complementary adjunct to tourism, as well as an important source of supplementary revenue.

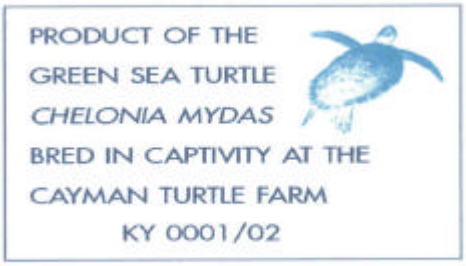
14. Marking Methods and Product Identification

All live adult breeding turtles are individually marked and identifiable by a numbered plastic cattle ear tag inserted into the rear flipper. A "back-up" numbered titanium tag is inserted into an anterior flipper to compensate for tags that are lost. Hatchling and immature animals are not marked, but are maintained as discrete age cohorts in grow-out tanks. Tagging takes place when animals have reached 4 to 6 years of age and are selected as candidates for incorporation into the breeding herd. In the early years of the Farm's head-starting program, all yearling turtles released into the wild were tagged. A variety of different tags were used (*e.g*. monel and stainless steel "turtle" tags, scute notches, "live" tags and plastic livestock tags for larger animals).

The minimum size of carapace that will be available for commercial export is sixteen (16) inches (40cm) straight length. All carapaces processed for sale and export will be individually marked using an aluminium plate (50mm x 40mm) bearing the following information:

CTF logo
Product of the Green Sea Turtle, *Chelonia mydas* bred in captivity at the Cayman Turtle Farm
KY0001/02

Where: KY is the ISO country code for the Cayman Islands; 0001 is a unique serial number; and 02 signifies the year in which the specimen was processed



The metal label will be attached to the anterior inside surface of the carapace with epoxy, rendering it difficult to remove without damage. The application of a replacement label, while possible, will appear as an obvious attempt to defraud barrier control officers.

In addition to the application of a non-reusable, unique numbered label, as a further measure to ensure exports are restricted to legally produced carapaces, each CITES Export Permit issued for a finished carapace will be accompanied by a digital image of the carapace(s) to which it refers. Each digital image will bear the number of the CITES Export Permit to which it refers and become an integral component of the Permit. A small adhesive plastic envelope will also be attached to the interior of each carapace for the purpose of containing the permit and digital image of the shell. In this manner, it will be possible for the permit and the image of each carapace that enters trade to be permanently retained with the shell.

15. Inspection and Monitoring Procedures

All marine turtles are protected in the Cayman Islands under the *Marine Conservation Law* and the *Marine Conservation (Turtle Protection) Regulations*. Under the legislation, which is administered by the Ministry of Tourism, Environment, Development and Commerce, the capture, possession, trade and export of protected species is prohibited unless authorized by permit. The Cayman Islands Government has maintained a policy of prohibiting the export of wild specimens of marine turtle, including their parts and manufactured products derived from marine turtles. Since 1998, this policy was also applied to turtles derived from the farm.

CITES is implemented by the Cayman Islands by the *Endangered Species Protection and Propagation Law of 1978*. The legislation prohibits import and export of live or dead specimens of CITES-listed species without a permit. The present CITES legislation will shortly be repealed and replaced by the *Endangered Species (Trade and Transport) Law.* The new legislation, which is in final draft form has been developed in close consultation with the UK Government and the CITES Secretariat, is expected to be signed into law in 2002. Even though the Cayman Islands Government owns the Cayman Turtle Farm, under the new legislation it will require a licence to operate.

The legislation will allow the Management Authority to apply conditions to licences. As a condition of its licence to operate, the Cayman Turtle Farm will be required to submit regular returns of its holdings, detailing the numbers of turtles hatched and slaughtered. The Farm's facilities and records will be subject to regular inspections and audits by officers of the Scientific and Management Authorities. Export permits will be issued on the basis of the Farm's compliance with its licence conditions.

All turtle shells processed for local sale (and export if registration is approved) through the Farm's retail outlet represent a by-product animals that are slaughtered for meat or normal mortality. At the beginning of each year, the Farm will be required to submit, to the Management Authority, the projected number of turtles to be processed for meat and estimates the number of carapaces that could be derived from normal mortality during the year. In the case of carapaces exported as tourist souvenirs, the Management Authority of the Cayman Islands will allocate blocks of serial numbers to the Cayman Turtle Farm for application to computer-generated CITES export permits issued by the Farm at the point of sale. When a particular allocation of export permit numbers has been exhausted, the Farm will be required to account for each permit number previously issued by

the Management Authority. New allocations will be contingent on the Management Authority being satisfied that all the previous numbers have been accounted for, and accurately recorded by, the Farm.

Commercial exports will not be eligible for the foregoing facilitated procedure. In order to undertake commercial exports, the Farm will be required to submit an application that will be assessed and approved by the Scientific Authority in the normal manner before the Management Authority issues the CITES Export Permit.

16. Description of Facilities and Management Procedures

The Cayman Turtle Farm is situated on the northwest coast of Grand Cayman, and occupies a total area of 10 acres. The Farm owns an additional 6 acres that, prior to Hurricane Michelle, have not been used and remain available for future development (see Section 16.11). The infrastructure associated with the husbandry and production of turtles is shown in the site plan at Annex 1, and comprises the following facilities:

i) A large (0.27 acre) breeding pond (780,000gallon) with an artificial nesting beach;
ii) A 30 x 50 feet hatchery building;
iii) 33 small (2.5 x 3 feet) and 19 large (5 x 3 feet) hatchling enclosures; and
iv) 21 x 775 gallon fibreglass; 9 x 11200 gallon concrete and 12 x 31300 gallon concrete grow-out tanks.

The grow-out tanks located near the sea were extensively damaged by Hurricane Michelle. Structures that survived Hurricane Michelle include; 12 x 775 gallon; and 7 x 11200 gallon tanks. The seven remaining 11,200 gallon concrete tanks all sustained varying degrees of storm damage, but are currently in temporary use until new facilities associated with the re-development are completed. All other grow-out tanks are located across a road that bisects the Farm, and did not sustain any storm damage. The facilities and management procedures applied for the annual production of green turtles constitute a “closed environment” as defined by Resolution Conf 10.16 (Rev.).

In addition to the infrastructure associated with producing and raising turtles, the facilities also include a slaughterhouse, administrative building, retail shop, storage building and a pumping facility.

16.1 Breeding Facility

The breeding facility was essentially a large pit (200 x 120 feet) excavated into the concretized coral bedrock, into which seawater was pumped. An artificial nesting beach has been constructed along the landward perimeter of the enclosure. In profile the base of the enclosure has a deepwater end that tapers to become the beach. The enclosure is approximately 200 feet from the sea and is protected by a 2-metre high concrete sea wall. All breeding stock and immature turtles selected as future breeders are housed in the breeding pond. All animals are individually numbered, enabling the breeding performance and history of each female to be monitored. The origin of the breeding stock is designated as follows:

CWO Captive wild-caught original (wild-caught animals)
CWM Captive wild-caught Mexico (wild-caught animals)
FRO Farm-reared original (animals derived from eggs collected from the wild that were incubated and reared on the Farm)
FRC Farm-reared Cayman stock (first generation animals)

For management purposes, the pond was divided into three separate enclosures each containing different lengths of nesting beach:

i) Main breeding enclosure for *C. mydas* parental stock (140 x 120 feet);

ii) Small breeding enclosure for *C. mydas* breeders (30 x 120 feet); and
iii) Small breeding enclosure for first generation *Lepidochelys kempii* (30 x 120 feet).

Following the end of each breeding season, the water level in the pond is lowered and males and females are separated into different sections of the pond. All animals are weighed at the beginning of each calendar year. The breeding herd is fed three times daily (0700 hrs, 1200 hrs and 1600 hrs) with a floating pelletized feed.

On 4 November 2001, the entire structure was irreparably damaged when a storm surge, caused by Hurricane Michelle, breached the concrete sea wall. Following an assessment of the overall damage sustained by the Farm, the Cayman Islands Government resolved to endure this disaster and approved the re-development of the Farm that will essentially up-date and restore the farm's facilities and infrastructure to their pre-hurricane production capacity (see Section 16.11).

16.2 Hatchery and Management of Eggs

Nesting occurs generally from May to October. Eggs from the nests that are laid during the sporadic nesting that characterize the early and late nesting season are removed from the beach each morning and placed in ventilated Styrofoam containers and placed in the hatchery. During peak nesting season, Farm staff monitor the beach from dusk to dawn and remove the eggs as the females lay them. The eggs from each female are placed in a bucket and identified with the tag number of that female. The following morning they are processed and placed in the hatchery. This allows nesting records to be kept for each individual female throughout its reproductive life.

Eggs in each container are placed onto a 2.5cm base of moist sand and covered by approximately 2.5 cm of sand. A lightweight cloth sheet is placed above the eggs to avoid the top layer of sand slipping between the eggs during incubation. The Styrofoam containers are then placed onto racks in the hatchery building. Each container has a lid to avoid excessive desiccation. Where possible, entire clutches are incubated as discrete entities, unless a clutch comprises a large number of large eggs, in which case, it is placed into two containers.

The hatchery consists of a 30 x 50 feet insulated concrete building with an air-conditioner to maintain a constant interior ambient temperature. Styrofoam containers are placed on the racks where the eggs are incubated at an ambient temperature of 29-30^{O}C. The incubation temperature is not manipulated to influence the production of either males or females. The relative humidity and sand moisture are monitored and maintained at the preferred regime by regularly watering the top layer of sand by hand. The hatchery has a capacity to incubate approximately 100,000 eggs.

16.3 Management of Hatchlings

Hatching generally commences in June and may continue through to December, reaching a peak during August and September. Immediately on hatching, hatchling turtles are placed in plastic trays containing sand where they are kept for approximately three days while they fully absorb their yolk sacs.

Hatchlings are transferred from the hatchery into rectangular concrete tanks, where they remain for up to one year until it is necessary to prepare the tanks for the subsequent season's cohort of hatchlings. During the first year, the approximate stocking density of hatchlings ranges from an initial 12.5 animals/square foot to 1.6 animals/square foot surface area of water.

Hatchling tanks have a continuous flow of water, but are fully drained and refilled each morning. Approximately every 2-3 days during this process, the tanks are scrubbed and cleaned with a concentrated chlorine solution. Hatchlings are fed on demand, commencing in quantities that equate to 3.0% bodyweight to 1.5% bodyweight for yearlings. Hatchlings are fed a high protein pelletized food that is simply scattered on the surface of the water. High (40-42%) protein pellets are purchased in four different sizes. Post hatching animals (1.5mm diameter pellets); two-month old hatchlings (2mm diameter pellets); six-month old hatchlings (3mm diameter pellets) and yearlings (5mm diameter pellets).

16.4 Management of Grow-out Stock.

After their first year in the hatchling tanks, young turtles are transferred to the Farm's grow-out tanks. Management of the grow-out stock is basically quite simple and straightforward. The turtles are maintained at an optimum stocking density (of approximately 0.2kg body weight per litre of water) which has been determined from past experience and experimentation on the basis of tank size and water volume, general health and appearance, growth and cost. High stocking densities result in reduced growth and increased mortality. However, excessively low densities result in increased algal growth, poor health and inefficient feed utilization. Age cohorts are kept as discrete groups and to the extent possible, individuals of comparable size, within a particular age class, are housed together.

Tanks are monitored daily and sick animals removed into quarantine facilities. Each tank has a continuous supply of seawater. The water in each tank is drained every 2-3 days to prevent an accumulation of organic waste on the bottom. Tanks are cleaned every two weeks with a saturated chlorine solution in the same manner as the hatchling tanks.

Grow-out stock greater than one-year old, up to the time they are slaughtered or selected as future breeders, are fed 7mm diameter pellets with 35% protein content. Depending on the size of animals, the daily quantities fed equate to 1.0% of body weight, or 0.5% of body weight for larger animals. Food is provided three times daily (approximately 0700hrs, 1200hrs and 1600hrs).

First generation turtles are processed for their meat when they are 4-6 year-old animals and weigh approximately 36-45kg. At this age it is sometimes possible to differentiate between males and females on tail morphology. Future breeding animals are selected on the basis of their general appearance. Each animal selected is given a unique identity by inserting a numbered plastic ear tag into the rear flipper. These animals are reared through to adulthood in a separate enclosure in the breeding pond.

16.5 Slaughter Procedures

Marketing projections and monitoring consumption patterns of the recipient local retailers determine the number of turtles slaughtered each day. The slaughtering facilities are located near the grow-out tanks. Animals selected for slaughter are removed from the grow-out tanks and placed, overnight, into a holding tank associated with the slaughter facility, thereby minimizing transport distance (and time) and any associated stress. Turtles are killed humanely using a captive bolt pistol held against the cranium. Following death, the throat is severed to bleed the animal. Carcasses are processed on a stainless steel bench, where different cuts are packed into plastic bags. Bags of meat, according to particular cuts, are placed into cardboard cartons and placed in a cold storage room at 10^{O}F adjacent to the processing room. Daily production records are maintained. At present, all meat, skin, plastron and fat is used in the production of traditional Caymanian stew or prime steaks.

16.6 Food Supplies

All captive turtles are fed commercially produced, floating, pelletized feed imported from the United States. The total annual consumption of feed by all captive turtles is approximately 572 metric tonnes. New feeds are periodically tested in an effort to identify the most cost-effective feeds.

16.7 Record Keeping

The Farm has maintained extensive computerized records of annual egg and hatchling production since breeding first occurred in 1973. Other data related to on-farm husbandry and production, such as annual inventories, growth rates, slaughter statistics *etc*. were initially entered into files as written records. Over the years, these records have been computerized on an opportunistic, but systematic, basis. Since the mid-1990s, comprehensive computerized records are maintained on all aspects of turtle management and production.

16.8 Staff & Security

In addition to the Managing Director, the Cayman Turtle Farm employs thirty (30) personnel involved in turtle husbandry and production research, tourist liaison, general and financial administration, retailing and maintenance. All facilities are enclosed within a two-metre high perimeter cyclone-wire and barbed wire security fence. In addition, a private firm provides after-hours security on the Farm. In all the years since the Farm was established, theft of stock has not proven to be a problem.

The facilities housing turtles have been designed to minimize escapes and until a winter storm in 1989 and Hurricane Michelle this has proven to be the case. Prior to the winter storm and the exceptional circumstances of Hurricane Michelle, there had been few escape or unintentional release of captive turtles since the Farm has been at its present location. The risk of losing further valuable captive stock from storm damage has been minimized by reconstructing the new facilities (i.e. breeding ponds, hatchery and yearling tanks) some distance inland away from the sea (see Section 16.11 & Annex 1).

16.9 Disease & Veterinary Services

In the period that the Farm has been maintaining and producing large numbers of turtles, certain infections and diseases have been encountered. The frequency and severity of these outbreaks has varied. The absence of any other large scale breeding operation involving marine turtles has necessitated the Cayman Turtle Farm exploring and testing different approaches for the clinical treatment of specific diseases and infections. Furthermore, in the absence of any veterinary laboratory and pathology service on Grand Cayman, it has been necessary to send tissue samples to the United States for disease diagnosis and, when possible, advice on treatment. Much of this research and development work has been undertaken in close collaboration with US universities and research institutions.

“Grey patch disease”, so called for the appearance of ulcerated gray lesions on the skin and carapace of hatchlings, was experienced annually during the early years of the Farm’s operation. The causative agent was a herpesvirus. The extent of each epidemic appears to be dependent on crowding, water temperature and quality. The virus is suspected to be naturally occurring in *Chelonia mydas* and high mortality from gray patch disease has not been encountered since 1978 when the Farm ceased acquiring eggs from the wild and reduced the numbers of hatchlings kept in each tank.

“Floppy flipper disease” is another disease that reached epidemic proportions among 2 to 4 year old turtles during the early days of the Farm’s operation (1971-1974). The disease is caused *by Clostridium botulinum* TYPE C and results in progressive paralysis and drowning. Administering each turtle with a 1cc intramuscular injection of *C. botulinum* toxoid controlled the disease. That single vaccination provided total protection for the captive population with no further outbreak of the disease since 1974. Each successive age group is vaccinated at 18-24 months of age.

Inappropriately high stocking densities often result in excessive skin abrasions, particularly on the neck and shoulders. These lesions are caused by turtles biting and scratching each other and from contact with the sides of the tank. Such situations are commonly found under commercial conditions. The health of any animal raised in captivity has to be carefully monitored and the individuals moved to quarantine if health problems develop. Commercial rearing of sea turtles is no different than that of commonly accepted food animals. Lesions that occur may become subject to bacterial and fungal infection. The infections are non-morbid and heal normally, leaving scar tissue that may be visually disturbing to visitors.

The most active and potentially serious disease continuing to occur on the Farm is LET disease, so named as an abbreviation for lung, ear and throat. Epidemics of LET disease appear in most age groups from six months to three year of age. Although some animals recover from the disease, in the majority of cases the disease is fatal. Attempts, in association with the University of Florida, to identify, treat and control this disease have focused on intensive parasitological, histopathological, virological and microbiological survey, and have to date, proven unsuccessful.

Fibropapillomas, commonly referred to as “warts”, were first detected on the Farm in 1977 when they were observed in an 8-year old farm-reared breeding female, immediately following the receipt of wild-caught turtles from Mexico. Fibropapillomas is not regarded as an important disease in the population of turtles held captive on the Farm and the disease is not considered to adversely affect the overall “health” of the herd. The disease is present in many of the turtles captured under the Farm’s tag and recapture program. Fibropapillomas is a naturally occurring disease that has a circumtropical distribution, having been recorded present in different species of marine turtles (Aguirre, 1998), and remains an area of active research among marine turtle biologists.

16.10 Hurricane Michelle

On 4 November 2001, Grand Cayman was hit by Hurricane Michelle. The infrastructure of the Farm sustained severe and irreparable damage from the storm. The most serious damage was incurred on the Farm’s investment in captive breeding. Mountainous waves breached the sea wall separating the breeding enclosure from the sea. A significant proportion (78%) of adult breeding turtles were swept out to sea during the storm. A number of animals rescued during the storm sustained injuries and have been quarantined while they receive treatment and recover. Eleven (11) animals have been recovered up to the time of writing. The loss of these breeding animals and the associated reduction in the production of hatchlings represents a serious setback for the Farm. The animals lost to Hurricane Michelle will be replaced with F_1 generation animals over the next 3-5 years.

In addition to the loss of livestock, the breeding pond was totally destroyed along with many of the grow-out tanks in the immediate vicinity of the breeding pond. The fibreglass tanks adjacent to the breeding pond sustained considerable damage and will all need to be replaced.

16.11 Post Hurricane Michelle Re-development Activities

In January 2002, following a series of meetings with the CTF Board, the Cayman Islands Government approved a re-development plan for the Farm. Re-development of the Farm will focus on installing new facilities for the production of turtles as well as expanding the capacity of the Farm to attract tourists to Grand Cayman. New facilities are being constructed on 2.5 acres of formerly unused land adjacent to the present bank of grow-out tanks on the landward side of the road. This site will be much less at risk from hurricane damage than the previous facilities. In addition to exhibition tanks, the new facilities will comprise the following structures for marine turtle husbandry and production:

- A new breeding pond (19,800 ft^2 water surface area - 570,000gal);
- Nine (9) grow-out tanks (30 foot diameter - 11,200 gallons);
- Fifty (50) hatchling tanks (to replace existing tanks); and
- Hatchery and laboratory.

The breeding pond will feature a larger artificial beach (approximately 12,200 ft^2). The surface area of water will be less (approximately 7,600 ft^2 surface area), but feature greater volume. The deep end of the pond will be twelve (12) feet. The base and walls of the pond will be concreted to avoid any water loss through seepage and any consequent environmental damage. Seawater will be pumped in a continuous flow. A plan of the re-development is at Annex 1. Despite the devastation caused by the hurricane, re-development provides the opportunity to create state of the art facilities based on over 30 years of the Farm’s experience.

17. <u>Conservation of the Wild Resource</u>

Caymanian people, like many other coastal communities throughout the tropics, have a long-established tradition of harvesting green turtles as a source of protein. Although a protected species, the cultural importance of consuming green turtle has been recognized by the Cayman Islands Government and a limited traditional fishery involving 16 licensed operators, Grand Cayman (8) and Cayman Brac (8), has been maintained. Licensed fishermen are required, as a condition of their license, to report to the Department of Environment the numbers, sizes and

dates of all turtles captured. However the Cayman Islands Government now recognizes that this subsistence harvest has severely depleted marine turtle populations occurring in Caymanian waters and may be inhibiting the ability of the population to recover (Aiken *et al*., 2002). The present marine turtle fishery, because of the depleted condition of the wild resource in Caymanian waters, is not able to satisfy local demand for the meat. Green turtles produced and slaughtered at the Turtle Farm has proven to be an effective means of filling local demand for turtle meat and accordingly limiting the impact on wild turtle populations. This is considered to be the primary conservation benefit of the Farm by the Cayman Island authorities.

Although management of the harvest involves the application of a closed season, minimum size-limits and catch-quotas (6 per license), there is limited compliance and most license-holders fail to report their catches to the Department of Environment. In view of the depleted nature of the Caymanian marine turtles and the failure of operators to comply with management measures, the Government is seriously considering closing the fishery. In the event the traditional fishery is closed, the continued provision of green turtle meat, sourced from captive-bred animals, by the Cayman Turtle Farm will become essential for maintaining an important cultural tradition among Caymanian people.

In 1998 the Department of Environment initiated a nest-monitoring program on Grand Cayman and Little Cayman. Numbers of nesting females are critically low and preliminary data show a decrease in hatching success, percentage of fertile eggs and clutch size (Bell *et al*., 2002). Prior to the Department of the Environment becoming the agency responsible for research of the wild turtle population, the Farm was also greatly involved with beach monitoring, primarily to rescue “doomed eggs”. Although current practice for nests considered by the DoE to be doomed is that they are relocated *in situ*, in the past these nests were moved to the Farm for incubation and subsequent release of hatchlings at their beach of origin. Some were also head-started. A tag and recapture study indicated that released turtles were adapting well to the wild (Wood & Wood 1993). The Farm also provides facilities for the rescue and rehabilitation of sick and injured wild turtles. A turtle that had been released from the Farm as a yearling in 1984 was returned injured in 1998, rehabilitated and released again later that year. This turtle was identified to the year of release by a “living tag” on one of the scutes on its carapace.

The farm is also a partner in a project commissioned by the CITES Management Authority of the United Kingdom to assess the status and impacts of harvests, both legal and illegal, of marine turtles in the UK’s Overseas Territories. This work will involve, amongst other things, assessing the importance to the Caribbean territories of turtle products and will also involve the genetic analysis and characterization of breeding, foraging and captive (Cayman Turtle Farm) populations.

During the years 1970-1983, in accordance with the collecting agreements with government authorities of the countries from which eggs had been obtained, almost 2,500 >10 month-old turtles were marked and returned to the nesting beaches. Table 4 presents the numbers of juvenile turtles released.

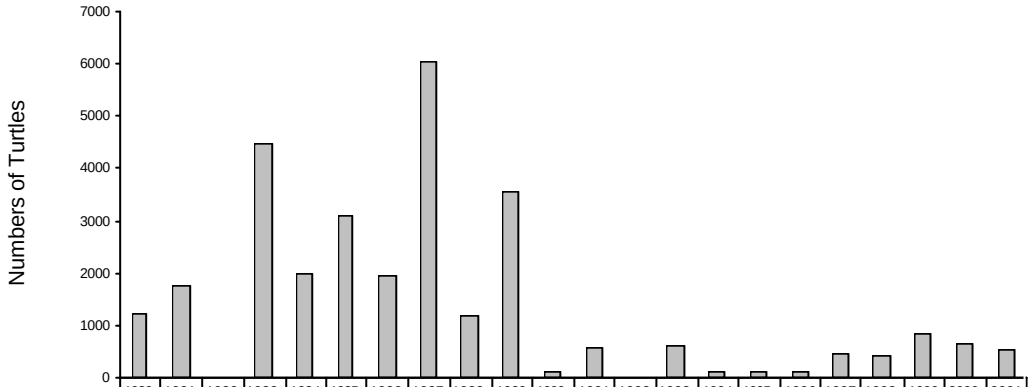
Table 4 - *Chelonia mydas* Returned to Countries of Origin

No. of Turtles	Age (months)	Release Date	Release Site	Collection Date
250	10	Aug 1969	Costa Rica	Costa Rica (1968)
56	10	Jan 1970	Ascension Is	Ascension Is (1969)
100	10	Aug 1970	Costa Rica	Costa Rica (1969)
52	22	Feb 1972	Ascension Is	Ascension Is (1970)
250	22	Apr 1972	Suriname	Suriname (1970)
300	10	Apr 1972	Suriname	Suriname (1971)
755	24	June 1972	Grand Cayman	Suriname (1970)
100	22	Aug 1972	Costa Rica	Costa Rica (1970)
100	10	Feb 1973	Ascension Is	Ascension Is (1972)
150	10	Aug 1973	Costa Rica	Costa Rica (1972)
558	10	1974	Suriname	Suriname (1973)
150	24	Mar 1976	Suriname	Suriname (1974)
150	12	Apr 1977	Suriname	Suriname (1976)
30	36	Apr 1977	Suriname	Suriname (1974)

In accordance with a 1980 policy of the Cayman Islands Government to replenish the Caymanian population of *Chelonia mydas*, the Cayman turtle Farm initiated a new conservation program of releasing juvenile turtles produced and raised on the Farm into the territorial waters of Grand Cayman and Little Cayman. During the period from 1980-2001, more than 29,000 turtles were released around the Cayman Islands. Wood (1982) provides a description of the releases and Wood & Wood (1993) provides information on the tag and recapture results.

Figure 10 and the accompanying data table show the numbers of hatchling and/or yearling *Chelonia mydas* tagged and released in Caymanian waters. Although there is no record of a head-started female nesting anywhere in the Caribbean Region, on the basis of continuing tag returns from the Region, there is little doubt that many of the thousands of yearling turtles released by the Farm (Wood & Wood, 1993) have survived and grown to adulthood. Aiken *et al.* (2002) considered the continued presence of green turtles in Caymanian waters may be due, in part, to the Farm's strategy of releasing yearling turtles. The Cayman Turtle Farm continues to receive tags from numerous countries in the Region. It has now been demonstrated that head-started female *Lepidochelys kempii* survive, grow to maturity and nest (Shaver & Caillouet Jnr. 1998). Balazs *et al.* (in press 2001) describes the nesting of a *Chelonia mydas* captive reared in Hawaii 19 years after release as a yearling. The absence of any nesting records of females tagged and released by the Cayman Turtle Farm may reflect the level of monitoring of nesting green turtles in the Caribbean and/or the length of time required by *Chelonia mydas* to attain reproductive maturity relative to that for *Lepidochelys kempii*.

Figure 10 - Numbers of *Chelonia mydas* released in Caymanian Waters



	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
# Released	1208	1764		4476	2000	3107	1946	6059	1202	3569	102	567		602	129	102	100	440	404	837	638	520

The UK-sponsored research referred to above may enable the contribution of released turtles to the local foraging and nesting populations to be properly assessed. In the meantime, the release programme is now being reviewed to enable the achievements to be fully analysed and a policy adopted towards future releases. This review process will involve the Department of the Environment for the Cayman Islands Government, the Cayman Turtle Farm and invited external and independent assessors.

In 1980 the Cayman Turtle Farm, in cooperation with the Government of Mexico initiated a conservation-breeding program for *Lepidochelys kempii*. 67 hatchlings and 96 yearling turtles were received from Rancho Nuevo, Mexico and the US National Marine Fisheries Laboratory at Galveston, Texas respectively. The Farm succeeded in rearing the juveniles and in 1984 successfully propagated the species. In the absence of any collaboration by range States, the captive breeding of *Lepidochelys kempii* for re-introduction (Wood & Wood, 1988) has been discontinued, and in April 1999, 110 animals were returned to Mexico. A small number of animals were retained at the Farm, where they have been relocated into rearing tanks for exhibition purposes. In 1998 the two smaller internal enclosures were combined for use by the F_1 *Chelonia mydas* breeding herd.

Since it commenced operation in 1968, the Cayman Turtle Farm has been responsible for, or sponsored, a considerable volume of research, both pure and applied, on *Chelonia mydas* and *Lepidochelys kempii*. The results of research, either undertaken or sponsored by the Farm, have produced numerous scientific papers that have either been published in peer review journals and newsletters or been the basis of post-graduate dissertations. A selection of publications undertaken or sponsored by the Farm is at Annex 2.

The Farm provides one of the few locations in the world where visitors are able to view different species of marine turtles and learn about conservation of the resource. Visitor numbers are increasing annually, with more than 340,000 tourists visiting the Farm in 2001 (more than double the figures for 1991). Guided tours and information boards explain the purpose and operation of the Farm, as well as highlighting the conservation threats faced by marine turtles. The re-development plans for the Farm include enhancing the facilities to promote visitor understanding of green turtles and their conservation, the Farm and its contribution to conservation of *Chelonia mydas* in the Region.

18. Animal Welfare Considerations

Aspects of this section related to the grow-out of the turtles are dealt with in Section 16. All animals are slaughtered in a humane manner, using a captive bolt gun to the cranium that results in instantaneous death (see Section 16.5). The time taken from removing an animal from the overnight holding tank to slaughter is less than one minute. Stocking rates in the hatchling and grow-out tanks have been determined to minimize stress and promote growth.

The presence of sick or diseased animals is checked on a daily basis. Any such animal is removed and placed into quarantine tanks for treatment. Animals that recover as a result of veterinary care, following a period of convalescence, are returned to the appropriate grow-out tank. Animals that cannot recover are killed using the captive bolt pistol against the cranium.

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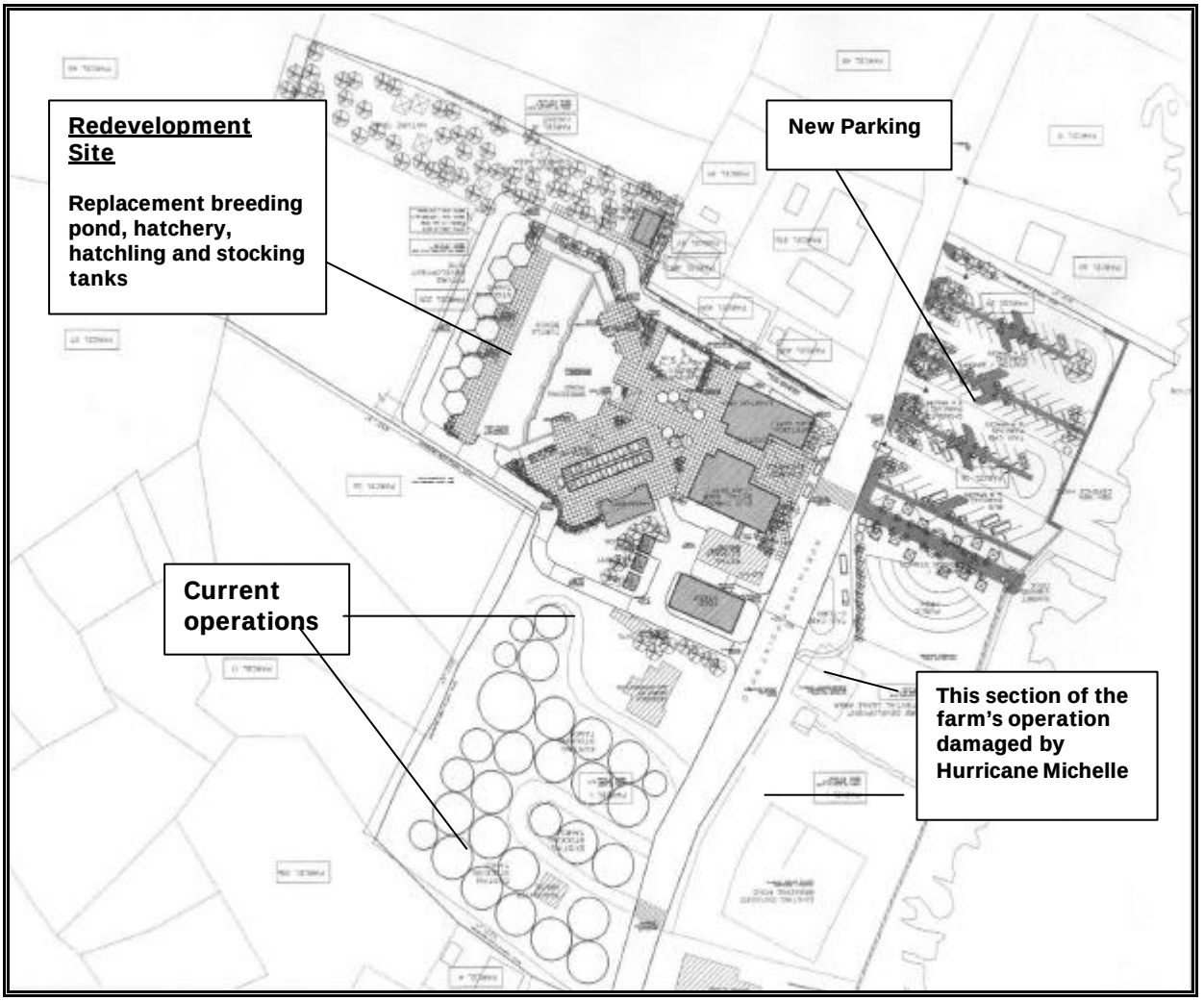
Annex 1 – Pre and Post-Michelle site plan of the facilities.

Annex 2 – Selected bibliography of published and presented papers for work supported by Cayman Turtle Farm (1983) Ltd. or its predecessors.

Annex 3 – Ascension Island's confirmation of legal acquisition.

Annex 1

Pre and Post-Michelle Site Plan of the Facilities



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Ascension Island's Confirmation of Legal Acquisition

03/05/2002 09:22 ADMINISTRATORASCENSION → 0013459451746 NO.840 001

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Mr Charles E Clifford
Permanent Secretary
Ministry of Tourism, Environment, Development & Commerce
CITES Management Authority for the Cayman Islands
Cayman Island Government

Fax No. 00l345 945 1746

Ref: 22C

Date: 02 May 2002

Dear Permanent Secretary.

Thank you for your fax of 22 April concerning Mariculture Ltd and its successors.

I have seen some papers on this but nothing in great detail. However I can confirm that the collections were made legally and with the full cooperation of the authorities here.

I hope that this is sufficient for your purposes.

Yours sincerely.

Geoffrey Fairhurst
Administrator

TOURISM, ENVIRONMENT, DEVELOPMENT & COMMERCE
MAY 0 3 2002
Cayman Islands