Threats and opportunities for the survival of the Yangtze finless porpoise

Hotbilder och framtidsutsikter för överlevnaden av den fenlösa Yangtze tumlaren

Angelica Åsberg

Etologi och djurskyddsprogrammet

Sveriges lantbruksuniversitet
Institutionen för husdjurens miljö och hälsa
Etologi och djurskyddsprogrammet

Skara 2012

Studentarbete 398

Swedish University of Agricultural Sciences
Department of Animal Environment and Health
Ethology and Animal Welfare programme

Student report 398

ISSN 1652-280X

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Angelica Åsberg

Studentarbete 398, Skara 2012

G2E, 15 hp, Etologi och djurskyddsprogrammet, självständigt arbete i biologi, kurskod EX0520

Handledare: Daniel Isaksson, Inst. för husdjurens miljö och hälsa,
Box 234, Gråbrödrargatan 19, 532 23 Skara.
Biträdande handledare: Anna Forslund, Ulriksdals Slott, 170 81 Solna.
Examinator: Malin Skog, Inst. för husdjurens miljö och hälsa,
Box 234, Gråbrödrargatan 19, 532 23 Skara.

Nyckelord: Yangtze finless porpoise, freshwater cetacean, threats, future prospects, behaviour.

Sveriges lantbruksuniversitet
Fakulteten för veterinärmedicin och husdjursvetenskap
Institutionen för husdjurens miljö och hälsa
Box 234, 532 23 SKARA
E-post: hmh@slu.se, **Hemsida:** www.slu.se/husdjurmiljohalsa

Contents

Abstract

The Yangtze finless porpoise (*Neophocaena phocaenoides asiaorientalis*), is a small freshwater cetacean which has recently fallen dramatically in number. It is an endemic species for the Yangtze River and unless drastic action is taken, it risks the same fate as the now functionally extinct Yangtze river dolphin (*Lipotes vexillifer*). Threats to the porpoise are diverse but they have in common that they are caused by man. Development of the river has been made to supply a growing human population with food, hydropower, and to reduce the risk of flooding. These changes have resulted in a degraded habitat for the porpoise. A major problem is that the species natural behaviour and morphological adaptions to a life in a river exposes it to serious risks. Porpoises navigate by echolocalization and have poorly developed eyes due to the turbid water in the river. Today this navigation is made difficult by the heavy vessels trafficing the Yangtze River. It is common that porpoises collide with vessels which lead to injuries and even death. Another behaviour that causes problems is that the porpoise hunt near the river bottom. This is the area where fishermen lay down most of their fishing gear. This increases the risk that they will get entangled which ultimately leads to their death. Measures have been taken to try to save the species. Conservation work is conducted in captivity, *ex situ* and *in situ*. *Ex situ* work takes place largely in the restored oxbow lake Tian'e-Zhou where porpoises breed naturally in an environment with reduced fishing and vessel traffic. The *in-situ* work is performed in established reserves in the main river. In captivity, the porpoises reproduce successfully and behavioural research can be conducted on them. However, it is important to work towards a restoration of a decent living environment in the Yangtze River since *in-situ* conservation should be the goal of all conservation work. The Yangtze River is such an important resource for the local people, and the species living in and around it that a big effort should be applied to preserve it. It seems that the re-creation of oxbow lakes has favored the species and establishment of more of these semi-natural reserves would therefore be of further benefit. Even so, this alone will not suffice to ensure the porpoise future. In order to give the species a fair chance of survival, efforts from many directions is required. Industry, government, local people and not least consumers across the world must pull together to restore the Yangtze River, thus giving the Yangtze finless porpoise a chance to survive.

1. Introduction

1.1 Background

The Yangtze finless porpoise (*Neophocaena phocaenoides asiaorientalis*) is an small-toothed cetacean (Zhuo *et al.*, 2004), and out of the six species of porpoises (*Phocoenidae*) in the world, this is the only one living in freshwater (Wei *et al.*, 2003). Freshwater cetaceans are among the most threatened mammals in the world and this has also affected the Yangtze finless porpoise (Smith & Reeves, 2000). Freshwater cetaceans have serious trials to face if they are going to survive in the long-term and there is both direct and indirect threats that cause their high mortality (Reeves *et al*, 2000).

Yangtze River is the world's third largest river and it drains an area of 1,800,000 km^2 (Liu *et al.*, 2000). The river is 6,279 km long (Liu *et al.*, 2000) and stretches from Qinghai, on the Tibetan Plateau, to Shanghai, where it empties into the East China Sea (Fu *et al.*, 2003). Along the river banks there are big, industrialized cities and the area is home to more people than in the USA (Dudgeon, 2005). The river plays a major role for the development of Chinas growing economy (Liu *et al.*, 2000). It is used as a source for hydroelectricity

and is widely used for transport, fishing and as a water source for industries and agriculture (Dudgeon, 2005; Liu *et al.,* 2000). The river has a large variety of species including several endemic species of which the Yangtze river dolphin (or – baiji) (*Lipotes vexillifer*) has been endemic for about twenty million years (Turvey *et al.,* 2007; Wu *et al.,* 2004). However, a few years ago a number of reasons collaborated to the tragic situation - that the river dolphin today is declared functionally extinct by the International Union for Conservation of Nature and Natural Resources (IUCN) (Turvey *et al.,* 2007).

One of the main reasons for the extinction of the baiji was by-catch (Kreb *et al.,* 2010). Unregulated and unselective fishing led to entanglement in gear like gillnets, rolling hooks and electrofishing gear (Turvey *et al.,* 2007). Another direct threat was collisions with vessels which could injure and kill them (Kreb *et al.,* 2010). Baijis were also killed due to indirect factors which reduced the quality of their habitat (Schelle, 2010). These factors were noise pollution from vessels which complicate navigation, habitat degredation, pollutants accumulated in rivers and competing with humans for resources like fish (Kreb *et al.,* 2010; Reeves *et al.,* 2000; Zhang *et al.,* 2003). Construction of many small dams in the Yangtze tributaries and its connecting lakes has led to a drastic reduction in the availability for migrating fish to reach habitats where they reproduce (Liu *et al.,* 2000). There is only two lakes left with uninterrupted passage to the Yangtze and these are Poyang and Dongting (Liu *et al.,* 2000). This led to a reduced availability of prey fish for the dolphins (Wang, 2009).

Loss of habitat was another big problem for the baiji and the construction of two big dams, Gezhouba and Three Gorges dam, contributed to this habitat loss (Liu *et al.,* 2000)**.** The latter is the world's largest hydroelectric power plant and has been expected to damage countercurrent habitat largely in the middle and upper reaches of the Yangtze River (Liu *et al.,* 2000). At the end the baijis also faced problems with population fragmentation which decreased their breeding opportunities (Zhang *et al.,* 2003). Zhang *et al.* (2003) made a survey between 1997-1999 where they found out that there was a mimimum of 13 baijis left. Another survey in 2006 searched for baijis from Yichang to Shanghai but they found none (Turvey *et al.,* 2007). This was the first extinction of a cetacean caused by human activity, and before this there was more then 50 years since a megafaunal (>100 kg) vertebrate became extinct (Turvey *et al.,* 2007).

Similar to the baijis, the Yangtze finless porpoise is also an endemic species to the Yangtze River (Zhao *et al.,* 2008). It is a freshwater subspecies to the finless porpoise (*Neophocaena phocaenoides*) which is distributed in coastal waters of China and elsewhere in the seas of southern and eastern Asia (Reeves *et al.,*2000; Yang *et al.,* 2003). All finless porpoises lack dorsal fin and are quite small, up to 1.9 m long (Schelle, 2010). The Yangtze finless porpoise is found only in the middle and lower part of the Yangtze River and its two connecting lakes, Dongting and Poyang (Wei *et al.,* 2003). Since 1996, the species has been classified as endangered (ED) by the IUCN Red List of Threatened Species (IUCN, 1996). IUCN is now investigating whether the species' classification should be changed to Critically Endangered (Wang & Reeves, 2011). The Yangtze finless porpoise is also listed in the Second Order of Protected Animals in China (Xia *et al.,* 2005a).

Wang *et al.* (2000) concluded from surveys made between 1989 to 1999 that the number of porpoises in the river were declining rapidly. The causes for this decline are considered the same as those that affected the baiji (Zhuo *et al*., 2004). Zhang *et al.* (1993) found out from

surveys made between 1978 and 1991 that there were around 2,700 porpoises left in the river in 1993. Another estimate from Zhao *et al.* (2008) indicate that there were only about 1,800 individuals left. This requires immediate and extreme remediations to prevent the extinction of another endemic species to the Yangtze River (Turvey *et al.,* 2007).

The World Wide Fund for Nature (WWF) has worked along the Yangtze River to recreate oxbow lakes which is a critical habitat for the species and a safer habitat to live in than the main river (A. Forslund, WWF Sweden, personal communication, may 4th 2012). Oxbow lakes are created naturally when a loop in the river is getting physically cut off from the main river when it has taken a new path (Cooper *et al*., 2003). The establishment of a breeding group of porpoises in the Tian'e-Zhou Oxbow Baiji National Reserve is the first attempt made to preserve an endangered cetacean *ex situ* (Xia *et al.,* 2005a). Before conservation biologists knew it was too late the oxbow was meant to keep a breeding group of baijis (Zhang *et al*., 2003). Since this was impossible, some porpoises were relocated to the oxbow instead and today they reproduce naturally (Wang *et al.,* 2000; Xia *et al.,* 2005a). The Yangtze finless porpoise critical situation is an important issue to highlight before it is too late and another key species disappears from the river like the baiji has already done.

1.2 Aim

The aim of the study was to investigate the reasons behind the fact that the Yangtze finless porpoise is now endangered and to evaluate the future prospects for the species. To achieve the purpose of the study, the following questions will be addressed;

- What are the threats facing the survival of the species?
- Has the species ethology and morphology contributed to its threatened status?
- What conservation attempts has been made?
- Has the reconstruction of oxbow lakes contributed to its survival?
- What does the species future prospects look like?

2. Material and method

Web of knowledge and Google Scholar were used for article research. The words used to collect data for the study were Yangtze finless porpoise, finless porpoise, *Neophocaena phocaenoides asiaorientalis*, freshwater cetacean, endangered cetacean, baiji, river dolphin, Three Gorges dam and biodiversity. There were 57 articles found, and out of these 41 were used. Some articles were not used because it was review articles which only summarized information. Insteed of these review articles, the original papers were used. Some additional items were deleted as they were not relevant to the thesis. The non-scientific sources used were personal communication with Anna Forslund, freshwater expert at WWF (World Wide Found for nature) Sweden, Tom Arnbom, WWF Sweden, Mei Zhigang, Ph.D.candidate and Xinqiao Zhang, WWF China. These people are actively working with the preservation on the Yangtze finless porpoise. Written material from the International Union for Conservation of Nature (IUCN), WWF, and the Food and Agriculture Organization (FAO) were also used.

3. Results

3.1 Threats

3.1.1 Fishing

The fishing industry in the Yangtze River affects the porpoises in two ways. The first is overfishing which leads to a lack of food for the Yangtze finless porpoise which feed mainly on fish and shrimps (Schelle, 2010; Wang, 2009). In 1954 the annual fish catch were 427,000 tonnes in the Yangtze River, today this number has decline to less than 100,000 tonnes (Wei *et al*., 2007). The second reason is that the methods used are often both illegal and harmful to the porpoises (Schelle, 2010). During a study searching for baijis, Turvey *et al.* (2007) saw people using illegal fishing methods every day. Gill nets are common in the Yangtze River and those nets can make the porpoises end up as by catch because they get entangled in them and drown (Schelle, 2010).

Another popular fishing method, even though it is forbidden, is rolling hooks which are a long line with a number of hooks (Schelle, 2010). This method is blamed for having contributed to the extinction of the baiji (Turvey *et al.*, 2007). Electrofishing is another illegal method used which is harmful because it is non-selective and has been widely used in the middle reaches of the river where there is a high density of porpoises (Smith & Reeves, 2000).

3.1.2 Industry

Industries along the Yangtze River is a problem when they discharges chemicals and hazardous wastes into the river (Schelle, 2010). In the Poyang Lake where around 400 porpoises live (Z. Xinqiao, WWF China, personal communication, april 23rd 2012), lies the biggest sand mining operation in the world (Leeuw *et al*., 2009). Dredging in Poyang Lake started in 2001 because sand mining got banned in the Yangtze River at this time (Leeuw *et al*., 2009). Sand dredging is needed for house building and it is an important economical source for the local people (Wang *et al*., 2010). Today the lakes biodiversity hotspots are protected from the industry but in the future those areas could be affected too and this would affect the porpoises and their prey fish (Leeuw *et al*., 2009).

3.1.3 Agriculture

Chinas developing agriculture is supplied with water from the Yangtze River for growing crops like rice (Schelle, 2010). With agriculture comes development of infrastructure. Dams and barrages prevent porpoises from swimming freely between feeding grounds and isolated groups of porpoises can reach a genetic bottleneck (Schelle, 2010). Agriculture can also lead to decreased water quality due to erosion when areas are deforested in order to be converted to farmland and/or the timber getting harvested for fuel (Schelle, 2010). The agriculture sector use large amounts of pesticides and fertilizers which lead to water pollution in the river (Schelle, 2010).

3.1.4 Pollution

Agriculture and industries also contributes to a declining volume in the river and this leads to an accumulation of toxins (Ongley, 1996). The agricultural sector contributes with many toxic chemicals and those are bioaccumulated in the porpoises since they are top predators (Schelle, 2010). Porpoises bioaccumulate trace metal and chemical pollutions during their whole life span, except during lactation and pregnancy when the calf get much of the mothers pollutant load (Smith & Reeves, 2000). For example, Dong *et al*. (2006) showed that a two-month calf had higher levels of mercury (T-Hg) in its tissues than the adult

individuals had. In the same study they also concluded that 5 porpoises had died in Dong Ting lake due to exposure to the pesticide hostathion, chromium and mercury. Recently, a total of 32 dead porpoises were found in the Dongting and Poyang lakes (Z. Xinqiao, WWF China, personal communication, April 23rd 2012) and pollution is believed to be the major reason for their deaths.

3.1.5 Inland water transport (IWT)

The Yangtze River is a heavily trafficked water way and inland water transport (IWT) that is very important for the economy of China (Liu *et al*., 2000; Schelle, 2010). Today nearly 1.2 billion tons of cargo is transported on the river each year, compared to only 400 million tons in the year 2000 (Yang *et al*., 2009). Turvey *et al*. (2007) noted that there were more than one vessel per 100m in the river. Vessels could be small boats, container ships, oil tankers and motorized ferries (Smith & Reeves, 2000). All these vessels create a lot of noise which cause acoustic pollution in the river that affect the porpoises (Schelle, 2010). Collisions with vessels are also a big threat to the porpoises (Akamatsu *et al*., 2002). With shipping comes development of the water ways for giving access to bigger vessels (Schelle, 2010). Channels are widened by dynamite explosions (Wang, 2009), and the number of vessels is 5 times higher today than it was in the 1980's (Wang *et al*., 2006). This increases the amount of pollution due to waste and the potential risk of oil spills (Schelle, 2010).

3.1.6 Flood protection

Vital resources for fish in the river, like nutrients and sediments is transported downstream, up on floodplains and to the coast by floods (Schelle, 2010). This help coastal and arable floodplains being fertile but a problem is that people living on the floodplains needs flood protection (Schelle, 2010). Controlling the river by reservoirs, embankments, dams and canalization help humans but decreases the water quality of the river and changes the habitat for porpoises and their prey (Schelle, 2010; Smith & Reeves, 2000). In the central Yangtze, a large amount of floodplain lakes no longer have a connection to the river due to flood protection constructions (Schelle, 2010).

3.1.7 Energy demand and habitat degradation

Projects for water development have affected the Yangtze finless porpoise negatively (Liu *et al*., 2000). China has a large demand for energy and the construction of the largest hydropower station in the world, the Three Gorges Dam (TGD), has affected the natural downstream flow in the Yangtze River a lot (Xie *et al*., 2007). This leads to changes in the ecological processes in the area and affect the biodiversity (Wu *et al*., 2004). An estimation by Fu *et al*. (2003) shows that around 40 fish species, of which 19 are endemic, will be affected by the dam construction in the Yangtze River in a negative way. This because dam construction and installation leads to habitat fragmentation, habitat loss, habitat isolation and downstream flow reduction (Wu *et al*., 2004). The total water volume in the river does not change due to hydropower dams, but the dams change the timing and volume of river flows (Schelle, 2010). Normally the river flow is seasonal, now it is regulated by human demand for energy (Xie *et al*., 2007).

The flow changes the temperature in the water and those two factors, flow and temperature, affect the spawning of a series of fish species (Schelle, 2010; Xie *et al*., 2007). The absence of flooding due to dams has affected the porpoises prey fish and the lack of natural flow leads to a loss of their preferred habitat (Schelle, 2010). Due to degraded habitat quality in the river, the porpoise population has declined fast during the last 10 years (Wei *et al*., 2003). Dam construction cause a destruction of habitat when being built, and afterwards by trapping sediment which otherwise would have formed sandbars and islands downstream

(Smith & Reeves, 2000). This is highly negative for the porpoises since their preffered habitats is rich of bends and sandbars (Reeves *et al*, 2000). Tributaries that connecting lakes to the river has been blocked by sluice gates in all lakes alongside the river except Dongting and Poyang (Fu *et al*., 2003). This make it impossible for migratory fish to reach their areas for spawning and feeding (Fu *et al*., 2003). Biodiversity and fish stocks has decreased according to the loss of habitat (Wang, 2009).

3.1.9 Climate change

Climate change is an uprising threat to the Yangtze finless porpoise (Schelle, 2010). Extreme weather events increase the pressure on the species with the changes in habitat and reduced prey fish base (Yang *et al*., 2009). Some porpoises died in 2008 when almost the whole Tian'e-Zhou oxbow were coverd by ice due to a snowstorm (Wang, 2009). There has also been extreme drought and the abnormal warming in the area makes the source of the Yangtze River, the glaciers at the Tibetan Plateau, melt down (Yang *et al*., 2009). According to Yang *et al*. (2009), this glacier melting will lead to a reduced water supply for the river in the future. With global warming comes an increased demand for water to agriculture and together with a reduced water supply this will change the river flow (Schelle, 2010). Extreme weather can also lead to more flood prevention by hard infrastructure (Schelle, 2010). Due to global warming, the need for low-carbon emission will probably increase the demand for hydropower which, as explained above, will fragment the Yangtze River even more (Schelle, 2010). Inland water transport might also increase to get a more fuel effective bulk transport (Schelle, 2010).

3.2. Behaviour and morphology

The porpoise is well adapted to its river habitat. Some aspects of its behaviour and morphology may have contributed to its endangered status.

3.2.1 Navigation and vision

For navigation and foraging porpoises use their biosonar ability which is a highly developed echolocalization made through high-frequency clicks (Akamatsu *et al*., 2010). The visibility in Yangtze River, and its appending lakes, is very poor so for hunting, navigation and travelling the acoustic sensory system is necessary for porpoises (Akamatsu *et al.*, 2009). When swimming and navigating in group, all porpoises uses sound (Wang *et al*., 2005b). By inspecting the area with acoustics before travelling there, porpoises have a better chance to avoid risks and to find prey (Akamatsu *et al.*, 2009). Li *et al*. (2005) investigated echolocalization clicks from porpoises in the Tian'e-Zhou oxbow and concluded that they were similar to other porpoise species (Li *et al*., 2005).

Akamatsu *et al*. (2007) found that Yangtze finless porpoises in Tian'e-Zhou Oxbow swam at a speed at 1.8 ms^{-1} and, on average, made sonar click trains every 6.4 s. In the oxbow the visibility is less than 1 m so the porpoises usually swim more than 10 m without exact knowledge about their surrondings (Akamatsu *et al*., 2007). Akamatsu *et al*. (1998) compared click intervals between wild and captured Yangtze finless porpoises. They found out that in 90% of 2,506 intervals, the wild porpoises made click intervals around 276 ms. The captive propoises were held in a tank ($8x5x2m^3$) and in 90 % of 36,647 intervals they made click intervals less than 18 ms.

In a study about finless porpoises biosonar behavior Akamatsu *et al.* (2010) found that porpoises often made rolling dives where they turn around their body axis. It is hypothesized that they do this to enlarge the search area for prey. Their biosonar has a very

narrow beam axis but during the rolling dives they change the direction of it thereby getting a wider view of the surroundings (Akamatsu *et al*., 2010). Another way for changing the beam axis is by head movements which porpoises used during both upright and rolling dives in the study of Akamatsu *et al.* (2010). When a porpoise detects a target it produces short-range sonar sounds (Akamatsu *et al*., 2010). Those short-range sounds are better for accurate navigation and help the porpoises hunt (T. Arnbom, WWF Sweden, personal communication, May 4th 2012). Porpoises use long interpulse intervals on the sonar when they navigate and sonar with short interpulse intervals when hunting prey (Wang *et al*., 2005b). Akamatsu *et al*. (2002) investigated dive depths of some Yangtze finless porpoises in the Tian'e-Zhou oxbow. They saw that the porpoises often turned around when they were at the maximum depth of their dive. This behavior was probably due do prey-pursuit.

The eyes of the Yangtze finless porpoise have adopted to the dim light in the river by having a decreased resolving power (Gao & Zhou, 1987). It has been shown by Gao & Zhou (1986) that the Yangtze finless porpoise has atrophy in their entire optic system compared to the marine sub species. In the study they explained it as an adaption to the dim light and turbid water of the Yangtze River.

3.2.2.Habitat preferences and feeding grounds

To investigate habitat use and preference a study was made in a 20km long section called the Balijiang section of the Yangtze River (Wei *et al*., 2003). The study showed that porpoises preferred to be 100-300m from the river banks and in most cases in water that was no deeper than 9m. Water clarity and water velocity did not seem to be important for the choice of habitat by the porpoises. Finless porpoises eat large quantities of small fish which dwell in shallow water and that could explain why the porpoises preferred more shallow water (Wei *et al*., 2003). The porpoises in the study also preferred to stay near confluences which are formed when several currents meet.

Kimura *et al*. (2012) made a study from May 2007 to August 2010 which showed that there is a high density of porpoises in the Balijiang section of the river, near the Poyang Lake. This is the same area where Wei *et al*. (2003) found a high density of the species between years 1996 to 2000. This indicates to Kimura *et al.* (2012) that the area still may contain the Yangtze Rivers largest concentration of porpoises. Their study also showed that there were a significantly higher percentage of porpoises in areas where there were fish all year round.

3.2.3. Development and behaviour

By observing porpoises in the Tian'e-Zhou oxbow, Wei *et al*. (2002a) could see that the porpoises moved around in small groups of 2-3 animals. The largest individual was always in the lead and the animals seemed to prefer shallow areas with muddy bottom. Relocated individuals first followed the existing groups in the oxbow but soon formed their own groups. The study by Wei *et al*. (2002a) also showed that the porpoises mated from May through June and that pregnancy lasted for 310-320 days. Calves started to eat fish after 5 months and continuously increased their swimming distance from their assumed mothers. The porpoises showed an average breath interval of approximately 30 s (Wei *et al*., 2002a).

A study by Xian *et al.* (2011) found that calves can suckle their mothers for as long as 16 months postpartum, therefore they should not be separated before that time. If calves are orphaned in the first 90 days they will die because they are not capable of survive by their own (Xian *et al*., 2012). Xian *et al*. (2010) studied the behaviour of calves in a semi-natural

reserve and in captivity. Behaviours essential for surviving, for example respire, dive and move, were shown during the calves first day post-partum. Most behaviours were the same in the semi-natural reserve and in captivity except for some aerial behaviours which the calf held in captivity did not express. Those aerial behaviours were probably suppressed in captivity due to the limitations in space.

3.3 What conservation attempts has been made?

A number of surveys has been done to investigate the population size of the Yangtze finless porpoise and to locate its preferred habitat (Wang, 2009; Wei *et al*., 2003). Since the 1980s conservation work has been performed in three different ways for saving the porpoise; conservation *in situ* (in the river), *ex situ* (in semi-natural reserves/oxbow lakes) and by captive breeding with behaviour research (Wang *et al*., 2005a).

3.3.1 Population surveys

It is estimated that there are 1,200 porpoises left in the Yangtze River - but the number is far from certain (Z. Xinqiao, WWF China, personal communication, April 23rd 2012). It is hard to sight the porpoises since they lack dorsal fin and their dark colour is a good camouflage in the Yangtze River (Wang, 2009). For breathing, they only break the water surface with a small part of their body which make it even harder to spot them (Wang, 2009). High-frequency clicks made by porpoises can, according to Li *et al*. (2010), be used for observing the animals by a passive acoustic method. This method can detect presence of animals, and also count and localize those, which can be very useful during population estimates (Li *et al*., 2010).

Wen & Xianfeng (2002) concluded from four surveys between November 1997 and November 1998 that there was a seasonal change in the density of porpoises in Poyang Lake and its main branches. They found out that the porpoises preferred the open lake and its main branches, like Xinjiang and Ganjiang, and that they were in particular distributed in the lower reaches of the branches. The density of porpoises in the area was highest in spring, and lowest in winter. With a mean size of the population was roughly estimated to be between 100-400 individuals.

Wei *et al.* (2002b) surveyed the Balijang section of the Yangtze River from 1989 to 1999 and found that the porpoise population was declining with 7.3% annually in this area. The porpoises stopped their migration during the dry season from the Yangtze mainstream in to Poyang Lake in 1996 and they also shortened their migration range with an average 40 of kilometers. The population of porpoises has become more fragmented, and between Yueyang and Shisou, Zhao *et al*. (2008), found no porpoises. This is a gap, around 150 km long, in an area where the porpoise used to be common (Zhao *et al*., 2008). There is a risk for local extinction in this area, which is also the same area where the Baiji first become locally extinct (Zhao *et al*., 2008).

3.3.2 In situ conservation

In situ conservation is often preferable to *ex situ* because of the benefits to the whole ecosystem, not only a single species (Schelle, 2010). The main reason for keeping a species in captivity is to have the possibility to release them (Hao *et al*., 2006; Schelle, 2010). In the main river and the appended lakes, 7 natural reserves has been established (Wang, 2009). Despite this, habitat is degraded in the reserves since vessel traffic, fishing, industry and agriculture can not be prohibited in the river (Wang *et al*., 2011). A healthy porpoise population would represent a sound Yangtze River since the porpoise needs a natural river flow, large supply of fish and good water quality to thrive (Schelle, 2010).

However, most of the leading scientists in WWF-China think that *ex situ* conservation will be the only effective way to save the Yangtze finless porpoise from extinction as the environment in the Yangtze River is too degraded to support their survival (Hao *et al*., 2006; Z. Xinqiao, WWX China, personal communication, April 23rd 2012). *In-situ* conservation must still be managed anyway since there are around 600 porpoises living in Yangtze's middle and lower reaches (Z. Xinqiao, WWF China, personal communication, April 23rd 2012). Around 30-40 porpoises live in the Tian'e-Zhou oxbow, 150 inhabit the Dongting lake and another 400 is found in the Poyang Lake so around half of the population are still living in the main river (Schelle, 2010; Z. Xinqiao, WWF China, personal communication, April 23rd 2012).

3.3.3 Ex situ conservation

Today, two semi-natural reserves have been established for keeping porpoises (Wang *et al*., 2010) In 1992 the first semi-natural national reserve was established for breeding of baijis in the Tian'e-Zhou oxbow (Dudgeon, 2005). The oxbow is 21 km long, 1-2 km wide and was separated naturally from the main river in 1972 (Zhang *et al*., 2003). The oxbow has water gates at both ends and is connected to the main river for about 5 months every year during high water (Zhang *et al*., 2003). WWF started to support the reserve in 2002 and the oxbow is the only successful *ex-situ* conservation program in the world for a small cetacean (Z. Xinqiao, WWF China, personal communication, April 23rd 2012). The first 5 porpoises were relocated from the main river to the oxbow in 1990 (Wang, 2009). Today there is about 30-40 porpoises living in the oxbow, due to new introductions and natural reproduction (Z. Xinqiao, WWF China, personal communication, April 23rd 2012). One to three calves are born in the oxbow each year and since the first introduction in 1990 over 30 calves has been born (Wang, 2009).

The reserve is funded by the Shishou County authorities, the Ministry of Agriculture and from the provincial fisheries authority, but 30% of the budget must come from fishing in the oxbow (Dudgeon, 2005). Fishing with gear harmful to porpoises is not allowed but it is not known if there is enough fish to support both fishermen and porpoises (Dudgeon, 2005). The porpoises hunt by them selves in the oxbow and are not feed by humans (Wang, 2009). Around 200 fishermen have been relocated from the oxbow and another 300 were given land for farming (Wang *et al*., 2010). This was achieved after the WWF together with the Institute of Hydrobiology (IHB) had convinced the local government that it was a good idea (Kreb *et al*., 2010). Some fishermen have been trained by the reserve staff so they can start work in the reserve instead (Kreb *et al*., 2010).

The semi-natural water of Tongling Freshwater Porpoise National Nature Reserve is an old side channel to the Yangtze River and was cut off from the main river as early as 1993 by the Tibean Islet and Heuye Islet (Xian *et al*., 2010). The reserve is 1,600 m long and between 80- 220m wide and it give the porpoises the opportunity to forage naturally (Xian *et al*., 2010). Despise this, every individual is fed with 4 kg fish each day since there is not enough fish in the channel to accomodate the porpoises. (Xian *et al*., 2010).

3.3.4 Captive breeding and research

A population of Yangtze finless porpoises are held at the Institute of Hydrobiology of the Chinese Academy of Sciences (IHB of CAS), Wuhan, Hubei, China (Xiao *et al*., 2005). After 9 years in captivity, the first Yangtze finless porpoise calf was born in 2005 (Wang *et al*., 2005a). This was a huge success since this calf was the first freshwater cetacean ever to be born in captivity (Wang *et al*., 2005a). According to Wang *et al*. (2005a) this is positive

for the conservation work on the species since the successful project leads to greater resources. It also gives the opportunity to breed more individuals which can be relocated to semi-natural environments each year (Wang *et al*., 2005a). Captive breeding is also good for collecting information about the species breeding behaviour (Wang, 2009).

3.4 Future prospects

The Asian River Dolphin Committee wants the Yangtze finless porpoise to be upgraded to a Class One species under the Chinese National Wildlife Legislation (Smith & Reeves, 2000). Class Two species is managed by each province in China while Class One species are managed by the Department of Agriculture (Z. Xinqiao, WWF China, personal communication, April 23rd 2012). An upgrade would protect the species fully from deliberate capture (Smith & Reeves, 2000). It would also give a harder punishment for killing porpoises and more funding can be allocated for protection of the species (Z. Xinqiao, WWF China, personal communication, April 23rd 2012). WWF-China has a 5 years plan for the porpoise in which they want to establish another 1-2 *ex situ* reserves which would be possible if the species is upgraded and more resources will be available to the project (Z. Xinqiao, WWF China, personal communication, April 23rd 2012). Recently, researchers, institutions, reserves and the government has founded a network for the protection the species (Wang, 2009).

Yang *et al*. (2003) showed that the genetic diversity in the Yangtze finless porpoise is low. Geological events in the past may have contributed to a bottleneck in the population of finless porpoises, or a fragmentation of the population which can explain the low genetic diversity (Yang *et al.*, 2003). Xia *et al*. (2005a) investigated the genetic diversity for the porpoises living in Tian'e-Zhou oxbow and found that it also was low. Compared with the wild population of Yangtze finless porpoise, only around 40% of the genetic variation was represented in the Tian'e-Zhou population, probably due to a founder effect. The porpoises in Tian'e-Zhou do now have genetic profiles that can be used for identification of individuals (Xia *et al*., 2005b).

4. Discussion

The Yangtze finless porpoise is highly threatened because of deterioration in its habitat due to human activity (Wang, 2009). The thesis has addressed the various threats to the species with focus on relating these to the species behaviour. Recreation of oxbow-lakes are thought to benefit the species and the success of this work will be examined along with the other conservation attempts made for the survival of this species. Finally, an estimated overview of the species future prospects will be given.

4.1. What are the threats facing the survival of the species?

All threats to the Yangtze finless porpoise contributes to its critical situation and are therefore discussed together. Overfishing and illegal fishing methods are a big threats since they reduce the amount of prey fish and is directly harmful to the propoises. The fishermen must start using less damaging methods. As a replacement for rolling hooks, circle hooks should be used instead (Schelle, 2010). Gill nets should be equipped with pingers (acoustic devices that help cetaceans to avoid nets by sending out signals perceptible for the porpoises)(Schelle, 2010).

The harbor porpoise has a high metabolic rate and its body condition will be affected within three days without food (Lockyer, 2007). This could also be the case of the Yangtze finless porpoise since the overfishing and degraded habitat leads to food shortage (Wang,

2009). To increase the number of prey fish in the river several measures could be done. Fish hatcheries and catch/release programs could be established for supporting the fish population (Schelle, 2010). The fish would also benefit from reconnections between the main river and its lake clusters (Wang, 2009).

Since the year 2002 there is a three months fishing ban in the lower and middle reaches of the Yangtze River to benefit the porpoises and other species (Kreb *et al*., 2010; Wang, 2009). In 2009, the Ministry of Agriculture extended the fishing ban to 4 months but fishermen seem to compensate the loss of fishing time by fishing more during the rest of the year (Kreb *et al*., 2010). WWF suggests that there should be a fishing ban for at least 10 years in reserves important for the porpoise (Schelle, 2010). This sounds like a good solution because the fish stocks will not recover as long as extensive fishing is done for 8 months each year. The lack of enforcement is another problem since illegal fishing methods are still being used even in the reserves (Kreb *et al*., 2010). For improvements to happen, probably a tougher legislation would help.

Agriculture can be operated in a manner that lessens the impact on the environment. WWF works with Better Management Practices (BMP), which is a system that help farmers to increase or maintain their economic return with less environmental damage (Schelle, 2010). The System of Rice Intensification is a good example. With this system, crop yields have increased by 30 percent and water consumption has decreased by 40 percent compared to conventional production (Gujja *et al.*, 2007). Certification and industry standard is another way to achieve a more sustainable agriculture where farmers with an environmentally friendly production can be rewarded (Schelle, 2010). Also, it is important to influence consumers around the world to buy products that are grown in an environmentally sustainable manner. What people are buying on one side of the globe affect freshwater ecosystems in the production countries on the other side (Schelle, 2010).

Collisions with vessels is a big threat to the survival of the porpoises (Wang, 2009). This threat increases with the number of vessels as will the acoustic pollution. To carry goods a long distance, shipping is a cost-effective way and it is not likely that the boat traffic on the Yangtze River will decrease (Schelle, 2010). This also creates a situation where two environmental problems are pitted against each other. Boat traffic will likely increase in order to reduce carbon emissions (Schelle, 2010), but this affects the environment in the river negative. A solution to this problem could be a vessel speed adjustment in areas where many porpoises residing (Akamatsu *et al*., 2002). An appropriate speed limit should be 10 km per hour due to the porpoises echolocalization behaviour (Wang, 2009). Speed limits would give the porpoise more time to detect approaching boats, and thereby reduce the risk of collisions.

Another solution would be to develop methods that make it easier for the porpoises to avoid vessels. It might be possible to equip the boats with some kind of sonar signal that porpoises can detect and avoid. The downside to this is a possible contribution to the acoustic pollution and thus adversely affect the porpoises. If it was possible to use a signal on a frequency that the porpoises can distinguish from the sound of engines, it might be feasonable. However, it is important to keep in mind that the signal should not affect prey fish and other species adversely.

Flood protection, which hinders the rivers natural flow, has increased in recent years (Schelle, 2010). The most important thing to consider with regard to flood protection is to

maintain the natural flow of floods. It is the key to biodiversity and the creation of different habitats in the river (Schelle, 2010). The river must be managed in a sustainable way where floodplains and wetlands are allowed to store water instead of solving this problem with engineered infrastructure (Schelle, 2010). There should be no further blasting and widening of channels since this work could damage the porpoises and destroy their habitat even more (Wang, 2009). According to Schelle (2010), the risk of flooding is bigger when the land is overgrazed, has been deforestated or when wetlands have been drained. It is important to educate people of the benefits with floods since they are necessary for maintaining a productive environment on land and in the river. Without education it is obvious that the local people want to protect themselves from floods. It probably takes a lot of time and money to rehabilitate areas devastated by floods. A solution beyond education could be financial support from the government when flooding occurs in areas where the river is allowed to flow naturally.

For maintaining biodiversity, new hydropower plants must be designed and sited in a way that affect the ecosystem as little as possible (Schelle, 2010). There are guidelines for how hydropower should be used and established, but these are set up solely by the industry (Schelle, 2010). Although recommendations are good, self-regulation by the industry should be coupled with opinions of environmental organisations. Polycies and regulations should be put up by the government and laws about how to comply to these could benefit the Yangtze River's ecosystem. Without legislation, the industry can continue to build dams that negatively affect the habitats in the river and thus porpoise survival. Fish would benefit from passages trough the dams like fishelevators or ladders (Schelle, 2010). If regard were taken to benefit the fish stocks a much as possible, this would also be beneficial to the porpoise as the supply of prey fish would be safer.

Pollution from industries must be controlled and regulated (Schelle, 2010). Although it is difficult to demonstrate emissions and pollution from industries, a control system would propably making it easier to deal with any emerging problems. The dredging in Poyang lake is a big problem since the people who lives there are poor and depend on the income from the industry (Wang *et al*., 2010). It would not be possible to ban the industry only to save the porpoises if the people will suffer (Wang *et al*., 2010). Forcing dredging restrictions will probably only lead to reluctance by the local people as they have to make a living. Conservation of the porpoise must be important for them, otherwise they will probably only see it as their living standards decline. The relocation of fishermen in Tian'e-Zhou and the ability for them to become farmers or work in the reserve instead is a good example of how local people become part of the conservation project. For successful harvests water quality must be good which also benefit the porpoises (Wang *et al*., 2010). It is not until people see their own benefit as it becomes easier to make progress.

In summary, the threats to the species are diverse with habitat destruction as a common denominator. It will not be enough to address one problem, there must be improvements on several fronts to improve the habitat in the river.

4.2. Has the species ethology and morphology contributed to its threatened status?

The finless porpoise navigates by echolocalization and today this is hard to manage due to the high acoustic pollution in the Yangtze River (Schelle, 2010). It is also hard for the animals to communicate and it prevents them from efficient hunting (Wang *et al*., 2006). The results from Akamatsu *et al*. (2007), which showed that porpoises swim around 10 m

without using their sonar, indicates that it is not surprising that collisions occurs between porpoises and vessels or fishing gear. Since the shipping traffic in the river is so heavy and the fishing so widespread, the frequency in which they use sonar is a big problem. According to Wang & Reeves (2011), the high mortality due to by-catch and vessel collisions must decrease if the species is going to survive. The prey-pursuit behavior where the porpoises turn around at the deepest point of their dives increases the risk that they will become entangled in fishing gear on the riverbed, like rolling hooks and gill nets (Akamatsu *et al*., 2002). This is probably a big problem in the conservation work on the species because scientists can not change the porpoises behavior during hunt. Pingers could be a solution to this problem scince they can make the porpoises aware of the existence of obstacles on the riverbed.

Without using the sonar constantly, which is a natural behaviour, porpoises also faces the risk of getting trapped in shallow waters, getting entangled in underwater debris, or having problems to respirate due to floating debris (Akamatsu *et al.,* 2009). The click intervals made by free ranging Yangtze finless porpoises is more than 15 times higher than the intervals made by captive individuals (Akamatsu *et al.,* 1998). This is an remarkable difference, probably due to limited space in the captive individuals tank. A reduction in click intervals is a possibly adaption to captivity since the animals wont need great click intervals. If those animals get relocated into, for example, an semi-natural reserve like the Tian'e-Zhou the adaption to low click intervals may be an risk for their survival. They must change their behaviour to greater click intervals for reduce the risk of getting entageled. Since their vision is adapted to dim light they must have an highly developed biosonar ability (Akamatsu *et al*., 2010; Gao & Zhou, 1987). If captive porpoises is going to be released into the Yangtze River in the future it may be important to first release them into a semi-natural reserve. This because they face less risks in the semi-natural reserve and may have the opportunity to getting used to an increased click interval.

According to Xian *et al*. (2012) it would improve the conservation work if the calf and mother were separated as little as possible the first 90 days after birth. In addition, fishing gear and other risk factors should not be allowed to exist near the calf for the first 60 days because its curiosity can make it manipulate novel objects which can be dangerous (Xian *et al*., 2012). It is a big problem that the calves are dependent on the mother for 3 months since they often reside in areas where much fishing takes place (Wei *et al*., 2002b). Here the mother risks to get entangled in nets or get injured by vessels which would lead to death of the calf.

The behaviour and morphology of the species has contributed to their decrease in number. Porpoises are unable to navigate properly in the Yangtze River because of the acoustic pollution and their eyes can not replace echolocalization since they are regressed (Gao & Zhou, 1987; Wang, 2009). Their hunting behaviour with rolling dives and preference for hunting near the bottom (Akamatsu *et al*., 2010), contributes to an increased risk for injuries and entanglement.

4.3. What conservation attempts has been made and has the recreation of oxbow lakes contributed to the survival of the species?

A working in situ conservation program with natural reserves would be the preferable way to save the Yangtze finless porpoise. The solution for giving the porpoises a good environment is also the way to give the humans around the Yangtze River a good environment (Schelle, 2010). Sadly enough this will not work out in the nearest future

since the established reserves do not help the porpoises much because of the highly decreased habitat quality in the main river (Wang, 2009). But meanwhile the porpoises is breed ex situ, actions must be done to conserve and restore the habitat in the Yangtze River (Schelle, 2010).

Breeding in captivity is successful and it is good for behaviour research. However, *ex situ* conservation in semi-natural reserves would be better since it gives the porpoises the aviability to live and behave normally. In the wild, the Yangtze finless porpoise prefer to move around in core groups of 2-3 individuals (Wei *et al*., 2002a). Wang & Wang (2011) saw that newly captured individuals from different parts of the Yangtze River were swimming by them selves most of the time the first months in captivity. They belived that the porpoises did not belong to the same core group and that a bigger pool could be more suitable when animlas are first introduced to the captive environment. It can be hard to construct such big pools and even if the pool is bigger it can be hard for the porpoises to maintain all their natural behaviours in an limited area. Since captured calves do not express all their natural behaviours (Xian *et al*., 2010b), and adult individuals use a much lower click intervals than wild porpoises (Akamatsu *et al*., 1998), the life in captivity do have impacts on behaviour. Therefore, it would be better to keep the animals in an semi-natural reserve, like the oxbow lakes, where they can express all of their behaviours fully.

The fact that more than 30 calves have been born in the Tian'e-Zhou oxbow lake (Wang, 2009) shows that this *ex situ* project is very successful and worth developing further. Reconstruction of this oxbow lake has been highly beneficial for the porpoise and their ability to obtain all their food by them selves shows that they could be relocated into the main river when the conditions there improve.

4.4. What does the species future prospects look like?

There are many threats facing the Yangtze finless porpoise, it would be easier with one major threat because no nation or business want to be the reason for driving a charismatic species to extinction (Schelle, 2010; Wang, 2009). The recently founded network for saving the porpoise can be beneficial since it gives the opportunity to share information, train staff and educate members and the public (Wang, 2009). This is a good initiative, conservation work will be easier when everybody works together.

If the species will be upgraded to a Class One species more funding would be available for establish new semi-natural reserves (Z. Xinqiao, WWF China, personal communication, April 23rd 2012). The Balijang section of the Yangtze River seems, according to Wei *et al*. (2002b), fit the porpoise's preferences for feeding and care-giving sites very well. This section has many microhabitats of the preferred variety (Wei *et al*., 2003). These microhabitats often include confluences where the boat traffic is light and therefore see a congregation of prey fish (Wei *et al*., 2003). Therefore this would be a good place for a conservation reserve for the species. If there are good opportunities for taking care of calves and hunt, the porpoises would probably have better reproductive success, and even more so if heavy boat traffic were forbidden in the area. Wang *et al*. (2010) suggest that a new semi-natural reserve could be established in the main river, above the Three Gorges Dam. It will be easier to control vessel traffic, fishing and pollution in that area so IHB and the management of TGD collaborates to implement this (Wang *et al*., 2010). There is also more oxbows and old courses than Tian'e-Zhou which could be good sites for more semi-natural reserves (Wang, 2009).

Nowadays a discovery of an earlier unknown problem faces scientists when they are trying to investigate the threats to a species. Huang *et al*. (2012) has seen that the method previously used to simulate changes in populations is not very reliable. A new method was used by Huang *et al*. (2012) model to simulate population dynamics of four freshwater cetaceans at the same time as their habitat deteriorated. The study showed that the traditional method probably do not detect early signs of a population decrease. Instead this is first discovered when a critical limit is reached. Empirical data about the extinction of the baiji confirms these results, species will become extinct faster than previously thought (Huang *et al*., 2012). This indicates that restoring habitats and landscapes must begin before population declines are detected, and preferably before the quality of habitat has deteriorated. This seems improbable because it is unlikely since there are neither the resources nor the ability to protect all the diversity in the world.

For avoiding inbreeding and keep a self-sustaining population over a long time it is generally said that the effective population size (Ne) must be approximately 50 breeding individuals (Xia *et al*., 2005a). Xia *et al*. (2005a) calculated that the Ne for the porpoises in the Tian'e-Zhou oxbow was between 5.5 – 16.5 which probably is too low for long-time survival of the group. For maintaining a healthy breeding population in the long-term, more porpoises with a rich genetic variation must be relocated to the Tian'e-Zhou oxbow (Xia *et al*., 2005a). It is important that the relocated individuals comes from different locations in the main river for preventing loss of rare alleles and an increasing of homozygosis in the DNA of the porpoises (Xia *et al*., 2005a). Now when porpoises can get their own genetic profile (Xia *et al*., 2005b), it will be easier to relocate individuals with a diverse genetic variation. This will probably influence the conservation work in a positive way.

Population surveys is easier to manage today with more developed acustic methods since these can count and localize individuals (Li *et al*., 2010). It is very hard to investigate the population status in the wild without acoustics scince the porpoises lack of dorsal fin makes it near impossible to study individuals (Xiao *et al*., 2005). Improved methods to count the number of individuals, and the possibility of individual identification, will make it easier to estimate the size of the population. This makes it easier to appreciate how much effort needs to be done in different locations of the porpoises habitat to maintain a viable population in all sections of their range.

In the current situation, it seems doubtful that the Yangtze finless porpoise will be able to avoid extinction, but there is hope. There are many ideas on how the species could be saved but these must come in to fruition. An upgrading to a Class One species seems like an absolute necessity since more semi-natural reserves could then be established for saving the species. One asset in the conservation is that the individual DNA profiles can improve the breeding work by making it easier to get a higher genetic diversity. Even if there are not many individuals of the speices left, development of acoustic techniques to inventory the species probably improve its prospects. Through reliable surveys, more attention can be given to conservation work in areas where the porpoise is about to disappear completely.

4.5. Methodology and sources of error

A literature review is appropriate for these kinds of questions as it gives the opportunity to gather information from multiple sources. An experimental study would not have been sufficient to investigate the threats to the species since they are som versatile. Nor is it possible to conduct an experimental study that investigates such diverse topics as

behaviour, threats and future prospects. In addition, an experimental study in the subject would require a trip to China which is not reasonable for a bachelor thesis of this size. However, the literature review may contain errors because information from many different authors has been merged. In the case of this study, some articles were in Chinese with only the abstract in English. If the translation was not carried out correctly, this can result in inaccurate information. Those abstracts were used, however, because they contain important information that was not available otherwise. Altough this is a major weakness in the literature selection, these articles still have a strength in that they were written by several of the prominent scientists on the species.

Another problem was that some information had to be excluded even though it was relevant in order not to exceed the maximum number of pages. This may have caused a bias in terms of important information to the questions were excluded. A critical comparison of the sources have not really been feasible scince all the results indicate the same things. This is certainly due to that there are a number of scientists who carrying out the major part of all research. The sources have a great strength in that very competent and experienced researchers have conducted the studies. However, this gives also a major disadvantage since the results can be affected by only a few people's own opinions. Much research is only published in China which makes it difficult to access material from the less prominent researchers.

4.6. Application and future research

This bachelor thesis can be used to gain an insight into the problems of preserving an endangered freshwater cetacean. These species are relatively unknown to the public and is in great need to be highlighted. River habitats are destroyed at an accelerating speed, and much of the research conducted will be published primarily in the home countries and does not reach a wider audience. This paper can be used to understand the big picture of threats, conservation work carried out in the field, and finally the future prospects for this particular species. Much of the new research on this species is summarized in the paper and thus it becomes easy for an outsider to find more deeply facts of the subject by the reference list.

The thesis is valuable to the area just because it takes up a lot of new research and compiles it. It also discusses how the species' behaviour has contributed to its endangered situation which is not common in the available literature. It is important to take natural behaviours into account in conservation work as those should be encouraged and satisfied. The questions in the paper demonstrates the need for more research into ways that boating and fishing in the Yangtze River should be developed to promote the porpoises. The *ex situ* work in Tian'e-Zhou had been proved so successful in the paper that a suggestion is that more attention must be devoted to research into how, and where, more semi-natural reserves can be established. However, the future goal would be to reintroduce the porpoises to the main river. The result of the studys issues shows that research is needed on the degree of adaption to the semi-natural reserves the porpoise will go through, and whether these adaptions are beneficial for a reintroduction to the main river. More research would also be needed on how the *in situ* work could be improved and how the reserves in the main river can be made safer for porpoises.

5. Conclusions

There is hope for the Yangtze finless porpoise but the species need every stakeholder to help, local efforts as well as efforts from the government. Because the threats are many, all industries, energy companies, farmers and fishermen must come togheter and develop new

methods that have less impact on the ecosystem in the Yangtze River. The river must flow freely to maintain the various habitats and the biodiversity in the river. Climate change is a fact and therefore as much action as possible must be done not to destroy the degraded habitat in the river even more. Since the species navigate with sonar and prefer areas where fishing activities are common, a speed limit should be statutory to help porpoises avoid vessel collisions and entanglement to nets. Fish stocks need to be restored to ensure the species food source and this is best done by fishing restrictions and the reconstruction of passages to areas where fish spawn.

An Class One upgrading would give the species higher protection, but a wider solution to the problem is education. In particular consumers need education, people must be aware of what they are buying. But an upgrading would be an improvement since more funding would be aviable to establish new semi-natural reserves. Since the conservation work in the Tian'e-Zhou oxbow is successful and the porpoises seems to thrive, more semi-natural reserves seems to be the best solution right now. In the current situation, more porpoises is needed to obtain a genetically stable population. A suggestion is to establish a new semi-natural reserve above Three Gorges Dam or in the Balijang section of the river. Several studies have shown that the porpoises thrive in the Balijiang section so that would be an ultimate solution until the animals can be released into the main river again.

Populärvetenskaplig sammanfattning

Den fenlösa Yangtze tumlaren är en mycket hotad art av tumlare som lever i Yangtzefloden I Kina. Arten är en sötvattenslevande underart till den fenlösa tumlaren som lever i kustnära områden runt om i asien. För några år sedan levde en floddelfin kallad baiji i floden men den har nu förklarats troligen utdöd till följd av mänsklig aktivitet i floden. Denna aktivitet har även fått den fenlösa Yangtze tumlaren att drastiskt sjunka i antal. För att utvärdera artens framtidsutsikter har fokus lagts på att studera dess hotbild och de bevarandeaktioner som har utförts för att rädda den. Fokus har även lagts på hur artens beteende har bidragit till att den idag är hotad.

Hoten som finns mot tumlaren är fiske, industri, jordbruk, tung båttrafik, skyddsåtgärder mot översvämningar, vattenkraft, förstörd livsmiljö och klimatförändringar. En stor del av Kinas befolkning lever längs med Yangtzefloden och därmed används floden i stor utsträckning för ovan nämnda saker. Fisket sker ofta med olagliga metoder som är direkt skadliga för tumlarna då de kan skada sig på krokar eller fastna i nät vilket leder till drunkning. Tumlarna uppehåller sig och jagar gärna i de områden som också är populärast bland fiskarna. En intensiv industri har även lett till att floden blivit överfiskad och därmed finns det en mindre födobas kvar åt tumlarna. Jordbruk och industri längs med floden bidrar till både föroreningar och ackumulerade halter av gifter då vattenvolymen minskas när vatten tas från floden.

Tumlare navigerar med hjälp av ekolokalisering då deras syn är dåligt utvecklad. Detta är ett problem då ekolokaliseringen idag försvåras av att den tunga båttrafiken i Yangtzefloden bidrar till en hög bullernivå. Tumlarna kan då av misstag kollidera med båtar och skadas eller dö. För att skydda sig mot översvämningar har många vattenreservoarer, kanaler och dammar byggts. Detta påverkar flodens naturliga flöde och näringsämnen som annars sprids till närliggande områden under översvämningar blir nu kvar i floden. Dammar byggs även för att skapa vattenkraft och världens största vattenkraftverk, Three Gorges Dam, ligger i Kina. Byggnationen av Three Gorges Dam har påverkat flödet i Yangtzefloden väldigt mycket och även möjligheten för djur att förflytta

sig till olika områden. De hotbilder som nämnts har alla bidragit till att försämra livsmiljön i Yangtzefloden vilket påverkar tumlaren. Ett nytt problem kommer med den pågående klimatförändringen som redan nu och på sikt kommer påverka flodens habitat ytterligare.

För att försöka rädda arten har bevarandearbete utförts i själva Yangtzefloden men även i semi-naturella reservat och i fångenskap. De semi-naturella reservaten ger tumlarna möjlighet att leva fritt men det är i en säkrare miljö med reglerat fiske och mindre båttrafik. Arbetet har varit lyckosamt och det föds kalvar i både reservaten och fångenskap. För att arten skall kunna överleva kommer det dock krävas hårt arbete från alla berörda parter, från lokalbefolkningen och industrier till konsumenter på andra sidan jorden. I och med att hotbilden är så bred så räcker det inte att ett problem åtgärdas utan något måste ske på alla fronter. Det är positivt att aveln fungerar bra men huvudmålet måste ändå vara att försöka återskapa en dräglig livsmiljö i själva Yangtzefloden. Målet med allt bevarandearbete bör vara att kunna hålla arter i deras naturliga miljö. En god levnadsmiljö för tumlarna i Yangtzefloden skulle dessutom symbolisera en bra miljö för människorna som bor längs med floden då de också behöver den för att kunna överleva.

Thanks

To my supervisior Daniel for contributing your knowledge and your assistance in limiting my thesis to appropriate levels. To my assistant supervisior Anna Forslund for the idea to the thesis and her knowledge about the subject. Xinqiao Zhang & Mei Zhigang for your commitment and contribution to current facts and literature, Per Normann for always being there to help me out. Dan Gustavsson because you have made me get through this. My friends for helping me thinking about other thing and last but not least, my family for always being there for me.

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Faculty of Veterinary Medicine and Animal Science
Department of Animal Environment and Health
P.O.B. 234
SE-532 23 Skara, Sweden
Phone: +46 (0)511 67000
E-mail: hmh@slu.se
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