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The Rescue, Rehabilitation, and Release of a Stranded Finless Porpoise (*Neophocaena phocaenoides sunameri*) at Bohai Bay of China

Jinhai Yu,[1] Yanming Sun,[1] and Zhaofei Xia[2]

[1] *Beijing Aquarium, Beijing, P.R., China*
[2]*Internal Medicine Laboratory, Department of Veterinary Clinical Medicine, College of Veterinary Medicine, China Agricultural University, Beijing, P.R., China; E-mail address: drxia@126.com*

Abstract

A stranded female west Pacific finless porpoise (*Neophocaena phocaenoides sunameri*) was found in the shallows of Bohai Bay, China, on 30 March 2008. It was moderately dehydrated. After transportation to Beijing Aquarium, medical treatment and rehabilitation were conducted. Under microscopic examination, the ova of *Nasitrema* spp. and *Zalophotrema hepaticum* were found in the feces. This is a new host record for the trematodes *Nasitrema* spp. and *Z. hepaticum* infecting a finless porpoise. Antibiotics were administered to prevent secondary infection, while supportive therapies, including fluid and electrolyte supplements, were provided. The porpoise was released on 6 June 2008, approximately 18.5 km offshore in Xingang, Tianjin, China. This is the first report of a rescue, rehabilitation, and release of a stranded marine mammal in Bohai Bay, China.

Key Words: finless porpoise, *Neophocaena phocaenoides sunameri*, stranding, rescue, rehabilitation, release

Introduction

The finless porpoise (*Neophocaena phocaenoides*) is the only porpoise that lacks a dorsal fin and has a small ridge that begins just behind the blowhole and extends to the tail flukes (Pilleri & Gihr, 1975). There are three subspecies: (1) Indian Ocean finless porpoise (*N. phocaenoides phocaenoides*), (2) west Pacific finless porpoise (*N. p. sunameri*), and (3) Yangtze finless porpoise (*N. p. asiaeorientalis*) (Zheng et al., 2005). Indian Ocean finless porpoise and West Pacific finless porpoise are found in warm, shallow coastal waters and in all major rivers of the Indian and western Pacific Oceans. The Yangtze finless porpoise, which was an endangered species, was only found in the Yangtze River of China. Populations of finless porpoise have been declining as a result of by-catch in the commercial fishing industry, pollution (Hung et al., 2006, 2007), and dam construction (Wang et al., 2005; Stone, 2008). Conservation measures are needed to prevent further population declines. Some researchers reported some finless porpoise that had been stranded due to some parasites (Parsons & Jefferson, 2000; Parsons et al., 2001). A stranded female west Pacific finless porpoise was found in the shallows of Bohai Bay, China, on 30 March 2008. The rescue, rehabilitation, and release of the porpoise were done by Beijing Aquarium. This observation represents a new host record for the trematodes *Nasitrema* spp. and *Zalophotrema hepaticum* infecting a finless porpoise. This is the first report of a rescue, rehabilitation, and release of this species in Bohai Bay, China.

Materials and Methods

Finless Porpoise Basic Information and Transportation

On 30 March 2008, a finless porpoise was found by local citizens on the shallow mudflats of Bohai Bay near Tang Shan City, China. When the animal was moved to deeper water, it did not swim away. Thus, it was placed into a temporary pool (2 m × 1 m × 0.5 m), which had natural salt water added into it and was shaded on the top. It refused to eat any live fish. Some local citizens watched the porpoise, and then Beijing Aquarium was contacted to rescue the animal. At 1700 h on 1 April, a rescue attempt was begun. An external examination of the animal was made by veterinarians Jinhai Yu and Yanming Sun, and the porpoise was determined to be a female west Pacific finless porpoise. Its body length was 135 cm, with a body weight that was approximately 30 kg. Due to its poor physical condition, the porpoise was transferred to a secure location for rehabilitation using a transportation unit (3.6 m × 1.2 m × 1.2 m, 1,000 L fresh water). The animal was moved at 0750 h on 2 April. The veterinarians monitored its respiration frequency, observed body posture during transportation, and

were responsible for splashing water onto its dry skin. The trip took about 7 h to arrive at the Beijing Aquarium where it was placed in the closed medical pool (6 m × 3 m × 1 m, 1,500 L artificial salt water) for quarantine and treatment.

Body Temperature
The porpoise's body temperature was checked in the temporary pool by a Thermistor Thermometer and probe (models 0840200 and YSI084300, respectively, Cole-Parmer Instrument Company, Vernon Hills, IL, USA). The probe was entered into the anus to about 25 cm. When data in the screen was stable for about 2 min, a record was kept.

Sample Collection
Blood was collected from the fluke blood vessels by a disposable Scalp Vein Set and a 10-ml syringe four times on 1, 3, 9 April, and 8 May 2008, and feces were collected with a disposable catheter. Blood samples for hematology were anticoagulated by EDTA K2, and samples for clinical biochemistry were filled in special biochemical vacuum tubes. The laboratory tests were performed as soon as possible by the staff of Beijing Deyi Clinical Laboratory (Beijing, China).

Laboratory Tests
A blood smear was stained by the Wright's and Giemsa stain. The feces were examined as direct smears under a microscope. Serum levels for biochemistry were determined using an Olympus AU400 biochemical analyzer (Olympus, Tokyo, Japan). Serum concentrations for hematology were determined by a Beckman coulter ACT. diff2 Hematology Analyzer (Beckman Coulter Inc., Fullerton, CA, USA). The porpoise was constrained and scanned a total of three times during rescue and rehabilitation by the SonoSite MicroMAXX (SonoSite Inc., Bothell, WA, USA).

Force Feeding
The porpoise did not eat any fish voluntarily after the rescue; therefore, stomach intubation via gastric tube was used to feed the animal. The daily food intake was from 0.5 to 1.5 kg during rehabilitation. A 1,000 mL minced fillet, which included herring and shrimp, was prepared with a juice extractor, then mixed with lactated ringer's solution (200 mL/d, initial 10 d) and multiple vitamin powder (during the entire time in rehabilitation). During the initial 5 d of rehabilitation, amoxicillin and Clavulanate potassium (5 mg/kg SID) and Ciprofloxacin (15 mg/kg SID) were administrated according to the information provided in *Marine Mammal Medicine* by Dierauf & Gulland (2001). The porpoise was able to stand the whole fish by force feeding at the end of rehabilitation.

Water Quality
While the porpoise was kept in the tank, several parameters were monitored daily, including water temperature, pH, dissolved oxygen (DO), ammonia (NH_3/NH_4^+), and nitrite (NO_2^-). Water temperature and pH were tested with a waterproof pH meter (model HI9025, Hanna Instrument, Woonsocket, RI, USA), and DO was tested with a Dissolved Oxygen Meter (model DO175, Hach Company, Loveland, CO, USA). Ammonia (NH_3/NH_4^+) and nitrite (NO_2^-) were tested with a Tetratest kits (Tetra Company, Melle, Germany). The salt water was changed about every 18 d and recycled independently with a small sand filter continuously every 24 h.

Results

Clinical Signs
In the temporary pool, the porpoise's body temperature was 36.8° C and its respiration frequency was 16 to 19 times/5 min. The caudal muscles were stiff, the blubber was thin, and the skin had lost its elasticity. The veterinarians Jinhai Yu and Yanming Sun noticed the porpoise was presented with head lashing during the transportation. After transport, it just floated in the pool, occasionally hitting the wall of the pool. The animal was unable to balance itself upright, and the veterinarians helped it keep a normal position.

Clinical Findings
The blood cells were morphologically normal; however, red blood cell (RBC), hemoglobin (HGB), and hematocrit (HCT) counts were decreased slightly during rescue and rehabilitation. The values of lactate dehydrogenase (LDH) and hydroxybutyric dehydrogenase (HBDH) declined during rehabilitation.

The ova of *Nasitrema* spp. (Figure 1) and . (Figure 2) and the larva of *Otostrongylus circumlitus* were found in feces over the first several days (Figure 3), and the ova of *Nasitrema* spp. and *Z. hepaticum* were still found a month later.

The results of the ultrasound scan did not present a fetus, and the image showed some liver flukes (Figure 4).

Water Quality Results
Most parameters were stable, but the levels of nitrite showed an increasing trend during the 2 mo in the temporary pool (Figure 5).

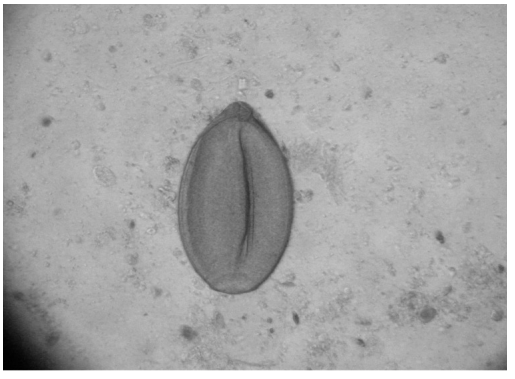

Figure 1. *Nasitrema* spp. ovum (original magnification × 400)

Figure 2. *Zalophotrema hepaticum* ovum (original magnification × 400)

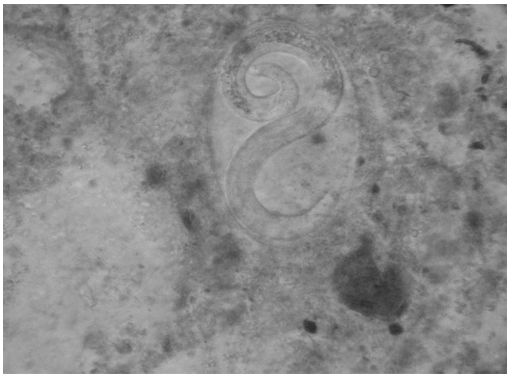

Figure 3. *Otostrongylus circumlitus* larva (original magnification × 400)

Figure 4. The ultrasonography of liver flukes

Rehabilitation and Release

The animal was administered antibiotics—amoxicillin and clavulanate potassium (5 mg/kg SID) and Ciprofloxacin (15 mg/kg SID)—and supportive therapies that included fluid and electrolyte supplements with the minced fillet diet. After treatment, the porpoise molted its skin and became stronger and better oriented. It was able to make dives to the bottom of the pool about 1.5 mo after entering rehabilitation. In order to avoid the serious side effects of praziquantel, which could kill parasites in the brain that may cause lost echolocation (Dierauf & Gulland, 2001), the porpoise was not given that medicine.

The porpoise recovered in good condition after 2 mo of rehabilitation. Its skin became light grey, and it could swim freely. In order to preserve this endangered species, it was decided to release it back into the sea. The release site chosen was the shallow water offshore of the Xingang of Tian Jing where many finless porpoise groups were often seen by local fishermen (Fishing Administrative Authority records, unpub. data). The porpoise was released on 6 June 2008, approximately 18.5 km offshore at north latitude 38° 58' and east longitude 118° in Xingang, Tianjin, China.

Discussion

The stranding of cetaceans is a worldwide occurrence (Rodriguez-Fonseca & Cubero-Pardo, 2001; Borsa, 2006). Some researchers have suggested that sloping beaches offer bad sonar reflections, which mislead the animals ashore (Sundaram et al., 2006); others believe that large-scale climate events had some relation to the strandings (Evans et al., 2005). de la Riva et al. (2009) reported there was a correlation between seasonal algal bloom, which produces domoic acid, and stranding. Anthropogenic activity such as gunshot (Stroud & Roffe, 1979) and acoustic exercises may cause the stranding of marine mammals (Fernandez et al., 2005). In addition, ocean pollution from agriculture and industry might be an important cause of cetacean strandings (Varanasi et al., 1994). The dystocia of female animals in delivery also has caused strandings (Stroud & Roffe, 1979).

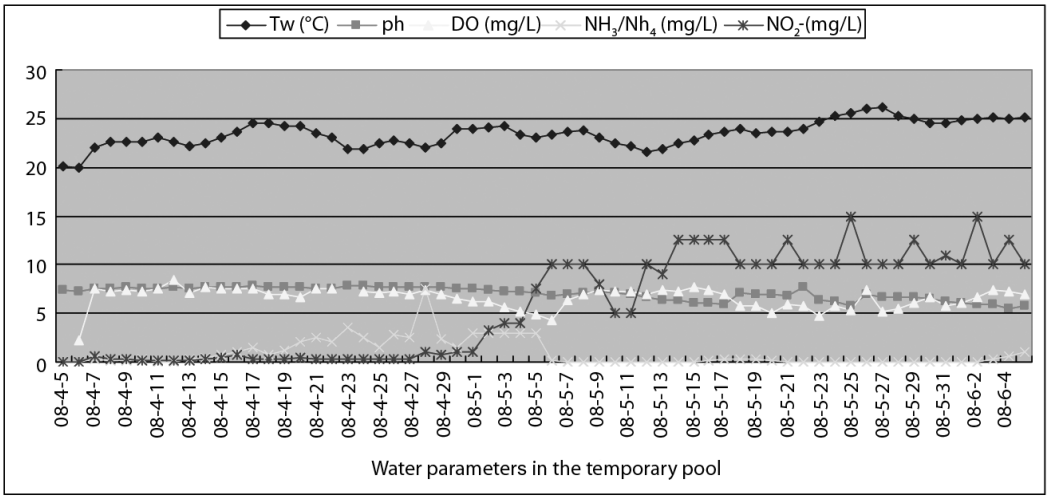

Figure 5. The water quality parameters in the temporary tank; Tw, water temperature; pH; DO, dissolved oxygen; NH_3/NH_4^+, ammonia; NO_2^-, nitrite.

Table 1. The hematology of the stranding finless porpoise

Blood parameter	1 April 2008	3 April 2008	9 April 2008
RBC (10^{12}/L)	6.5	5.3	4.8
HGB (g/L)	226.0	182.0	163.0
HCT (%)	63.0	51.5	46.3
MCV (fL)	96.8	97.7	97.1
MCH (pg)	34.7	34.5	34.3
MCHC (g/L)	358.0	353.0	353.0
PLT (10^9 /L)	126.0	110.0	115.0
ESR (60 min) mm/h	ND	1.0	2.0

※ WBC, leukocyte or white blood cell; RBC, erythrocyte or red blood cell; HGB, hemoglobin; HCT, hematocrit; MCV, mean corpuscular volume; MCH, mean corpuscular hemoglobin; MCHC, mean corpuscular hemoglobin concentration; PLT, platelet; ESR; Erythrocyte Sedimentation Rate; ND, not determined.

However, the results indicated this porpoise was not pregnant.

According to the results of the clinical and laboratory tests, the finless porpoise suffered from moderate dehydration, and two kinds of trematode ova (*Nasitrema* spp. and *Z. hepaticum*) were found in the feces. It was reported that the *Nasitrema* spp. infection could destroy or compress the auditory nerve leading to the decline or loss of echolocation, which could result in stranding (Morimitsu et al., 1987, 1992).

The real causes for the stranding of the porpoise were not clear. However, it was hypothesized that the *Nasitrema* spp. infection was the main reason, and the *Z. hepaticum* infection was secondary. *Z. hepaticum* may affect the activity of liver enzymes, and the value of LDH and HBDH in this porpoise were a little high. In fact, veterinarian Zhiyong Li (Qinghuangdao Ledao Sea World, Qinghuangdao, China) has found some liver flukes and lungworms in the necropsy of dead finless porpoises, so it is a concern (pers. comm.). As the stranding time on the beach went on, the animal could present signs of dehydration. Additionally, the blood circulation of some compressed muscles might have been blocked or reduced, causing the animal to have difficulty maintaining balance. Although the larva of *O. circumlitus* were found in its feces over the first several days, they disappeared later, so it could be deduced that the larva came from the fish.

The rescue, rehabilitation, and release of a stranded animal are a complex operation that requires considerable funds and long-term contributions. This porpoise was kept in the medical pool for 2 mo. The funds needed to cover these expenses could be provided by animal conservation organizations or local or state governments.

Table 2. The biochemistry of the stranding finless porpoise

Blood parameter	3 April 2008	9 April 2008	8 May 2008
T.BILL (umol/L)	1.5	0.8	1.2
D.BILL (umol/L)	0.3	0.4	0.5
TP (g/L)	63.1	71.6	76.5
ALB (g/L)	35.7	42.2	40.6
GLB (g/L)	27.4	29.4	35.9
ALT (U/L)	213.2	592.6	300.0
AST (U/L)	3.6	6.9	5.1
ALP (U/L)	317.3	208.9	480.9
GGT (U/L)	39.9	106.3	152.1
TBA (umol/L)	3.8	5.3	6.9
CHE (U/L)	5.4	2.8	6.8
CDCP (mmol/L)	29.1	52.4	25.9
K^+ (mmol/L)	3.7	3.4	4.8
Na^+ (mmol/L)	152.6	154.4	155.9
Cl^- (mmol/L)	112.7	109.1	115.2
Ca^{++} (mmol/L)	2.2	2.5	2.6
Pi (mmol/L)	1.1	1.4	1.5
Mg^{++} (mmol/L)	1.0	0.9	0.7
Fe^{++} (umol/L)	47.7	63.9	ND
BUN (mmol/L)	13.3	13.3	12.0
CRE (umol/L)	68.2	100.8	75.3
UA (umol/L)	23.0	4.9	18.4
TCHO (mmol/L)	4.4	7.9	6.4
TG (mmol/L)	0.9	3.8	1.5
HDL (mmol/L)	2.8	5.2	2.7
LDL (mmol/L)	0.1	0.2	0.6
Glucose (mmol/L)	6.7	7.5	5.6
CK (U/L)	238.0	186.0	210.5
LDH (U/L)	1,153.9	1,161.7	401.9
HBDH (U/L)	1,315.9	1,342.8	446.3

※T.BILL, total billirubin; D.BILL, direct billirubin; TP, total protein; ALB, albumin; GLB, globin; ALT, alanine aminotransferase; AST, aspartate aminotransferase; ALP, alkaline phosphatase; GGT, γ-glutamyl transferase; TBA, total bile acid; CHE, cholinesterase; CDCP, carbon dioxide combining power; K^+, potassium ion; Na^+, sodium ion; Cl^-, chloride; Ca^{++}, calcium ion; Pi, inorganic phosphorus; Mg^{++}, magnesium ion; Fe^{++}, iron ion; BUN, blood urea nitrogen; CRE, creatinine; UA, uric acid; TCHO, total cholesterol; TG, triglyceride; HDL, high density lipoprotein; LDL, low density lipoprotein; CK, creatine kinase; LDH, lactate dehydrogenase; HBDH, hydroxybutyric dehydrogenase; ND, not determined.

Experienced veterinarians or biologists also are needed to treat and monitor the animal during the rescue, rehabilitation, and release. Without this support, the aquaria cannot accomplish and cover the high cost of rescue, rehabilitation, and release.

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