

**Baiji/Chinese River Dolphin/Yangtze River Dolphin**  
*(Lipotes vexillifer)*

**5-Year Review:  
Summary and Evaluation**

**National Marine Fisheries Service  
Office of Protected Resources  
Silver Spring, MD**

## **5-YEAR REVIEW**

### **Baiji/ *Lipotes vexillifer***

#### **1.0 GENERAL INFORMATION**

##### **1.1 Reviewers** (*list primary reviewers of species information below*)

###### **Lead Regional or Headquarters Office:**

Ron Dean, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD (301) 427-8445

##### **1.2 Methodology used to complete the review:**

This review was prepared pursuant to section 4(c)(2) of the Endangered Species Act (ESA) and in accordance with sections 4(a) and (b) of the ESA following guidance provided in the joint NMFS and U.S. Fish and Wildlife 5-year Review Guidance and template ([http://www.nmfs.noaa.gov/pr/pdfs/laws/guidance\\_5\\_year\\_review.pdf](http://www.nmfs.noaa.gov/pr/pdfs/laws/guidance_5_year_review.pdf)). The National Marine Fisheries Service (NMFS) initiated a 5-year review of the Baiji (*Lipotes vexillifer*) in June 2017. NMFS solicited information from the public through Federal Register notice (82 FR 28304; June 21, 2017) and received information from the Marine Mammal Commission, which was incorporated as appropriate.

To complete the 5-year review, we did a literature search and evaluated all information that has become available on the species since the previous review in 2012. We used internet resources to find relevant information, and relied on peer-reviewed publications, and technical reports. We gathered information through September 2017.

##### **1.3 Background:**

###### **1.3.1 FR Notice citation announcing initiation of this review:** 82 FR 28304

###### **1.3.2 Listing history**

Original Listing

**FR notice:** 54 FR 22906

**Date listed:** 1989

**Entity listed:** Species

**Classification:** Endangered

###### **1.3.3 Associated rulemakings:** N/A

###### **1.3.4 Review History:**

National Marine Fisheries Service. 2012. Baiji/Chinese River Dolphin/Yangtze River Dolphin (*Lipotes vexillifer*). 5-Year Review: Summary and Evaluation. 13 pages.

Conclusion: Retain the listing as an endangered species.

**1.3.5 Species' Recovery Priority Number at start of 5-year review:** N/A

**1.3.6 Recovery Plan or Outline**

**Name of plan or outline:** N/A– It was determined that a plan will not promote the conservation of the species because it exists solely in foreign waters.

## **2.0 REVIEW ANALYSIS**

### **2.1 Application of the 1996 Distinct Population Segment (DPS) policy**

**2.1.1 Is the species under review a vertebrate?**

  X   *Yes*  
      *No*

**2.1.2 Is the species under review listed as a DPS?**

      *Yes*  
  X   *No*

**2.1.3 Was the DPS listed prior to 1996?** N/A

      *Yes*  
      *No*

**2.1.3.1 Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?**

      *Yes*  
      *No*

**2.1.3.2 Does the DPS listing meet the discreteness and significance elements of the 1996 DPS policy?**

      *Yes*  
      *No*

**2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?**

\_\_\_\_ *Yes*  
X *No*

## **2.2 Recovery Criteria**

N/A

### **2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?**

\_\_\_\_ *Yes*  
X *No*

### **2.2.2 Adequacy of recovery criteria.**

N/A

#### **2.2.2.1 Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?**

\_\_\_\_ *Yes*  
\_\_\_\_ *No*

#### **2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)?**

\_\_\_\_ *Yes*  
\_\_\_\_ *No*

### **2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information**

N/A

## **2.3 Updated Information and Current Species Status**

### **2.3.1 Biology and Habitat**

#### **2.3.1.1 New information on the species' biology and life history:**

The baiji is a freshwater dolphin and considered the most endangered cetacean in the world. It has several common names including the Chinese River dolphin, the Yangtze River dolphin, white-flag dolphin, and white-fin dolphin. The baiji is the

only member of the family Lipotidae (Rice 1998). Scientists debated this phylogenetic position for years, but molecular studies have supported the determination of Lipotidae as a separate family (Yan *et al.* 2005).

The baiji is pale blue to grey on the dorsal side and white on the ventral side (Zhou 1989). Its beak is long and slightly upturned (Zhou 2006), with 31–36 conical teeth on either jaw (Zhou and Li 1989). The dorsal fin is low, and triangular. A mature baiji can measure 8 ft long and females tend to be larger than males (Zhou and Li 1989). Like other freshwater dolphins, the eyes are smaller than those of marine dolphins and located higher on the head (Zhou 1989; Zhou 2006) as a result of the lack of visibility in the murky water of the Yangtze River. Thus, the baiji relies on underwater sound for orientation, feeding, and communication. The baiji produces two primary sounds—whistles for communication and clicks for echolocation (Wang *et al.* 1989; Xiao and Jing 1989).

Breeding takes place in the first half of the year (Zhou and Li 1989), with most births taking place between February and April (Zhou 2006). Gestation lasts for 10–11 months, and a newborn calf is about 3 ft long (Zhou and Li 1989). The baiji reaches maturity at 4–6 years old (Zhou 2006). Normally they live in groups of 2–4 individuals, but a group of 16 has been observed (Zhou 2006; Zhou and Li 1989).

#### **2.3.1.2 Abundance, population trends (e.g., increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:**

Scientists have observed a steady decline in the baiji population since the first Yangtze River surveys conducted in the late 1970's.

- Zhou (1982) assumed that there were about 400 animals based on quantitative survey data from 1979–1981.
- From surveys conducted in 1985–1986 by Chen and Hua (1989), the total population was concluded to be around 300.
- Zhou and Li (1989) estimated that there were 100 baiji in a 770 km segment of the lower Yangtze based on surveys conducted from 1982–1986.
- Zhang *et al.* (2003) concluded after surveys of the middle and lower reaches of the main Yangtze River and its estuary from 1997–1999 that there were a minimum of 13 individuals in the river.

The last photographic supported sighting was in 2002 and the last confirmed stranding was in 2001 (Turvey *et al.* 2007). In November and December of 2006, a visual and acoustic survey failed to locate a single baiji leading to conclusions that the baiji is likely extinct (Rosel *et al.* 2017; Turvey 2008;

Turvey *et al.* 2007). A few sightings have been reported since the 2006 range wide survey, but these reports have not been verified.

Lee *et al.* (2017) used a statistical model that took into account biological traits, such as body size and range size along with intensity of search effort, to estimate the probability that potentially extinct mammals are still extant and to estimate the proportion of presumed extinct mammals that are incorrectly assigned extinction status. Based on these models, there is a 72.45% probability that the baiji is extinct. If the species were extant, the maximum time to rediscovery is estimated to be 28 years.

#### **2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):**

A genetic bottleneck is a steep reduction in the size of a population due to environmental events. Such events can result in a loss of genetic diversity. Zhou *et al.* (2013) reported that a genetic reconstruction of the demographic history of the baiji indicated a genetic bottleneck occurred near the end of the last ice age, which coincided with a rapid decrease in temperature and a rise in sea level.

#### **2.3.1.4 Taxonomic classification or changes in nomenclature:**

There are no changes in the taxonomic classification or nomenclature.

#### **2.3.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species within its historic range, etc.):**

The baiji is found only in freshwater, particularly in the Yangtze River in China, where they ranged from the mouth of the river at Shanghai (Zhou and Li 1989) up to the Three Gorges area (Zhou 2006). Traditionally, the baiji were present in middle to lower areas of the Yangtze River, its tributaries, and connecting lakes (Zhou and Yuemin. 1977). The baiji were seen in the Qiantang River and Fuchun River before the construction of the Xinanjiang Hydropower Station (Liu *et al.* 2000; Turvey 2008; Zhou 2006) and occurred in the Dongting and Poyang Lakes (Liu *et al.* 2000; Zhou and Yuemin. 1977).

Baiji are attracted to counter-current eddies around banks and sandbars (Hua *et al.* 1989; Zhang *et al.* 2003; Zhou 2006) where the water is calmer (Turvey 2008). These are areas of high fish abundance (Hua *et al.* 1989) and, consequently, major fishing areas (Zhou 2006).

#### **2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):**

The baiji's habitat was greatly reduced due to development along the Yangtze River. The Yangtze River is the longest river in Asia and the third longest (and largest) river in the world and has always been an important route for shipping and trade and by 1992 there were 221 ports along the Yangtze (Turvey *et al.* 2010).

Water development significantly changed the baiji's habitat by interrupting the movement of the dolphins upstream of dams, eliminating their entrance to tributaries, and depleting fish resources (Chen and Hua 1989; Liu *et al.* 2000a; Zhou and Li 1989). Construction on the first dam on the mainstem of the Yangtze River—Gezhouba Dam—began in 1970 and cut off upstream habitat between the dam and the Three Gorges area, affected counter-current habitat below the dam, and reduced fish populations (Liu *et al.* 2000b; Wang *et al.* 2006b).

## **2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)**

### **2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:**

Water pollution in the Yangtze River is a moderate threat due to mercury accumulation. Zhou *et al.* (1998) reported that 15.6 billion cubic meters of wastewater were discharged into the Yangtze each year as of 1998, 12.3 billion tons of which are industrial pollution, and of this waste, 80 percent is untreated. Nutrients from agricultural runoff are a major pollutant in the Yangtze River estuary and the use of fertilizers has been increasing in the river basin since the 1970's (Daoji and Daler 2004; Turvey *et al.* 2010). Studies of Yangtze finless porpoise, who inhabit the same area of the Yangtze River as baiji, have shown high mercury concentrations (Wang *et al.* 2006b).

Vessel traffic in the river is also a threat to the baiji. By 1992 there were 221 ports along the Yangtze (Turvey *et al.* 2010; Zhou *et al.* 1998) and during the most recent baiji survey in 2006, researchers counted 19,830 large shipping vessels and 1175 fishing vessels in the survey area between Yichang and Shanghai (Turvey 2008; Turvey *et al.* 2007). This increases the chance that baiji will be injured or killed by interactions with vessels (Chen *et al.* 1997; Zhou and Zhang 1991) or that underwater noise from the vessels will affect the baiji's communication and echolocation (Wang *et al.* 2006b).

### **2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:**

Overfishing was a major cause of the baiji's decline, both from reducing the baiji's prey and leading to baiji bycatch in the fishing gear. Drastic declines in the river's fish fauna from overfishing and other factors have led to a reduction in prey availability for the baiji (Turvey *et al.* 2010). Baiji were bycaught in local

fisheries using rolling hooks, gillnets, fyke nets, and electrofishing (Zhou *et al.* 1998; Zhou and Wang 1994). The animals frequently had scars and open wounds from rolling hooks, and hook remains were sometimes found in the stomachs of dead animals (Lin *et al.* 1985; Turvey *et al.* 2010; Zhou and Li 1989)—50 to 60 percent of dead baiji found in the 1970s and 1980s had evidence of hook marks. Electric fishing, although illegal, is also widely practiced in the Yangtze River (IWC 2001; Wang *et al.* 2006b) and was known as the most significant direct threat to the species in the 2000s (Zhang *et al.* 2003). The shocks kill baiji and other aquatic organisms, including the baiji's prey (Chen and Hua 1989).

#### **2.3.2.3 Disease or predation:**

There are no records of disease or predation of the species.

#### **2.3.2.4 Inadequacy of existing regulatory mechanisms:**

Since 1986, five reserves have been established along the middle and lower areas of the Yangtze River to protect the species (Wang *et al.* 2006a). Unfortunately, these reserves were ineffective in preventing the decline of the dolphins (Wang *et al.* 2006a). The use of rolling hook longlines, fyke nets, and electric fishing was banned, but the ban has had little effect on human behavior and these fishing practices continue (Turvey 2008; Zhou *et al.* 1998).

#### **2.3.2.5 Other natural or manmade factors affecting its continued existence:**

Explosives used to widen river channels or for fishing are another cause of baiji depletion (IWC 2001; Lin *et al.* 1985; Zhou and Li 1989).

## **2.4 Synthesis -**

While no baiji were seen during the 2006 survey, there are still periodic, undocumented claims of baiji sightings (Turvey *et al.* 2010). While there may still be a few individuals in the Yangtze River and its tributaries, it is unlikely that these individuals would be able to perpetuate the species considering the existing threats in the Yangtze River and the survival potential of small populations. This leads us to conclude that the baiji is extremely close to, if not already, extinct. While we determine that the baiji may be extinct, we do not recommend changing the classification at this time.



### 3.0 RESULTS

#### 3.1 Recommended Classification:

- ☐ Downlist to Threatened
- ☐ Uplist to Endangered
- ☐ Delist (*Indicate reasons for delisting per 50 CFR 424.11*):
  - ☐ Extinction
  - ☐ Recovery
  - ☐ Original data for classification in error
- ☒ No change is needed

#### 3.2 New Recovery Priority Number: N/A

#### 3.3 Listing and Reclassification Priority Number, N/A

### 4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

No future actions are recommended.

## 5.0 REFERENCES

- Chen, P., and Hua, Y. 1989. Distribution, population size and protection of *Lipotes vexillifer*. Pages 81–85 in W. F. Perrin, R. L. Brownell, K. Zhou, J. Liu, and (eds.), editors. Biology and Conservation of the River Dolphins. World Conservation Union, Gland, Switzerland.
- Chen, P., Liu, R., Wang, D., and Zhang, X. 1997. Biology, Rearing and Conservation of Baiji. Science Press, Beijing, China.
- Daoji, L., and Daler, D. 2004. Ocean Pollution from Land-based Sources: East China Sea, China. AMBIO: A Journal of the Human Environment 33(1):107-113.
- Hua, Y., Zhao, Z., and Zhang, G. 1989. The Habitat and Behavior of *Lipotes vexillifer*. Biology and Conservation of the River Dolphins.
- IWC. 2001. Annex K. Report of the standing sub-committee in small cetaceans. Journal of Cetacean Research and Management 3:263-291.
- Lee, T. E., Fisher, D. O., Blomberg, S. P. and Wintle, B. A. 2017. Extinct or still out there? Disentangling influences on extinction and rediscovery helps to clarify the fate of species on the edge. Global Change Biology. 23: 621–634.
- Lin, K., Wang, D., and Zhou, K. 1985. Population size and conservation of *Lipotes vexillifer*. Acta Zoologica Sinica 5:77–85.
- Liu, R., Wang, D., and Zhou, K. 2000a. Effects of water development on river cetacean in China. Pages 40–42 in R. R. Reeves, B. D. Smith, T. Kasuya, and (eds.), editors. Biology and Conservation of Freshwater Cetaceans in Asia. IUCN, Gland, Switzerland and Cambridge, UK.
- Liu, R., Wang, D., and Zhou, K. 2000b. Effects of Water Development on River Cetaceans in China. Pages 49–53p in R. R. Reeves, B. D. Smith, and T. Kasuya, editors. Biology and Conservation of Freshwater Cetaceans in Asia, Gland, Switzerland and Cambridge, UK.
- Rice, D. W. 1998. Marine mammals of the world: Systematics and distribution. The Society for Marine Mammalogy, Lawrence, Kansas.
- Rosel, P. E., Baker, C. S., Berta, A., Boness, D. J., Brownell, R. L. Jr., Domning, D. P., Fordyce, R. E., Sreemba, A., Jefferson, T. A., Kinze, C., Mead, J. G., Oliveira, L. R., Perrin, W. F., Rice, D. W., Wang, J. Y., and Yamada, T. K. 2017. List of Marine Mammal Species and Subspecies. The Society for Marine Mammalogy. <https://www.marinemammalscience.org/species-information/list-marine-mammal-species-subspecies/>. Accessed October 2017.
- Turvey, S. 2008. Witness to Extinction: How we failed to save the Yangtze River Dolphin. Oxford University Press, Oxford.
- Turvey, S. T., Barrett, L. A., Yujiang, H., Lei, Z., Xinqiao, Z., Xianyan, W., Yadong, H., Kaiya, Z., Hart, T., and Ding, W. 2010. Rapidly shifting baselines in Yangtze fishing communities and local memory of extinct species. Conservation Biology 24(3):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, X., Pusser, L., Richlen, M., Brandon, J. R., Wang, D. 2007. First human-caused extinction of a cetacean species? Biology Letters, 3(5), 537–540. <http://doi.org/10.1098/rsbl.2007.0292>. 2007. First human-caused extinction of a cetacean species? Biology Letters 3(5):537-540.
- Wang, D., Lu, W., and Wang, Z.. 1989. A Preliminary Study of the Acoustic Behavior of the Baiji, *Lipotes vexillifer*. W. F. Perrin, R. L. Brownell, K. Zhou, and J. Liu, editors.

- Biology and Conservation of River Dolphins, No. 3 edition. IUCN--World Conservation Union, Gland, Switzerland.
- Wang, D., Zhang, X., Wang, K., Wei, Z., Würsig, B., Braulik, G. T. and Ellis, S.. 2006a. Conservation of the Baiji: No simple solution. *Conservation Biology* 20(2):623-625.
- Wang, K., D. Wang, X. Zhang, A. Pfluger, and L. Barrett. 2006b. Range-wide Yangtze freshwater dolphin expedition: The last chance to see Baiji? *Environmental Science and Pollution Research* 13(6):418-424.
- Xiao, Y., and Jing, R.. 1989. Underwater Acoustic Signals of the Baiji, *Lipotes vexillifer*. Pages 129-136 in W. F. Perrin, R. L. Brownell, K. Zhou, J. Liu, and (Eds), editors. *Biology and Conservation of the River Dolphins*, No. 3 edition. IUCN--World Conservation Union, Gland, Switzerland.
- Yan, J., Zhou, K., and Yang, G. 2005. Molecular phylogenetics of 'river dolphins' and the baiji mitochondrial genome. *Molecular Phylogenetics and Evolution* 37(3):743-750.
- Zhang, X., Wang, D., Liu, R., Wei, Z., Hua, Y., Wang, Y., Chen, Z. and Wang, L.. 2003. The Yangtze River dolphin or baiji (*Lipotes vexillifer*): Population status and conservation issues in the Yangtze River, China. *Aquatic Conservation: Marine and Freshwater Ecosystems* 13(1):51-64.
- Zhou, K. 1982. On the conservation of the baiji. *Journal of Nanjing Normal College* 4:71-74.
- Zhou, K. 1989. Review of studies of structure and function of the Baiji, *Lipotes vexillifer*. Pages 99-113 in W. F. Perrin, R. L. Brownell, Jr., K. Zhou, and J. Liu, editors. *Biology and Conservation of the River Dolphins*. Occasional Papers of the IUCN Species Survival Commission (SSC) 3.
- Zhou, K. 2006. Baiji *Lipotes vexillifer*. Pages 71-76 in W. F. Perrin, B. Würsig, and J. G. M. T. (eds), editors. *Encyclopedia of Marine Mammals*. Academic Press, San Diego, CA.
- Zhou, K., and Li, Y. 1989. Status and aspects of the ecology and behavior of the baiji, *Lipotes vexillifer*, in the lower Yangtze River. Pages 86-91 in W. F. Perrin, R. L. Brownell, Jr., K. Zhou, and J. Liu, editors. *Biology and Conservation of the River Dolphins*. Occasional Papers of the IUCN Species Survival Commission (SSC) 3.
- Zhou, K., Sun, J. Gao, A., and Würsig, B. 1998. Baiji (*Lipotes vexillifer*) in the lower Yangtze River: Movements, numbers threats and conservations needs. *Aquatic Mammals* 24(2):123-132.
- 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 Special Issue* (15):347-354.
- Zhou, K., Qain, W., and Yuemin, L. 1977. Studies on the distribution of baiji, *Lipotes vexillifer* Miller. *Acta Zoologica Sinica* 23(1):72-79.
- Zhou, K., and Zhang, X.. 1991. Baiji: The Yangtze River Dolphin and Other Endangered Animals of China. Yilin Press, Nanjing, China.
- Zhou, X., Sun, F., Xu, S., Fan, G., Zhu K., Liu, X., Chen, Y., Shi, C., Yang, Y., Huang, Z., Chen, J., Hou, H., Guo, X, Chen, W., Chen, Y., Wang, X., Lv, T., Yang, D., Zhou, J., Huang, B., Wang, Z., Zhao, W., Tian, R., Xiong, Z., Xu, J., Liang, X., Chen, B., Liu, W., Wang, J., Pan, S., Fang, X., Li, M., Wei, F., Xu, X., Zhou, K., Wang, J., and Yang, G. 2013. Baiji genomes reveal low genetic variability and new insights into secondary aquatic adaptations. *Nature Communications*. 4:2708.

**NATIONAL MARINE FISHERIES SERVICE**  
**5-YEAR REVIEW**  
*Lipotes vexillifer*

**Current Classification:** Endangered

**Recommendation resulting from the 5-Year Review**

- ☐ Downlist to Threatened
- ☐ Uplist to Endangered
- ☐ Delist
- ☒ No change is needed

**Review Conducted By:** Ron Dean

**HEADQUARTERS APPROVAL:**

**Assistant Administrator, NOAA Fisheries**

☒ Concur ☐ Do Not Concur

Signature  Date 11/15/12