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

Twenty-eighth meeting of the Animals Committee
Tel Aviv (Israel), 30 August-3 September 2015

Interpretation and implementation of the Convention

Species trade and conservation

Proposals for possible consideration at CoP17

PROPOSAL FOR THE TRANSFER FROM APPENDICES I TO II OF *CROCODYLUS POROSUS* IN MALAYSIA

1. This document has been prepared by Malaysia.*

Purpose

2. Transfer *Crocodylus porosus* in Malaysia from Appendix I to Appendix II of CITES for wild harvest restricted to the State of Sarawak, with a zero quota on wild harvest for the other States of Malaysia (Sabah and Peninsular Malaysia), with no change in the zero quota unless approved by the Parties.

3. Supporting Statement of the proposal as per below:

3.1 Taxonomy

3.1.1	Class:		Reptilia
3.1.2	Order:		Crocodylia
3.1.3	Family:		Crocodylidae
3.1.4	Genus, species or subspecies, including author and year:		*Crocodylus porosus* Schneider, 1801
3.1.5	Scientific synonyms:		*Crocodilus biporcatus*, *Crocodilus oopholis* , *Crocodylus raninus* , *Oopholis pondicherianus*
3.1.6	Common names:	English:	Saltwater crocodile, saltie, Estuarine crocodile, Indo-Pacific crocodile, Buaya katak/tembaga/muara (malay), Baya, Pukpuk, Kone huala (Papua New Guinea), Jara Kaenumkem (Thailand), ius (Palau)
		French:	Crocodile d'estuaire, Crocodile marin

* *The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CITES Secretariat (or the United Nations Environment Programme) concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. The responsibility for the contents of the document rests exclusively with its author.*

Spanish: Cocodrilo poroso

3.1.7 Code numbers: L-306.002.001.009

3.2 Overview

3.2.1 Technical Justification

Article II Fundamental Principles: *C. porosus* in Sarawak no longer meets the criteria for Appendix I (Article II.1). The Appendix I listing helped stimulate conservation actions and population recovery, and it now fits the criteria for Appendix II (Article II.2). Malaysia is committed to CITES and has demonstrated its ability to comply with the provisions of CITES (Article II.4).

Article IV Regulation of Trade in Specimens of Species Included in Appendix II. Crocodiles are protected in Sarawak under the Wild Life Protection Ordinance and its Rule. This law and regulation is adequate to ensure the provisions of Article IV can be complied with, including the obligation on the CITES Scientific Authority to demonstrate non-detriment (Article IV.2.a).

3.2.2 General

Malaysia is represented geographically by 3 regions namely; Peninsular Malaysia (and the Federal Territory of Labuan), Sabah and Sarawak. Sabah and Sarawak are located on the northern part of Borneo, separated from Peninsular Malaysia by the South China Sea, sharing the island with the Sultanate of Brunei Darussalam and the Indonesian's Kalimantan.

Movement or trading of wild flora and fauna within the three Malaysian territories is governed by the region's own laws: Wildlife Conservation Act 2010 (Act 716) for the states in Peninsular Malaysia and the Federal Territory of Labuan; Wildlife Protection Enactment for Sabah; and, the Wild Life Protection Ordinance for Sarawak. In addition to the regional laws, the international trade of wild flora and fauna in Malaysia is also regulated by the Malaysian International Trade in Endangered Species Act 2008 [*Act 686*].

The population of *C. porosus* in the wild in Sarawak has increased significantly over the last 30 years due to successful conservation actions. Commensurate with the increasing population of adults, which are seen as voracious predators, there has been a substantial increase in human-crocodile conflict including fatal and non-fatal attacks. This is eroding public confidence in ongoing conservation. The goal of the current proposal is to incorporate into the overall management of this species in Sarawak the ability to conduct a strictly controlled sustainable harvest that can provide economic benefits to local communities being adversely affected by the crocodiles, while retaining viable wild populations. Without economic returns, crocodiles are increasingly seen only as pest that should be eradicated.

The proposed harvest will be experimental and restricted to a maximum of 500 post-hatching *C. porosus* per year (around 4% of the estimated population) and <2500 eggs (or their equivalent in hatchlings) for the first three years, with safeguards aimed at reducing this if the population response does not meet expectations. It is an adaptive management approach.

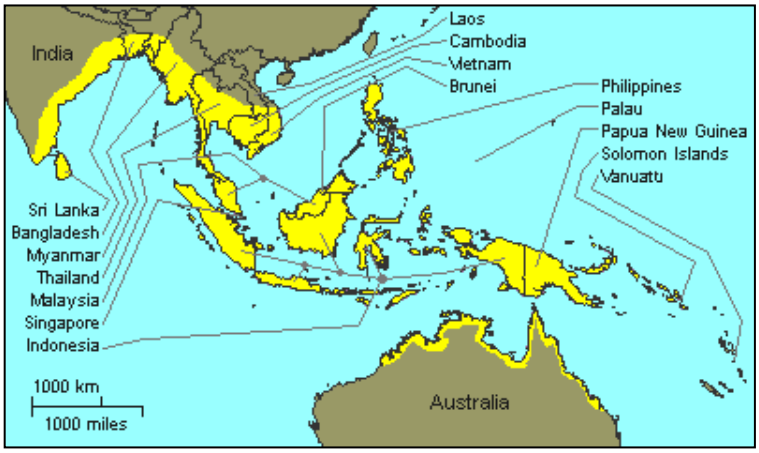
3.3. Species Characteristics

3.3.1. Distribution

The distribution of *C. porosus* (see figure 1) encompasses Australia, Bangladesh, Brunei, Cambodia (extinct?), China (possibly historically), India, Indonesia, Malaysia, Myanmar, Palau, Papua New Guinea, Philippines, Seychelles (extinct), Singapore (extinct?), Sri Lanka, Solomon Islands, Thailand (extinct?), Vanuatu, Vietnam (extinct?) (Webb et. al., 2010).

Estuarine crocodiles are widely distributed in Malaysia. In Sarawak, crocodiles are found in all river basins. Sarawak covers an area of 12 million hectares comprising 22 major river basins (see figure 2).

Fig. 1: *Distribution of C. porosus in the world*



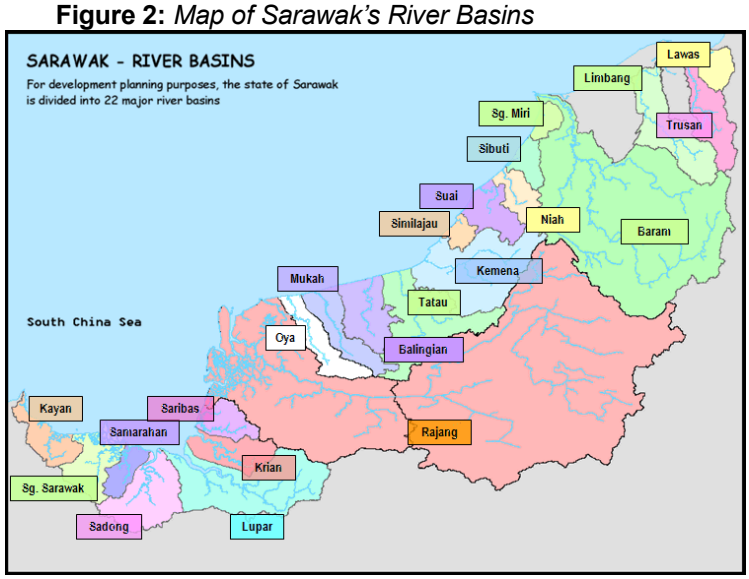
(Adam Britton (n.d.))

3.3.2. Habitat

Sarawak lies 0.5° - 5° north of the Equator, possesses a hot and humid climate with an average rainfall of more than 3000mm/year and average temperature of 26°C. The topography of the State is generally flat in the peat swamp areas closer to the coast to gently undulating hills and rugged mountains towards the borders in the west and south. The tidal portions of the rivers are lined with mangrove and the rivers meander through great distances through broad flood plains with oxbow lakes.

Sarawak's extensive crocodile habitats are found in the mangrove estuaries, the large river systems, and the inland freshwater swamps. The highest crocodile densities in Borneo are usually found in mid-river areas of medium sized to large rivers (Whitaker, 1984; Stuebing et. al., 1993) but some are also found as far as Kapit town (Rajang RB), which is more than 160 kilometres from its river mouth and is not affected by tidal influence. Crocodiles are known to traverse across and utilize different habitats as a result of social dynamics.

Figure 2: *Map of Sarawak's River Basins*



Source: Department of Irrigation and Drainage, Sarawak

3.3.3. Biological Characteristics

Estuarine crocodiles are water's edge predators that take a wide variety of prey. Juveniles feed on smaller prey such as insects, crustaceans, small reptiles, frogs and small fish while larger and mature crocodiles eat turtles, snakes, birds, livestock, buffalo, monkeys, wild pigs, mudcrabs and people. Breeding territories are usually established along tidal rivers, creeks

and freshwater areas. Female estuarine crocodiles reach sexual maturity at 10-12 years and males at 16 years. Females on average lay 40 to 60 eggs in mound nests made from vegetation (usually grasses and vines) and mud. The sex of the brood is determined by the temperature of the nest. If the nest is around 31.6° C, all the eggs will become male. Above or below that and they are females. Less than 1% of hatchlings will survive to reach maturity (Bayliss and Messel, 1990; Burbridge, 1987; Messel *et al,.* 1979-87; Messel and Vorlicek 1985 and 1986; Taplin, 1987 and 1990; Webb *et al.,* 1984 and 1987; Webb and Manolis, 1989 and 1992; Stubeing *et al.,* 1993; Whitaker, 1984).

3.3.4. Morphological Characteristics

Estuarine crocodiles are the largest living reptiles, with the females attaining lengths of 3m and males 3-6m and weigh from 640kg to 1,100kg. They have very large heads with a pair of ridges running from the eyes orbits along the center of the snout. The eyes, ears, and nostrils are located on the same plane on the top of the head, allowing for it to see, hear, and breathe while almost totally submerged. The jaws are heavyset and contain 64-68 teeth. Juveniles are yellow in colour with black stripes and spots. Adults are dark in colour with light grey areas. The belly is yellowish and the underside of the tail is grey near the tip. Dark bands are located on the lower flanks. The hide lacks osteoderms (bony plates) on the ventral (belly scales), and the scales are oval and squarish in shape on the flanks and belly skin (Cogger, 1993; Grigg and Gans, 1993; Cooper-Preston and Jenkins, 1993).

3.3.5. Role of the species in its ecosystem

Crocodiles are usually considered top-end predators within rivers and lakes, and arguably maintain genetic quality by feeding on weak, injured and dead animals. It has been claimed crocodiles impact positively on fisheries by feeding on predators of commercially valuable fish e.g. catfish, turtles, otters and water birds (Whitaker, 1984; Gorzula, 1987). Crocodiles are a food source for other animals that prey on small crocodiles, and dead crocodiles of all sizes are eaten by many animals.

3.4. Status and Trends

3.4.1. Habitats Trends

There have been minimum changes to the general habitat of major rivers in Sarawak. It is a regulatoryrequirement to put aside river reserve or river buffers along the waterways, except in towns, cities and human settlements. Land developments and land uses such as agriculture adjacent to major rivers, has little impact and even lead to positive habitat improvement. Stuebing *et al.,* (2003) suggested that secondary type of vegetation called 'padang', a stable community of secondary growth of grasses and herbs, is used by crocodiles for nest construction, thus creating a suitable nesting habitat.

3.4.2. Population size

The Sarawak Forestry Corporation conducted a comprehensive population survey of *C. porosus* in most rivers in all river basin in Sarawak from 2012 - 2014. The result shows that all 22 river basins were inhabited by crocodiles in various densities as in Table 1. From this survey, the estimated population of *C. porosus* for Sarawak is 13,507 (non hatchling).

Table 1: *Summary of Crocodile Survey conducted by Sarawak Forestry Corporation 2012-2014*

	River Basin	Distance Surveyed	H	Y	SA	A	EO	With H	Without H	ρ with H	ρ without H
1	Kayan	137	13	13	9	13	22	70	57	0.51	0.42
2	Sarawak	245.55	153	74	50	65	60	402	249	1.64	1.01
3	Samarahan	110	82	82	34	37	4	239	157	2.17	1.43
4	Sadong	255.9	253	76	44	32	81	486	233	1.90	0.91
5	Lupar	234.6	138	130	38	43	87	436	298	1.86	1.27
6	Saribas	60.8	29	2	3	6	97	137	108	2.25	1.78
7	Krian	123.3	54	15	1	5	108	183	129	1.48	1.05
8	Rajang	270.86	21	6	4	1	84	116	95	0.43	0.35

	River Basin	Distance Surveyed	H	Y	SA	A	EO	With H	Without H	ρ with H	ρ without H
9	Oya	74.3	1	1	0	1	3	6	5	0.08	0.07
10	Mukah	43	0	1	0	1	0	2	2	0.05	0.05
11	Balingian	45	0	0	3	2	2	7	7	0.16	0.16
12	Suai	84	25	41	4	6	27	103	78	1.22	0.92
13	Similajau	27	64	49	8	0	34	155	91	5.74	3.37
14	Tatau	45	5	15	0	5	4	29	24	0.64	0.53
15	Kemena	45	13	16	6	7	3	45	32	1	0.7
16	Niah	42	33	12	3	3	22	73	40	1.74	0.95
17	Sibuti	35.65	13	14	10	5	9	51	38	1.43	1.07
18	Miri	23	1	1	0	0	2	4	3	0.17	0.13
19	Baram	150	12	62	14	10	47	145	133	0.96	0.88
20	Limbang	75	10	16	2	4	11	43	33	0.57	0.44
21	Lawas	25	0	1	1	0	2	4	4	0.16	0.16
22	Trusan	35	0	2	0	0	1	3	3	0.08	0.08
		2,186.96	920	629	234	246	710	2739	1819	1.25	0.83

Note: ρ is density of observed crocodile per distance surveyed
H = Hatchling (less than 60 cm); Y = Yearling (between 60 to 120 cm); SA = Sub-adult (between 120 – 180cm); A = Adult (more than 180 cm); EO = Eye Only

In a separate and independent study carried out by Sarawak Forest Department (see Figure 2) for the same period (2012-2014), covering 45 main rivers and total distance of 2,108.38 km, a total of 2,236 crocodiles were observed, giving a relative density of 1.06 individual per km. The study estimated the population of crocodile in the surveyed rivers at about 12,000 individuals.

These calculations are considered conservative because the population that lives in heavily vegetated swamps which could not be surveyed was not taken into account.

Table 2: *Summary of crocodile survey conducted by Forest Department Sarawak 2012-2014*

	Rivers	**Distance covered (km)**	**No. of ind. sighted**	**% Hatchling**	**Rel density (ind./km)**
1.	Kuching Wetland NP	77.72	65	4.62	0.84
2.	Sg. Bako & Sg. Santubong	81.92	174	41.95	2.12
3.	Sg. Sarawak	102.84	25	4	0.24
4.	Sg. Kuap	62.73	18	22.22	0.29
5.	Sg. Tuang	19.50	37	40.54	1.90
6.	Btg. Samarahan	94.51	104	35.58	1.10
7.	Btg. Sadong	137.80	360	60	2.61
8.	Btg. Krian	87.20	140	27.86	1.61
9.	Sg. Seblak	56.10	103	45.63	1.84
10.	Sg. Kayan	125.66	31	3.23	0.25
11.	Btg. Lingga	20.72	71	56.34	3.43
12.	Sg. Seterap	41.45	49	48.98	1.18
13.	Sg. Sebuyau	31.55	98	24.49	3.11
14.	Btg. Lupar	128.44	182	18.68	1.42
15.	Sg. Sekrang	34.90	10	0	0.29
16.	Sg. Lemanak	7.30	4	0	0.55
17.	Btg. Saribas	137.96	368	45.38	2.67
18.	Sg. Nyelong	17.96	12	33.33	0.67

	Rivers	Distance covered (km)	No. of ind. sighted	% Hatchling	Rel density (ind./km)
19.	Sg. Sarikei	15.88	14	57.14	0.88
20.	Btg Rejang (Tg. Manis-S'kei)	46.89	21	47.62	0.45
21.	Sg. Selalang	28.61	7	25.10	0.24
22.	Sg. Belawai	23.42	21	57.14	0.90
23.	Sg. Meradong	58.40	8	0	0.14
24.	Sg. Igan & Pasai	52.47	15	0	0.29
25.	Upper Rejang	19.86	1	0	0.05
26.	Btg Rejang (lower Rejang)	84.16	14	14.29	0.17
27.	Sg. Pasin	32.63	9	0	0.28
28.	Btg. Kemena	41.88	43	13.95	1.03
29.	Sg. Labang	22.53	1	0	0.04
30.	Sg. Pandan	25.04	2	0	0.08
31.	Sg. Tatau/Anap	31.27	29	27.59	0.93
32.	Upper Tatau	35.3	2	0	0.06
33.	Sg. Niah	29.9	9	11.11	0.30
34.	Sg. Suai	32.6	15	0	0.46
35.	Sg. Sebuti	26.8	11	0	0.41
36.	Upper Baram	41.6	40	12.50	0.96
37.	Lower Baram	34.89	36	13.89	1.03
38.	Sg. Bakong	37.87	46	8.70	1.21
39.	Sg. Limbang	125.12	41	2.44	0.33

3.4.3. Population structure

As observed in the survey by Sarawak Forestry Corporation, hatchlings account for 33.58% of the population followed by 22.96% yearlings, 8.54% subadult and 34.9% adult (assuming that all EOs are adult). This population structure for *C. porosus,* with a high proportion of adults, is consistent with a population that has recovered and is both viable and healthy.

3.4.4 Population trends

A baseline study jointly conducted by WWF and the Sarawak Forest Department 30 years ago (1985) showed uniformly low densities of 0.054 observed crocodiles per kilometer of river surveyed throughout Sarawak (Cox and Gombek, 1985). A very significant increase in population abundance had been confirmed in later (1994-2008) and the most recent surveys (2012-2014). These confirm that the conservation program has met with considerable success. Batang Samarahan recorded the highest increase of relative densities (108 times); from 0.02 to 2.17 individuals sighted per km.

Table 3: *An increasing trend of relative densities of estuarine crocodile in Sarawak*

River	Surveyor	Year	Distant (km)	No. seen (non-hatchling)	Rel. density (ind./km)	Increase
Samunsam	Cox & Gombek	1985	12	3	0.25	2 times
	Engkamat	2003	9	4	0.44	
	Sarawak Forestry	2014	10	5	0.5	
Sarawak Mangrove/ Kuching Wetland	Cox & Gombek	1985	48	2	0.04	34.5 times
	Engkamat	1995	78.7	93	1.18	
	Sarawak Forestry	2008	59	53	0.90	
	Engkamat	2012	77.72	65	0.84	

River	Surveyor	Year	Distant (km)	No. seen (non-hatchling)	Rel. density (ind./km)	Increase
	Sarawak Forestry	2014	77.5	107	1.38	
Btg. Lupar	Cox & Gombek	1985	206	11	0.05	28.4 times
	Engkamat	1995	180.1	45	0.25	
	Engkamat	2013	128.44	182	1.42	
	Sarawak Forestry	2014	234	298	1.27	
Btg. Samarahan	Cox & Gombek	1985	110*	1	0.02	108.5 times
	Engkamat	2012	94.51	104	1.10	
	Sarawak Forestry	2014	110	239	2.17	
Sungai Suai	Cox & Gombek	1985	40	2	0.05	22.4 times
	Engkamat	2014	32.6	15	0.46	
	Sarawak Forestry	2014	84	103	1.12	
Btg Rajang	Cox & Gombek	1985	403	11	0.02	21.5 times
	Engkamat	2014	380.28	122	0.32	
	Sarawak Forestry	2014	270.86	116	0.43	
Sungai Baram	Cox & Gombek	1985	335	24	0.072	14.7 times
	Sarawak Forestry	2014	150	145	0.96	
	Engkamat	2014	114.36	122	1.06	
Sg. Limbang	Cox & Gombek	1985	43	1	0.02	28.5 times
	Sarawak Forestry	2014	75	43	0.57	
	Engkamat	2014	125.12	41	0.33	

*The actual distance was not mentioned in the survey.

3.4.5 Geographic trends

Population surveys showed that crocodiles have increased in numbers and now occupying stretches of rivers previously considered beyond their normal range. They have extended into small upstream creeks and sections of river well beyond tidal influence. It is now not uncommon to find crocodiles in drains in towns and human settlements.

3.5 Threats

In Sarawak, human-crocodile conflict has been on the rise. It has long been taboo to kill, or even 'harass' crocodiles but of late there is an increasing view that crocodiles are pests because they prey on people and livestock. There have often been demands and outcries for the authority to kill or remove the crocodiles in the rivers, especially after fatal attacks on people.

Table 4: Summarized record of crocodile attack incident in Sarawak since 1940

Year	Killed	Survived	Total
1940-1949	3	-	3
1950-1959	6	-	6
1960-1969	5	-	5
1970-1979	4	-	4
1980-1989	7	10	17
1990-1999	11	9	20
2000-2009	19	24	43
2010 – 2015 (3.6.15)	24	21	45
Total	**79**	**64**	**143**

3.6 Utilization and trade

3.6.1. National utilization

Currently, no direct commercial utilization of wild crocodiles has been reported because crocodiles are legally protected in Malaysia. All trade in live crocodiles, skins and products

come from crocodile farms registered with CITES as commercial captive-breeding facilities for Appendix I species.

3.6.2 Legal Trade

Malaysia only allowed trading of crocodiles from registered crocodile farms in accordance to Article III of the Convention and provision of the national/regional wildlife laws. As Malaysian crocodiles population is currently listed in CITES Appendix I, international trade of crocodiles from the wild is not permitted.

Table 6: Exports from CITES registered crocodile farms from Sarawak

Year / Origin	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Jong's Crocodile Farm	12*	-	-	-	-	83*	-	10*	203*	244*	-
Benaya Sdn Bhd	-	-	15**	8**	7**	18**	8**	2*	-	-	-

* live crocodiles
** crocodile skin

3.6.3 Parts and Derivatives in Trade

While trade from Sarawak is limited to skins and live crocodiles, exports from Peninsular Malaysia, where there are more registered captive breeding farms, also include skins, other byproducts and manufactured products such handbags, shoes, belts, watch straps accessories etc.

Table 7: Summary of exported *C. porosus* sourced from registered captive breeder in Peninsular Malaysia

Year	Skin	Dorsal Ridge	Products (unit)
2014	120	120	0
2013	0	0	3,359
2012	120	120	47,068
2011	0	0	869
2010	115	0	1,612

As for Sabah, the trade ranges from skin, dorsal body parts, meat, oil and products.

Table 8: Summary of exported *C. porosus* sourced from registered captive breeder in Sabah

Year	**Skin and Dorsal Ridge**	**Meat and fats**	**Oil**	**Stuffed Crocodile**	**Parts**	**Products**
2014	2,869 pcs	2,300 kg	505.8L	11 pcs	5 pcs	20 pcs
2013	842 pcs	237 kg	1000 bottles	20 boxes	-	
2012	3,267 pcs	-	8 boxes and 20 bottles	2 boxes	-	
2011	884 pcs	360 kg 17 boxes	-	19 pcs	10 pcs	18 pcs
2010	1,094 pcs	242 kg	1 box	5 pcs	-	5 pcs

3.6.4 Illegal Trade

There is no recent (post-CITES accession) record of illegal trade in crocodile skin or meat leaving Malaysia.

3.6.5 Actual or Potential Trade

Trade in crocodiles from Sarawak is restricted largely to live crocodiles and small amount of skins from 2 crocodile farms. In Peninsular Malaysia and Sabah, where crocodiles are also captive bred, other finished products are also produced in addition to skins. In Sabah, crocodile meat is also sold for consumption. Under the proposed program in Sarawak, culled crocodiles can be a source of economic benefit when the skins, meat and other products from the crocodiles are sold.

3.6.6. Proposed utilization

The maximum sustainable yield for wild *C. porosus* populations is not known precisely. What is known is that a 5% annual harvest rate for alligators did not interfere with continued population growth, and a selective harvest strategy (males) for *caiman crocodilus* resulted in the harvested wild population increasing rather than decreasing (Webb 2015). A 5% annual harvest rate for the non-hatchling population estimated to exist in the surveyable rivers in Sarawak (population = 13,507 individuals; 5% = 675 individuals) is considered to have a high probability of being sustainable.

Sarawak proposes to harvest no more than 500 non-hatchlings per year for the first three years of the program, and to quantify the response of the population to these limit harvests through survey work. Harvest rates will then be adjusted up or down, based on the results. It is also intended to harvest <3000 eggs, or their equivalent in hatchlings, i.e., 750 hatchlings based on 25% hatchability, or 375 one-year-olds based on an estimated 50% survival to year 1 as recommended by Webb et al. 1984.

3.7 Legal Instruments

3.7.1. National

Crocodiles are either listed as protected or totally protected in Malaysia according to the region's law i.e., Wildlife Conservation Act 2010 [*Act 716*] for the states in Peninsular Malaysia and the Federal Territory of Labuan, Wildlife Protection Enactment for Sabah and the Wild Life Protection Ordinance for Sarawak. Hunting, capturing, keeping, farming, import, export and are regulated under these laws. Offences range from RM10,000 (USD37,000) to RM300,000 (USD111,000) and imprisonment of one to ten years.

3.7.2. International

C. porosus is listed as Appendix I in most range states including Malaysia and as Appendix II for Australia, Papua New Guinea and Indonesia. The implementation of CITES in Malaysia is instrumented under the International Trade in Endangered Species Act 2008 [*Act 686*] as well as the regional wildlife laws.

3.8. Species management

3.8.1. Management measures

Sarawak has put in place a Master Plan for Wildlife in Sarawak which provides recommendations and guidelines for a sound management and protection of wildlife and its habitat. The master plan was approved by the State Legislative Assembly and its recommendations were translated into law and policy.

The State Cabinet of the State Legislative Assembly has also provided directions for crocodiles to be managed holistically and where possible the local communities must be able to derive benefits from the presence of crocodiles in the locality. Measures taken include promoting ecotourism tours, based on crocodile watching at selected rivers with low human density and high density of crocodiles.

The state has also provided the necessary fund to enable continuous monitoring of crocodile, promoting conservation of crocodiles through CEPA programs, signages to warn

communities of the dangers in selected locations, and where necessary, the implementation of non-tolerance zone or crocodile removal zone.

Sarawak has vigorously engaged with the IUCN-SSC Crocodile Specialist Group to seek advice and guidance on crocodile management. The CSG conducted a specialized training workshop in survey and monitoring techniques, data analysis, and management issue for people managing crocodiles in Sarawak.

A number of specialized workshops including two international crocodile conferences were held in Sarawak (2011 and 2014) to solicit ideas, guidance and recommendations for the development of a Crocodile Management Plan for Sarawak.

3.8.2 Population monitoring

The monitoring data available for *C. porosus* in Sarawak spans over 30 years and provides definitive insights into the recovery trends that have taken place. Monitoring started in 1985, and a renewed monitoring effort in selected rivers occurred between 1994 and 2008. More recently two separate and independent surveys were conducted between 2012 and 2014 by the Sarawak Forestry Corporation and Sarawak Forest Department. University Malaysia Sarawak had also conducted population surveys, as part of post graduate student research programs.

The study conducted by Engkamat Lading of the Sarawak Forest Department (2012-2014) was specifically aimed at getting standardized results that could be used as a baseline for assessing the sustainability of wild harvests over time, and the information that would be needed to comply with the non-detriment provisions of CITES (Article IV.2.a). He found that *C. porosus* were widely distributed along most rivers with remarkably high population densities in some. A number of the rivers had high percentages of hatchlings, indicating successful reproduction. He concluded that some rivers would be suitable for initiating harvest programs and monitoring the results.

Table 9: Rivers where harvesting is considered

Rivers	Relative density (Ind./Km) with CF	% of Hatchling (H)
Sg. Bako	7.34	41.97
Btg. Samarahan	6.01	35.58
Sg. Tuang	9.42	40.54
Btg. Sadong	8.24	60.00
Sg. Sebuyau	12.71	24.49
Sg. Lingga	9.67	56.34
Btg. Saribas	11.86	45.38
Sg. Seblak	11.01	45.63
Lower Baram	11.49	13.89
Sg. Bakong	14.55	8.70

3.8.3 Control measures

3.8.3.1 International

The implementation of CITES in Malaysia is instrumented under the International Trade in Endangered Species Act 2008 [Act 686] as well as the regional wildlife law.

For the Sarawak, any international movement will not only require the necessary CITES permit but also export license issue by the Controller of Wild Life.

3.8.3.2 Domestic

Movement within the states in Malaysia does not require any CITES permits but may require export and/or import license or permit. In Sarawak, such license is issued by the Controller of Wild Life.

3.8.4. Captive breeding and artificial propagation

Captive breeding of *C. porosus* is governed under the International Trade in Endangered Species Act 2008 [*Act 686*] as well as the regional wildlife law as stated in 7.1. The penalties for offences committed in respect with captive breeding are very steep with fines up to two million ringgit and imprisonment of seven years.

There are seven crocodiles farms registered with CITES in Malaysia including two in Sarawak. They are:

1. Sandakan Crocodile Farm Sdn. Bhd., Sabah
2. Jong's Crocodile Farm, Sarawak
3. Taman Buaya Langkawi, Kedah
4. Benaya Sdn. Bhd, Sarawak
5. Syarikat Jaya Sewajar Sdn. Bhd., Johor
6. Borneo Crocodile Center Sdn. Bhd., Sabah
7. Suan Hong Crocodile Farm Sdn Bhd., Sabah

These farms are set up primarily to enable the utilization of the crocodile skins for leather. Besides production of skins, the farms also capitalize in getting revenue from visitors.

3.8.5 Habitat conservation

Table 10 below shows the totally protected areas (TPAs) in Sarawak where crocodile are found in relative abundant. The Kuching Wetland NP is a Ramsar Site in Sarawak. Currently, Pulau Senduku, an island in Batang Lupar is being proposed as a totally protected areas dedicated to the conservation of crocodile.

Table 10: List of TPAs in Sarawak where crocodiles are found

No	**Name of TPA**	**Area** (hectares)
1	Samunsam WS	22,798
2	Kuching Wetland NP	6,610
3	Ulu Sebuyau NP	18,287
4	Maludam NP	43,147
5	Rajang Mangrove NP	9,373
6	Similajau NP	8,996 (+13,124 territorial waters)
7	Niah NP	3,138
8	Sibuti WS	678
9	Loagan Bunut NP	10,736
10	Bako NP	2,727

3.8.6. Safeguards

The purpose of transferring *C. porosus* from Appendix I to Appendix II is to enable the sustainable utilization of wild population in Sarawak which will provide the socio-economic benefits to communities thus helping to ensure the sustainability of crocodile in the wild. Such utilization will be managed and safeguarded by the present law and policies concerning protected species and the continuous monitoring of the crocodile's population.

As safeguards, the following will be implemented:-

a. If the monitoring results indicate the non-hatchling wild population is more or less stable after the first harvest, then the second year's harvest will be unaltered.

b. If the wild population declines by 20% after the year 1 harvest, the harvest levels for year 2 will be reduced 40%.

c. If the wild population continues to decline after year 2, the harvest will be reduced to 60%

d. If the decline is not compensated for by an increase in the population the wild harvest program will be abandoned.

In Sarawak, a specific CEPA program called '3M Buaya' is currently being implemented to promote the importance of conserving crocodiles, living with crocodiles and benefiting from crocodiles.

Utilization of wild *C. porosus* will not affect a similar species found in Sarawak, the Malayan False Gharial, *Tomistoma schegelli. T. schegelli* is on Appendix I, is no longer involved in international trade, and is not in demand for that trade due to characteristics of its skin and scale pattern.

3.9 Information on similar species

A similar species crocodile recorded in Sarawak is the Malayan False Gharial, (*Tomistoma schlegelli*). *T. schlegelli* are usually found in upper parts of some rivers with peat swamp habitat. They can be easily distinguished from their external appearance. The snouts of estuarine crocodiles are normally short and blunt, relative to those of the false gharials, which are elongated and narrow.

The distribution of the false gharial is somehow limited and has only been reported along upper reaches of Sg. Ensengei (tributary of Btg. Sadong), Sg. Kroh and Sg. Runjing, Engkelili (tributaries of Btg. Lupar). Old records have shown that this species is found in Sg. Dor (upper Sg. Kelauh), Sg. Maying (upper Tubau) and also Loagan Bunut in Tinjar. Recently, the presence of the false gharial has been detected in Kepayang River (near Ulu Sebuyau National Park, upper Samarahan River and upper Sadong River.

3.10 Consultations

3.10.1 A draft of an earlier proposal was distributed to the range states in 2009 and received support from Bangladesh and an acknowledgement by the Philippines. Australia put up a number of comments and recommendations which have been taken into consideration and acted on.

3.10.2 This proposal was tabled during the 11th Meeting of the ASEAN Experts Group on CITES on 7-8 May 2015 in Bandar Seri Begawan, Brunei and at the 1st East and South-East Asia Regional Crocodile Specialist Group Meeting on 25-29 May 2015 in Siem Reap, Cambodia.

3.10.3. The latest proposal has been distributed to the Range States namely Australia, India, Indonesia, Myanmar, Palau, Papua New Guinea, Philippines, Singapore, Sri Lanka and Thailand for comments and inputs.

3.11 Additional remarks

In a recent Review Mission to Indonesia by the CSG, two of their recommendations as in Brien et. al. 2015 are relevant to Malaysia's proposal:

Recommendation 1d.Ranching and Compliance with CITES
Consideration should be given to whether the current Appendix-II listing under the ranching criteria [in Indonesia} should be amended to an unqualified Appendix-II listing, despite ranching remaining the primary form of use.

It is possible to pursue ranching with or without wild harvest on Appendix II and there may be practical advantages in having *C. porosus* in Malaysia and Indonesia, and regionally in PNG and Australia, managed under Appendix II using zero quotas for areas in which the population has not recovered or may never recover.

Recommendation 3. Management of Human-Crocodile Conflict.
That when basic information on HCC is compiled, that Indonesia host a National workshop on Human-Crocodile Conflict, similar to those that have been held in Malaysia in recent years, in which national approaches to HCC can be refined.

Malaysia has played a prominent role in addressing Human-Crocodile Conflict in the region to ensure the survival of the species while minimizing conflict with people. Indonesia faces the exact same problem within some provinces, and sharing results and experience should be a priority.

3.12 References

Adam Britton (n.d.). Retrieved February 4, 2008, http://www.flmnh.ufl.edu/cnhc/cst_cpor_dh_map.htm

Bayliss, P., Webb, G. J. W., Whitehead, P. J., Dempsey, K., and Smith, A. (1986) Estimating the abundance of saltwater crocodiles, *Crocodylus porosus* Schneider, in tidal wetlands of the Northern Territory: a mark–recapture experiment to correct spotlight counts to absolute numbers and the calibration of helicopter and spotlight counts. *Australian Wildlife Research* **13**, 309–320.

Bayliss, P. (1987). Survey Methods and Monitoring Within Crocodile Management Programmes. . In: *Wildlife Management: Crocodiles and Alligators*, (ed. by G.J.W. Webb, S.C. Manolis and P.J. Whitehead. Surrey Beatty and Sons Pty. Ltd. in association with the Conservation Commission of the Northern Territory) Sydney, 125-127.

Bayliss, P. and Messel, H. (1990) The population dynamics of estuarine crocodiles. In: An assessment of longterm census data. *Proceedings 9th Working Meeting IUCN-SSC Crocodile Specialist Group,* Lae, PNG. IUCN: Gland, Switzerland, 1-44.

Brien. M., Shwedick. B., McCaskill. L., Ramono. W. and Webb. G. (2015) Crocodile Conservation, Management and Farming in Indonesia: a Preliminary Review with Recommendations. Summary Report of the IUCN-SSC Crocodile Specialist Group Review Mission to Indonesia (23 August-17 September 2014) March 2015

Burbidge, A.A. (1987). The management of crocodiles in Western Australia. In: *Wildlife Management: Crocodiles and Alligators*, (ed. by G.J.W. Webb, S.C. Manolis and P.J. Whitehead. Surrey Beatty and Sons Pty. Ltd. in association with the Conservation Commission of the Northern Territory) Sydney, 125-127.

Cogger, H. (1993). General description and definition of the Order Crocodylia, In: *Fauna of Australia, Vol. 2A, Amphibia and Reptilia*. (ed. By C.J. Glasby, G.J. Ross and P.L. Beesley), AGPS, Canberra, 235.

Cooper-Preston, H. and Jenkins, R.W.G. (1993). Natural history of the Crocodylia. In: *Fauna of Australia, Vol. 2A, Amphibia and Reptilia.* (ed. By C.J. Glasby, G.J. Ross and P.L. Beesley), AGPS: Canberra, 337-343.

Cox, J. and F. Gombek. (1985). A preliminary survey of the crocodile resource in Sarawak, East Malaysia. *IUCN/WWF Project No. MAL 74/85.* World Wildlife Fund Malaysia, Kuala Lumpur.

Engkamat, L. (1998). Preliminary surveys of Crocodiles in some Major Rivers in Sarawak. (Unpubl. Report). National Park and Wild Life Office, Forest Department, Kuching, Sarawak, Malaysia.

Fukuda, Y., Webb, G., Manolis, C., Delaney, R., Letnic, M., Lindner, G., and Whitehead, P. (2011). Recovery of saltwater crocodiles following unregulated hunting in tidal rivers of the Northern Territory, Australia. J. Wildl. Manag. 75(6): 1253-1266.

Gorzula, S. (1987). The management of crocodilians in Venezuela. Pp. 91-101 *in* Wildlife Management: Crocodiles and Alligators, ed. by G.J.W. Webb, S.C. Manolis and P.J. Whitehead. Surrey Beatty & Sons: Chipping Norton.

Grigg, G. and Gans, C. (1993). Morphology and physiology of the Crocodylia, In: *Fauna of Australia, Vol. 2A Amphibia and Reptilia* (ed. by C.J. Glasby, G.J.B. Ross and P.L. Beesley), AGPS, Canberra, 326-336.

Messel, H., Green, W.J., Wells, A.G., Vorlicek, G.C., Onley, I.C., Johnson, A., Gans, C., Elliott, M., Brennan, K.G., Burbidge, A.A., Curtis, H.S., Fuller, P.J., Roff, C.R., Weaver, C.M. and King, W.F. (1979-87). Surveys of the tidal river systems in the Northern Territory of Australia and their crocodile populations, Series of 20 monographs, Pergamon Press, Sydney.

Messel, H., Vorlicek, G. C., Wells, A. G., and Green, W. J. (1981). Surveys of the tidal river systems in the Northern Territory of Australia and their crocodile populations. Monograph 1. The Blyth–Cadell River

systems study and the status of *Crocodylus porosus* in tidal waterways of northern Australia. Methods of analysis and dynamics of a population of *C. porosus*. (Pergamon Press: Sydney.)

Messel, H. and Vorlicek, G.C. (1985). Population dynamics of *Crocodylus porosus* -a ten year overview. In: *Biology of Australasian Frogs and Reptiles*, (ed. by G. Grigg, R. Shine and H. Ehmann). Surrey Beatty and Sons: Sydney, pp. 71-82.

Messel, H. and Vorlicek, G.C. (1986). Population dynamics and status of *Crocodylus porosus* in the tidal waterways of northern Australia. *Aust. Wildlife Research.* **13**, 71-111.

Stuebing, R., S.M. Mohd Sah, M. Andau and L. Ambu. (1993). Conservation, management and farming of crocodiles in Sabah. Working paper, *Proceedings of the 2nd. Regional Meeting of the Crocodile Specialist Group*, 12-19 March, 1993. Darwin, NT, Australia.

Taplin, L.E. (1987). The management of crocodiles in Queensland. In: *Wildlife Management; Crocodiles and Alligators,* (ed. by G.J.W. Webb, S.C. Manolis and P.J. Whitehead). Surrey Beatty and Sons: Sydney, 129-40

Taplin, L.E. (1990). The population status and management of estuarine crocodiles in Queensland – present situation and future prospects. *Proceedings of the 9th Working Meeting IUCN-SSC Crocodile Specialist Group,* Lae, PNG, IUCN; Gland, Switzerland, 253-307.

Webb, G.J.W. (2015). Principles of Sustainable Use. Section 4.2 in "CSG Crocodilian Capacity Building Manual" (in prep). http://www.iucncsg.org/pages/Crocodilian-Capacity-Building-Manual-Home.html

Webb, G.J.W., Manolis, S.C. and Whitehead, P.J. (eds.) (1987). The management of crocodiles in the Northern Territory of Australia. In: *Wildlife Management: Crocodiles and Alligators.* (ed. by G.J.W. Webb, S.C. Manolis and P.J. Whitehead). Surrey Beatty and Sons Pty. Ltd. in association with the Conservation Commission of the Northern Territory: Sydney.

Webb, G.J.W., Manolis, S.C., Whitehead, P.J. and Letts, G.A. (1984). A proposal for the transfer of the Australian population of *Crocodylus porosus* Schneider (1801), from Appendix I to Appendix II of C.I.T.E.S. Conservation Commission of the Northern Territory, Tech. Report No. 21.

Webb, G.J.W. and Manolis, S.C. (1989). *Crocodiles of Australia*. Reed Books: Sydney.

Webb, G.J.W. and Manolis, S.C. (1992). Monitoring saltwater crocodiles (*Crocodylus porosus*) in the Northern Territory of Australia. In: *Wildlife 2001: Populations* (ed. by D.R. McCullough and R. Barrett). Elsevier Applied Science: London and New York, 404-18

Webb, G.J.W., Manolis, S.C., and Brien, M.L. (2010). Saltwater Crocodile *Crocodylus porosus.* Pp. 99-113 *in* Crocodiles. Status Survey and Conservation Action Plan. Third Edition, ed. by S.C. Manolis and C. Stevenson. Crocodile Specialist Group: Darwin.

Whitaker, R., (1984). Preliminary survey of crocodiles in Sabah, East Malaysia. IUCN/WWF Project No. 3127. World Wildlife Fund, Kuala Lumpur.