IUCN Red List Assessment:

For Publication in 2013.1 Red List update (July 2013)

Neophocaena asiaeorientalis ssp. asiaeorientalis - (Pilleri & Gihr, 1972)

ANIMALIA - CHORDATA - MAMMALIA - CETARTIODACTYLA - PHOCOENIDAE - Neophocaena - asiaeorientalis - asiaeorientalis

Common Names: Yangtze Finless Porpoise (English), Changjiang Jiangtun (Chinese)
Synonyms: *Neophocaena phocaenoides* ssp. *asiaeorientalis* (Pilleri & Gihr, 1972);

Taxonomic Notes:
Until recently, *Neophocaena* was thought to comprise only one species (*N. phocaenoides*) containing three subspecies. However, recent genetic and morphometric studies (Jefferson and Wang 2008, Chen *et al.* 2010) have shown that northern (including freshwater) and southern populations are distinct at the species level, with northern populations assigned to *N. asiaeorientalis* and recognized as representing two subspecies (*asiaeorientalis* and *sunameri*).

Red List Status	
CR - Critically Endangered, A3b+4b (IUCN version 3.1)	
Possibly Extinct:	No
Possibly Extinct in the Wild:	No
Year Last Seen:	

Red List Assessment

Assessment Information

Date of Assessment: 2012-02-24

Reviewed?	Date of Review:	Status:	Reasons for Rejection:	Improvements Needed:
true	2013-03-14	Passed	-	-

Assessor(s): Wang, D., Turvey, S.T., Zhao, X. & Mei, Z.

Reviewer(s): Taylor, B.L. & Slooten, E.

Regions: Global

Assessment Rationale

Justification 1 from trends analysis based on historical surveys (data for criterion A: rate of population reduction):

We examined trends in abundance of Yangtze Finless Porpoises using published and unpublished survey data between 1979 and 2007 collected from the main Yangtze channel. Encounter rates from these surveys were used as a measure of relative porpoise abundance in a generalized linear model (GLM) that accounts for differences in survey method and relative porpoise abundance in different sections of the Yangtze River. Factors included in the GLM analysis were: river section (i.e., Yichang-Ezhou, Ezhou-Huayang, and Huayang-Shanghai), boat size (large/small), boat number (multiple/single), water season

(high/low), and observer number (multiple/single). Our analyses indicate that the population in the upper survey section (Yichang-Ezhou) showed the greatest rate of decrease (r = -7.7% yr^{-1}, 1990-2007), while populations in the middle and lower sections (Ezhou-Huayang and Huayang-Shanghai) showed lower rates of decrease (r = -6.2% yr^{-1}, 1990-2007). The average rate of decline across the whole river was 6.4% yr^{-1}(1990-2007). We therefore predict that porpoise population change in the main Yangtze channel over three generations from 1990-2040 (T=16.5 yrs, Taylor *et al.* 2007) would be 92.4%.

According to the criteria of CR(A4b): "*An observed, estimated, inferred, projected or suspected population size reduction of ?80% over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on:(b) an index of abundance appropriate to the taxon.*"

The Yangtze Finless Porpoise population should therefore be classified as CR (A4b).

Justification 2 from life table analysis (data for criterion A: rate of population reduction; and criterion E: quantitative analysis):

We used data from 279 incidentally-killed Yangtze Finless Porpoises that were collected along the middle and lower reaches of the Yangtze River from 1978 onwards to construct population life tables for two time intervals, before 1993 and after 1993. Demographic rate estimates revealed an accelerating porpoise decline according to the instantaneous rate of increase (r), from r= -1.59% in the pre-1993 population to r= -6.25% in the post-1993 population. We then predicted a three-generation reduction from 2008-2058 (T = 16.5 yrs, Taylor *et al*. 2007) in the post-1993 scenario. We predict that over 93.95% (SD = 4.63%) of the current population will be lost in the next three generations based on an individual-based Leslie matrix model (Mei *et al.* 2012).

According to the criteria of CR A3b: "*A population size reduction of ?80%, projected or suspected to be met within the next 10 years or three generations, whichever is longer (up to a maximum of 100 years)*"

The Yangtze Finless Porpoise population should therefore be classified as CR (A3b).

Calculation based on the same model (Mei *et al*. 2012) revealed the probability of extinction of Yangtze Finless Porpoise within the next three generations is extremely high (58.55%, SD = 1.03%).

According to the criteria of CR (E): "*Quantitative analysis showing the probability of extinction in the wild is at least 50% within 10 years or three generations, whichever is the longer (up to a maximum of 100 years)*."

The quantitative analysis referred to above is currently under review by IUCN to confirm whether its use for criterion E is appropriate. Criterion E is therefore not used in this current assessment pending the outcome of that review. Meanwhile, the assessment is accepted under criterion A.

Conclusion: Results from life table analysis correspond closely with historical population trends analysis, and suggest that the Yangtze Finless Porpoise should be classified as Critically Endangered (CR A3b+4b) according to the criteria of IUCN.

Further comments: The major threats facing this subspecies in the Yangtze are likely to increase further over the near future, and possible gaps in a formerly continuous porpoise distribution were identified during recently conducted surveys (Zhao *et al.* 2008), further suggesting that the subspecies faces a very high risk of extinction.

Reasons for Change

Genuine Change: Recent

Distribution

Geographic Range

The Yangtze Finless Porpoise is endemic to the middle-lower Yangtze River drainage basin in eastern China, from Yichang downstream to the estuary near Shanghai. It is now almost completely restricted to the main river channel and its two largest appended lakes (Poyang and Dongting). It formerly also occurred, at least occasionally, in some large adjacent tributaries, but has now been extirpated from most of them (Zhang *et al.* 1993, Yang *et al.* 2000, Xiao and Zhang 2002). Of the seven extant species of porpoise (Phocoenidae), this is the only population found in freshwater (Gao and Zhou 1995). Figure 1 shows the distribution of Yangtze Finless Porpoise.

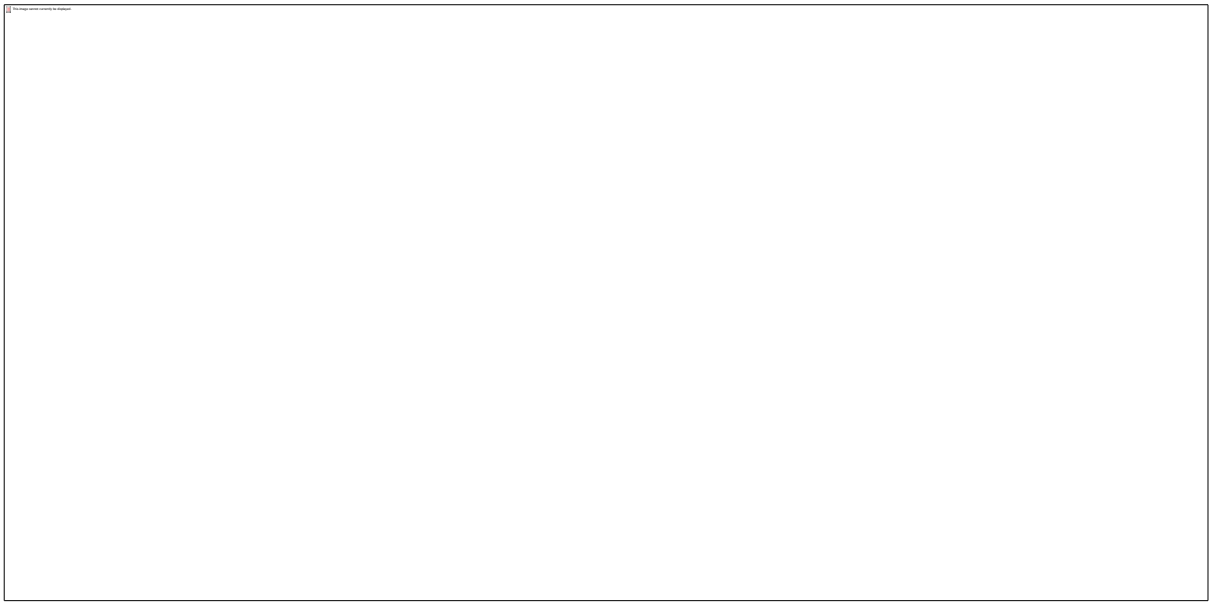

Figure 1. Distribution map of the Yangtze Finless Porpoise. Dashed line shows the distribution of the porpoise from Yichang to Shanghai and two large appended lake systems. Locations of porpoise reserves (Tian'e-Zhou Oxbow, Dongting Lake, Honghu, Poyang Lake, Anqing, Tongling and Zhenjiang) are also shown on the map.

Biogeographic Realms

Biogeographic Realm: Palearctic

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
China	Extant	Native	-	Resident
China -> Anhui	Extant	Native	-	Resident
China -> Hubei	Extant	Native	-	Resident
China -> Jiangsu	Extant	Native	-	Resident

China -> Shanghai	Extant	Native -	Resident

Population

Zhang *et al.* (1993) generated the first range-wide estimate of Finless Porpoise abundance in the Yangtze River system based on a series of small-scale surveys conducted between 1984 and 1991, providing a population estimate of approximately 2,700 animals by using a directed count method calibrated by a combination of correction factors. A series of surveys were conducted annually between 1997 and 1999 across the entire middle-lower Yangtze drainage, and a preliminary analysis of these data indicate that approximately 2,000 animals might have been present during that period (Ding Wang, unpublished). In 2006, a systematic survey using line-transect methods (with data analysed using line-transect and strip-transect approaches) indicated that the porpoise population in the Yangtze mainstem was approximately 1,000-1,200 animals (confidence intervals for abundance estimates derived from three different population models are 907-1,543 individuals, 825-1,496 individuals, and 755-1,245 individuals; Zhao *et al.* 2008). If estimates for the porpoise populations in the two lakes are also included, the entire extant population was then approximately 1,800 animals (Zhao *et al.* 2008).

It is essential to note that different survey techniques employed by Zhang *et al.* (1993) and Zhao *et al.* (2008) mean that results from these two surveys are not directly comparable. Zhao *et al.* (2008) evaluated the complicated subjective correction factors used by Zhang *et al.* (1993) in comparison to the systematic survey method in their own survey, and concluded that the estimate of Zhang *et al.* (1993) was probably biased downwards, meaning that the actual porpoise population decline between 1984?1991 and 2006 has probably been even greater than these estimates suggest; the annual rate of decline is likely to have been at least 5% for the entire porpoise population in the Yangtze system (Zhao *et al.* 2008).

Population Information

Current Population Trend: Decreasing

Number of mature individuals (=population size): 500-1800

Population Reduction - Future

Percent Change in future	Reduction or Increase	Qualifier	Justification
93.95%	Reduction	Projected	Assessors predict that over 93.95% (SD = 4.63%) of the current population will be lost in the next three generations based on an individual-based Leslie matrix model (Mei et al. 2012).

Basis?
b) an index of abundance appropriate for the taxon

Population Reduction - Ongoing

Both: Percent Change over any 10 year or 3 generation period, whichever is longer, and must include both past and future, future can't go beyond 100 years	Reduction or Increase	Number of years for this period	Qualifier	Justification
92.4%	Reduction	49.50	Projected	Based on Generalized Linear Model

	(GLM), Assessors predict that porpoise population change in the main Yangtze channel over three generations from 1990-2040 (T=16.5 yrs, Taylor et al. 2007) would be 92.4%.

Basis?
b) an index of abundance appropriate for the taxon

Reversible?
Unknown

Understood?
No

Ceased?
No

Quantitative Analysis

Probability of extinction in the wild within 3 generations or 10 years, whichever is longer, maximum 100 years	**Justification**
58.55	Calculation based on model used in Mei *et al*. 2012.

Habitats and Ecology

The Yangtze Finless Porpoise is assumed to inhabit freshwater exclusively, with genetic data showing that Finless Porpoises from the Yangtze River and neighbouring East China Sea represent discrete populations with minimal or no gene flow between them (Chen *et al.* 2010). Finless Porpoises occur both in the main Yangtze River channel and also in connected lake systems, side-channels and tributaries. Preferred habitats include confluences of rivers, tributaries and lakes; areas adjacent to sand bars; and areas close to river banks in the main channel. Preferred porpoise habitat overlaps extensively with gillnetting areas in the river (Yu *et al.* 2005).

Age at sexual maturity is approximately six years (Gao *et al.* 1993), with only one calf born at a time. Gestation is approximately one year, and lactation lasts for over six months (Hao and Wang 2009). Finless Porpoises therefore have a very low natural rate of increase, meaning that population recovery is slow.

IUCN Habitats Classification Scheme

Habitat	**Season**	**Suitability**	**Major Importance?**
5.1. Wetlands (inland) -> Wetlands (inland) - Permanent Rivers/Streams/Creeks (includes waterfalls)	-	Suitable	Yes
5.5. Wetlands (inland) -> Wetlands (inland) - Permanent Freshwater Lakes (over 8ha)	-	Suitable	Yes
5.13. Wetlands (inland) -> Wetlands (inland) - Permanent Inland Deltas	-	Suitable	Yes

Life History

Generation Length	Justification	Data Quality
16.5	Generation length follows Taylor et al. 2007	-

Breeding Strategy

Does the species lay eggs?
No

Does the species give birth to live young
No

Does the species exhibit parthenogenesis
No

Does the species have a free-living larval stage?
No

Does the species require water for breeding?
No

Systems

System: Freshwater

Use and Trade

General Use and Trade Information

Although deliberate exploitation of porpoises occurred for a short period in the late 1950s, there is apparently no longer any direct hunting for them in the Yangtze River. Small numbers of fishermen still report using porpoise oil obtained from accidentally killed animals for medicinal purposes, notably to cure burns.

Offtake trends

Trend in level of total offtake from wild sources: Unknown

Trend in level of total offtake from domesticated sources: Not cultivated

Livelihoods

No Livelihood Information: true

Threats

The range of anthropogenic threats associated with escalating human overpopulation and industrialization in the Yangtze, and the limited data available on porpoise mortality, complicates our understanding of the drivers of population decline. Turvey *et al.* (2007) concluded that entanglement in unregulated and non-selective fishing gear (e.g., illegal 'rolling hook' long-lines, electro-fishing and gillnets) was probably the main factor responsible for the probable extinction of the Baiji or Yangtze River Dolphin (*Lipotes vexillifer*), the other cetacean species formerly present in the Yangtze system.

Incidental catch in fishing gear may also be responsible for the ongoing decline of the Yangtze Finless Porpoise (D. Wang *et al.* 1998, 2000, 2005; K. Wang *et al.* 2006; D. Wang 2009). Illegal fishing (rolling hooks, electro-fishing, gillnets) is widespread in the Yangtze River (Reeves *et al.* 2000b, IWC 2001) and was observed daily during a range-wide survey in 2006 (Turvey *et al.* 2007). Zhou and Wang (1994) reported that "most" of the 80 Finless Porpoise specimens collected by Nanjing Normal University since 1974 had been killed by rolling hooks or gillnets. Other studies indicate that by-catch in gillnets is also adversely affecting marine populations of Finless Porpoises (Jefferson and Curry 1994, Zhou *et al.* 1995, Reeves *et al.* 1997, G. Yang *et al.* 1999). The preferred habitat of the Yangtze Finless Porpoise overlaps extensively with the occurrence of gillnets (Yu *et al.* 2005), which makes the subspecies particularly vulnerable to entanglement. However, a recent large-scale interview survey conducted in fishing communities along the banks of the Yangtze suggests that mortality due to by-catch may have decreased over the past two decades as the porpoise population has declined, and so is unlikely to represent the primary driver of this decline (Turvey *et al.* 2013).

Increases in vessel traffic, pollution, and habitat degradation have also almost certainly contributed to population declines. Vessel traffic causes death from propeller strikes, and boat noise may mask porpoise communication and compromise foraging (D. Wang *et al.* 1998, 2000; K. Wang *et al.* 2006; D. Wang 2009). Interviews in fishing communities conducted by Turvey *et al.* (2013) indicate that porpoise mortality associated with vessel collisions has increased substantially in recent years, in contrast to mortality from by-catch.

Widespread sand mining of the river and lake beds and banks (often illegal) has destroyed important habitat for porpoises and their prey, and adversely affected primary productivity. This problem is especially serious in Dongting and Poyang Lakes (Xiao and Zhang 2000, K. Wang *et al.* 2006, Zhao *et al.* 2008). Four hundred million people live in the Yangtze River basin and the banks are lined with thousands of factories, which together discharge tremendous quantities of domestic sewage and agricultural and industrial effluent. Relatively few data exist to assess the impacts of these pollutants on Yangtze Finless Porpoise health, fertility and population status. In April 2004, five porpoises died in Dongting Lake within a single week, apparently due to short-term exposure to the pesticide hostathion, possibly in combination with long-term exposure to mercury and chromium (Dong *et al.* 2006, Yang *et al.* 2008). Water development projects, especially dams, have major effects on river and lake ecology, and block porpoise movements between the river and adjoining lakes or tributaries in the Yangtze system (Liu *et al.* 2000, Smith and Reeves 2000), as well as affecting migrations of porpoise prey species (Xie and Chen 1996). The Three Gorges Dam in particular has altered, and will continue to alter, downstream hydrological conditions in the Yangtze River and its connected/adjoining lakes (Tong *et al.* 2008).

Although the relative importance of each of the above threats has not been quantified, all are escalating in their severity and are likely to have contributed to the decline of the Yangtze Finless Porpoise.

Threats Classification Scheme

Threat	Timing	Scope	Severity	Impact Score
1.2. Residential & commercial development -> Commercial & industrial areas	Ongoing	Majority (50-90%)	Slow, Significant Declines	Medium Impact: 6
3.2. Energy production & mining -> Mining & quarrying	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5

4.3. Transportation & service corridors -> Shipping lanes	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7
5.4.3. Biological resource use -> Fishing & harvesting aquatic resources -> Unintentional effects: (subsistence/small scale) [harvest]	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7
5.4.4. Biological resource use -> Fishing & harvesting aquatic resources -> Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7
6.1. Human intrusions & disturbance -> Recreational activities	Ongoing	Unknown	Unknown	Unknown
6.2. Human intrusions & disturbance -> War, civil unrest & military exercises	Ongoing	Unknown	Unknown	Unknown
7.2.1. Natural system modifications -> Dams & water management/use -> Abstraction of surface water (domestic use)	Ongoing	Unknown	Unknown	Unknown
7.2.2. Natural system modifications -> Dams & water management/use -> Abstraction of surface water (commercial use)	Ongoing	Unknown	Unknown	Unknown
7.2.3. Natural system modifications -> Dams & water management/use -> Abstraction of surface water (agricultural use)	Ongoing	Unknown	Unknown	Unknown
7.2.9. Natural system modifications -> Dams & water management/use -> Small dams	Past, Likely to Return	Majority (50-90%)	Rapid Declines	Past Impact
7.2.10. Natural system modifications -> Dams & water management/use -> Large dams	Past, Likely to Return	Minority (<50%)	Rapid Declines	Past Impact
8.2. Invasive and other problematic species, genes & diseases -> Problematic native species/diseases	Ongoing	Unknown	Unknown	Unknown
9.1.1. Pollution -> Domestic & urban waste water -> Sewage	Ongoing	Unknown	Unknown	Unknown
9.1.2. Pollution -> Domestic & urban waste water -> Run-off	Ongoing	Unknown	Unknown	Unknown
9.2.3. Pollution -> Industrial & military effluents -> Type Unknown/Unrecorded	Ongoing	Unknown	Unknown	Unknown
9.3.3. Pollution -> Agricultural & forestry effluents -> Herbicides and pesticides	Ongoing	Unknown	Unknown	Unknown
9.3.4. Pollution -> Agricultural & forestry effluents -> Type Unknown/Unrecorded	Ongoing	Unknown	Unknown	Unknown
9.6.3. Pollution -> Excess energy -> Noise pollution	Ongoing	Unknown	Unknown	Unknown
11.1. Climate change & severe weather -> Habitat shifting & alteration	Ongoing	Unknown	Unknown	Unknown
11.2. Climate change & severe weather -> Droughts	Ongoing	Minority (<50%)	Unknown	Unknown

Conservation

Harmful fisheries, including those resulting in porpoise by-catch and overexploitation of fishery resources, must be better regulated throughout the Yangtze system (D. Wang *et al.* 1998, 2005, 2006; K.

Wang *et al.* 2006; D. Wang 2009). As fishing activities in the Yangtze River become more intensive, fish catch yield continues to decrease, from a peak of 427,000,000 kg in 1954 to approximately 100,000,000 kg in recent years (Wei *et al.* 2007); many fish populations in the river are nearing collapse and some are already extinct. Current conservation actions include laws that prohibit electro-fishing, rolling hooks, and certain other harmful gear types across some or all of the Yangtze Finless Porpoise's range. To protect the Yangtze's remaining fish resources, since 2003 the Chinese government has also prohibited all fishing activity in the middle and lower reaches of the Yangtze River and two lakes for three months from April to June. This measure may have improved fish populations (Wei *et al.* 2007), but benefits for porpoise conservation have been limited, and recent interviews with fishers (Turvey *et al.* 2010, 2013) confirm that there is little to no enforcement of restrictions in fishing gear. To protect Yangtze Finless Porpoises and fish stocks, regulation of electro-fishing and other illegal fishing activities must be vigorously enforced, and fishing must be banned in all cetacean reserves. Fishing activities may ultimately have to be banned year-round in the entire river. Government-supported schemes to buy out fishers have been implemented in some regions, but these have not proved very successful, in part because of inadequate planning. Further activities to provide Yangtze fishers with improved education, alternative livelihoods and training must be implemented immediately.

Several protected areas or reserves have been established in both the Yangtze mainstem and in Dongting and Poyang Lakes, encompassing key sites of porpoise abundance. However, protective measures remain difficult or impossible to enforce in most of these reserves, because the areas still support multiple, intensive human activities, most of which are beyond the influence of reserve management. For example, heavy vessel traffic cannot realistically be excluded from protected river or lake sections, but additional navigational rules need to be developed and implemented (e.g. vessel speed should be limited to below 10 km/h in porpoise reserves, and blasting to deepen and widen shipping channels in reserves must be prohibited). Sand mining is likely to degrade habitat quality by reducing good habitat for fish to feed and breed, and the huge economic and commercial benefits specifically associated with this harmful activity have led to its recent substantial increase in Dongting and Poyang Lakes outside the jurisdiction of local reserves (Chen *et al.* 1997; D. Wang *et al.* 1998, 2000; D. Wang 2009). Although elimination of sand-mining is not currently realistic, regional and seasonal closures could reduce impacts on critical fish habitat needs, and better regulations must be developed in key porpoise conservation areas.

The effectiveness of *in situ* conservation activities for the Yangtze Finless Porpoise remains limited because the primary drivers of porpoise decline are still incompletely understood and because the diversity of known threats requires a variety of management strategies, some of which are unfeasible given the high priority placed on economic development in the Yangtze River basin. Further research is required into recent and ongoing porpoise mortality through the development of monitoring networks in local fishing communities; improved protocols for carcass salvage and postmortem investigations; development of a mortality database; and analyses of tissue samples to determine the effect of pollutants on porpoise health and fertility.

Realistically, it is unlikely that management efforts in the Yangtze will significantly reduce the deleterious impacts of anthropogenic activities such as ship traffic, sand mining, and dumping pollutants. The maintenance of well-managed *ex situ* populations may therefore also be an important component for conserving the Yangtze Finless Porpoise. A breeding population of finless porpoises has been established in the Tian'e-Zhou 'semi-natural' oxbow reserve in Shishou (Hubei Province), although further demographic analysis is required to determine whether this population is self-sustaining. There may be additional opportunities for establishing *ex situ* reserves in other oxbows or old river courses, such as the Heiwawu oxbow near Tian'e-Zhou oxbow and the Xijiang River near Anqing. Surveys to identify suitable candidate sites for *ex situ* porpoise conservation, and formal establishment and protection of such sites, should be a conservation priority. There is also the possibility of establishing a population of Yangtze Finless Porpoises in the huge reservoir upstream of the Three Gorges Dam. This should be investigated, as porpoises were historically reported as far upstream as the lower Three Gorges region before construction of the Gezhouba Dam in 1981. Progress has also been made on captive breeding Finless Porpoises at the Institute of Hydrobiology, Wuhan (D. Wang *et al.* 2005), with a male porpoise calf born in 2005 and still surviving. Increased efforts could be made to establish a self-sustaining breeding group and study biological parameters (e.g. acoustics, breeding behaviour, reproductive biology) that could ultimately help conservation efforts in the wild.

A network composed of governmental agencies and research institutions has recently been organized to

exchange information, train conservation staff, organize surveys, and educate the public on Finless Porpoise conservation. The Yangtze Finless Porpoise is currently a State II Protected Animal in China, but this designation should be upgraded to State I Protected status given its increasingly threatened conservation status. This upgrade would help to promote necessary actions at a national level.

It should be emphasized that most of the measures proposed above have already been suggested in countless workshops, published papers and reports to the Chinese government. Despite these repeated urgings, insufficient attention has been paid to these recommended conservation actions, and even less progress has been made in carrying them out. Most of the known threats to Finless Porpoises and the Yangtze ecosystem are still present, and at least some continue to escalate in severity. Unfortunately, development activities associated with China's ongoing economic growth have largely prevailed over conservation, seriously jeopardizing the future survival of the Yangtze Finless Porpoise.

Conservation Actions Needed

Conservation Actions Needed
1.1 Landwater protection -> Site/area protection
2.1. Land/water management -> Site/area management
3.4.1. Species management -> Ex-situ conservation -> Captive breeding/artificial propagation
4.3. Education & awareness -> Awareness & communications
5.1.2. Law & policy -> Legislation -> National level
5.1.3. Law & policy -> Legislation -> Sub-national level
5.2. Law & policy -> Policies and regulations
5.4.2. Law & policy -> Compliance and enforcement -> National level
5.4.3. Law & policy -> Compliance and enforcement -> Sub-national level
6.1. Livelihood, economic & other incentives -> Linked enterprises & livelihood alternatives

Research Needed

Research Actions Needed
1.2. Research -> Population size, distribution & trends
1.5. Research -> Threats
2.1. Conservation Planning -> Species Action/Recovery Plan
2.2. Conservation Planning -> Area-based Management Plan
3.1. Monitoring -> Population trends
3.4. Monitoring -> Habitat trends

Bibliography

Chen, L., Bruford, M.W., Xu, S., Zhou, K. and Yang, G. 2010. Microsatellite variation and significant population genetic structure of endangered finless porpoises (*Neophocaena phocaenoides*) in Chinese coastal waters and the Yangtze River. *Marine Biology*: 1453-1462.

Chen, P., Liu, R., Wang, D. and Zhang, X. 1997. *Biology, Rearing and Conservation of Baiji*. Science Press, Beijing, China.

Dong, W., Xu, Y., Wang, D. and Hao, Y. 2006. Mercury concentrations in Yangtze finless porpoises (*Neophocaena phocaenoides asiaeorientalis*) from eastern Dongting Lake, China. *Fresenius Environmental Bulletin* 15: 441-447.

Gao, A. and Zhou, K. 1995. Geographical variation of external measurements and three subspecies of *Neophocaena phocaenoides* in Chinese waters. *Acta Theriologica Sinica* 15: 81-92.

Hao, Y. and Wang, D. 2009. Reproduction research of Yangtze finless porpoise (*Neophocaena phocaenoides asiaeorientalis*). In: Dahnof, L.T. (ed.), *Animal reproduction: new research developments*, pp. 251-267. NOVA Science Publishers Inc., New York.

IWC. 2001. Annex K. Report of the standing sub-committee on small cetaceans. *Journal of Cetacean Research and Management* 3 (Supplement): 263-291.

Jefferson, T.A. and Curry, B.E. 1994. A global review of porpoise (Cetacea, Phocoenidae) mortality in gillnets. *Biological Conservation* 67: 167-183.

Jefferson, T.A. and Wang, J.Y. 2011. Revision of the taxonomy of finless porpoises (genus *Neophocaena*): the existence of two species. *Journal of Marine Animals and Their Ecology* 4: 3-16.

Liu, R., Wang, D. and Zhou, K. 2000. Effects of water development on river cetaceans in China. In: R. R. Reeves, B. D. Smith and T. Kasuya (eds), *Biology and conservation of freshwater cetaceans in Asia*, pp. 40-42. Occasional Paper of the IUCN Species Survival Commission.

Liu, R., Yang, J., Wang, D., Zhao, Q., Wei, Z. and Wang, X. 1998. Analysis on the capture, behaviour monitoring and death of the baiji (*Lipotes vexillifer*) in the Shishou Semi-natural Reserve at the Yangtze River, China. *IBI Reports* 8: 11-22.

Mei, Z., Huang, S., Hao, Y., Turvey, S., Gong, W. and Wang, D. 2012. Accelerating population decline of Yangtze finless porpoise, *Neophocaena asiaeorientalis asiaeorientalis*. *Biological Conservation* 153: 192-200.

Reeves, R.R., Jefferson, T.A., Kasuya, T., Smith, B.D., Wang, D., Wang, P., Wells, R.S., Wursig, B. and Zhou, K. 2000. Report of the Workshop to Develop a Conservation Action Plan for the Yangtze River Finless Porpoise, Ocean Park, Hong Kong, 16-18 September 1997. In: R. R. Reeves and B. D. Smith and T. Kasuya (eds), *Biology and conservation of freshwater cetaceans in Asia*, pp. 67-80. Occasional Paper of the IUCN Species Survival Commission.

Reeves, R.R., Smith, B.D. and Kasuya, T. 2000. *Biology and conservation of freshwater Cetaceans in Asia*. IUCN, Gland & Cambridge.

Reeves, R.R., Wang, J.Y. and Leatherwood, S. 1997. The finless porpoise, *Neophocaena phocaenoides* (G. Cuvier 1829): a summary of current knowledge and recommendations for conservation action. *Asian Marine Biology* 14: 111-143.

Smith, B. and Reeves, R.R. 2000. Survey methods for population assessment of Asian river dolphins. In: Reeves, R.R., Smith, B.D., Kasuya, T. (ed.), *Biology and conservation of freshwater cetaceans in Asia. IUCN SSC Occasional Paper No. 23*, pp. 97-115. IUCN, Gland, Switzerland and Cambridge, UK.

Taylor, B. L., Chivers, S. J., Larese, J. and Perrin, W. F. 2007. Generation length and percent mature estimates for IUCN assessments of Cetaceans. Southwest Fisheries Science Center.

Tong, H., Zheng, Y. and Xu, Q. 2008. Preliminary analysis of flow and sediment variation of the Yangtze River from Yichang to Wuhan. *Yangtze River* 39: 37-41.

Turvey, S.T., Barrett, L.A., Hao, Y., Zhang, L., Zhang, X., Wang, X., Huang, Y., Zhou, K., Hart, T. and Wang, D. 2010. Rapidly shifting baselines in Yangtze fishing communities and local memory of extinct species. *Conservation Biology* 24: 778-787.

Turvey, S.T., Pitman, R.L., Taylor, B.L., Barlow, J., Akamatsu, T., Barrett, L.A., Zhao, X., Reeves, R.R., Stewart, B.S., Wang, K., Wei, Z., Zhang, K., Richlen, M., Brandon, J.R. and Ding, W. 2007. First human-caused extinction of a cetacean species? *Biology Letters*. In press.

Turvey, S.T., Risley, C.L., Moore, J.E., Barrett, L.A., Hao, Y., Zhao, X., Zhou, K. and Wang, D. 2013. Can local ecological knowledge be used to assess status and extinction drivers in a threatened freshwater cetacean? *Biological Conservation* 157: 352-360.

Wang, D. 2009. Population status, threats and conservation of the Yangtze finless porpoise. *Chinese Science Bulletin* 54: 3473-3484.

Wang, D., Hao, Y., Wang, K., Zhao, Q., Chen, D., Wei, Z. and Zhang, X. 2005. The first Yangtze finless porpoise successfully born in captivity. *Environmental Science and Pollution Research* 12: 247-250.

Wang, D., Liu, R., Zhang, X, Yang, J., Wei, Z., Zhao, Q. and Wang, X. 2000. Status and conservation of the Yangtze Finless Porpoise. In: R. R. Reeves, B. D. Smith, and T. Kasuya (eds), *Biology and Conservation of Freshwater Cetaceans in Asia*, pp. 81?85. IUCN SSC Occasional Paper No. 23, Gland, Switzerland and Cambridge, UK.

Wang, K.X., Wang, D., Zhang, X.F., Pfluger, A. and Barrett, L. 2006. Range-wide Yangtze freshwater dolphin expedition: the last chance to see baiji? *Environmental Science and Pollution Research* 13: 418-424.

Wei, Q., Wang, D. and Wang, L. 2007. Aquatic biodiversity conservation. In: Yang, G., Weng, L. and Li, F. (eds), *Yangtze conservation and development report*, pp. 90-113. Changjiang Press, Wuhan.

Xiao, W. and Zhang, X. 2002. Distribution and population size of Yangtze finless porpoise in Poyang Lake and its branches. *Acta Theriologica Sinica* 22: 7-14.

Xie, P. and Chen, Y. 1996. Biodiversity problems in freshwater ecosystems in China: impact of human activities and loss of biodiversity. In: MacKinnon, J. and Wang, S. (eds), *Conserving China's biodiversity*, pp. 160-168. China Environmental Science Press, Wuhan.

Yang, F., Zhang, Q., Xu, Y., Jiang, G., Wang, Y. and Wang, D. 2008. Preliminary hazard assessment of polychlorinated biphenyls, polybrominated diphenyl ethers and plochlorinated pibenzo-p-dioxins and pibenzofurans to Yangtze finless porpoises in Dongting Lake, China. *Environmental Toxicology and Chemistry* 27: 991-996.

Yang, J., Xiao, W., Kuang, X., Wei, Z. and Liu, R. 2000. Studies on the distribution, population size and the activity of *Lipotes vexillifer* and *Neophocaena phocaenoides* in Dongting Lake and Boyang Lake. *Resources and Environment in the Yangtze Basin* 9(4): 444-450.

Yu, D., Wang, J., Yang, G. and Zhang, X. 2005. Primary analysis on habitat selection of Yangtze finless porpoise in spring in the section between Hukou and Digang. *Acta Theriologica Sinica* 25: 302-306.

Zhang, X., Liu Renjun, Zhao Qingshong, Zhang Guocheng, Sei Zhuo, Wang Xiaoqiang and Yang Jian. 1993. The population of finless porpoise in the middle and lower reaches of Yangtze River. *Acta Theriologica Sinica* 13: 260-270.

Zhao, X., Barlow, J., Taylor, B.L., Pitman, R.L., Wang, K., Wei, W., Stewart, B.S., Turvey, S.T., Akamatsu, T., Reeves, R.R. and Wang, D. 2008. Abundance and conservation status of the Yangtze finless porpoise in the Yangtze River, China. *Biological Conservation* 141: 3006-3018.

Zhou, K. and Wang, X. 1994. Brief review of passive fishing gear and incidental catches of small cetaceans in Chinese waters. *Report of the International Whaling Commission* 15: 347-354.

Zhou, K., Leatherwood, S. and Jefferson, T.A. 1995. Records of small cetaceans in Chinese waters: a review. *Asian Marine Biology* 12: 119-139.