

Passive acoustical counting of odontocetes using towed and stationed platforms



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Two steps of PAM for biological studies

1. Detect target animals

2. Count target animals

Discrimination of each sound source

Detection probability of PAM

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Frequent sound production has been confirmed by A-tags on odontocetes.



Finless porpoise

@China

Proc. Roy. Soc. B, 272, 797-801 (2005)

1. Detect target animals



White-beaked dolphin

@Iceland

Miller et al., 2007, MMSC @Capetown



Harbor porpoise

@Denmark

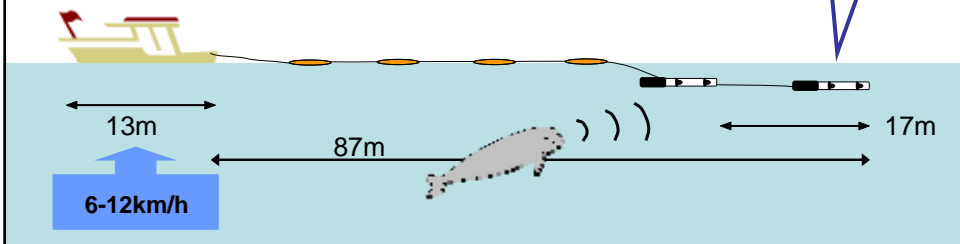
Deep-Sea Research II, 54, 290-297 (2007)

Passive Acoustical Method

A-tag (ML200-AS2, Marine Micro Technology, Japan)

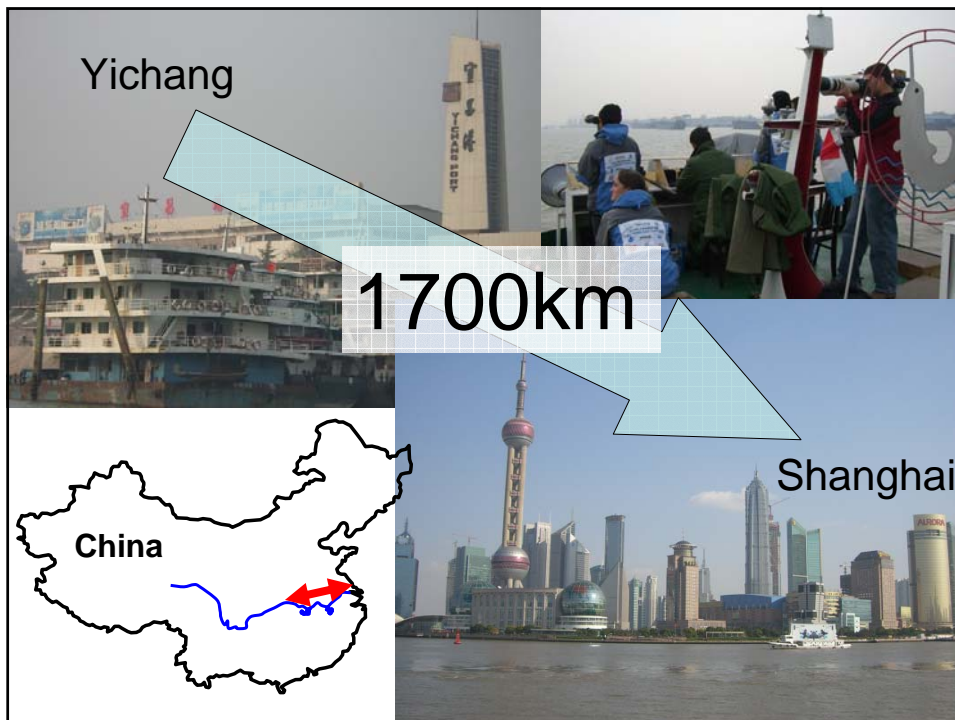
- A-tag is a stereo pulse event recorder
- SPL, IPI, bearing angle of sound source
- body (21mm x 112mm, 65g) + hydrophones
- Receiving bandwidth; 100-160 kHz (-5dB width)
- Sensitivity of the hydrophone; -201dB/V at 120kHz
- 730,800 JPY/each +options (I/F box, D cell case)

Akamatsu et al. 2008, JASA

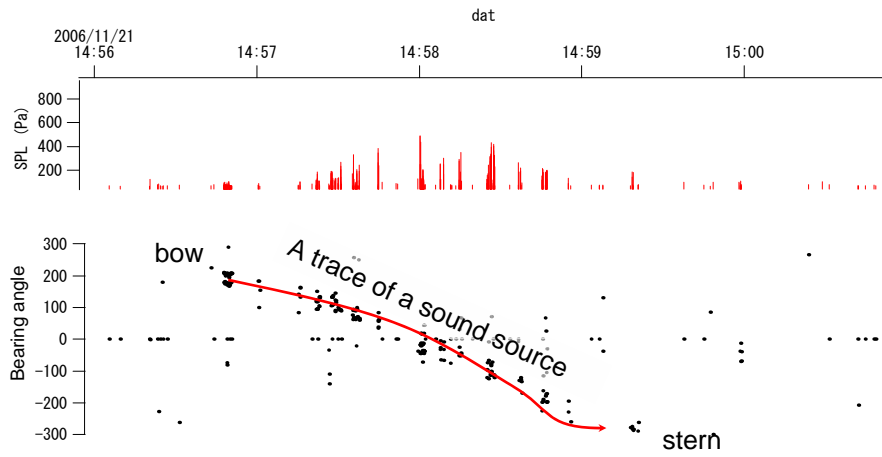


Study site and target animals

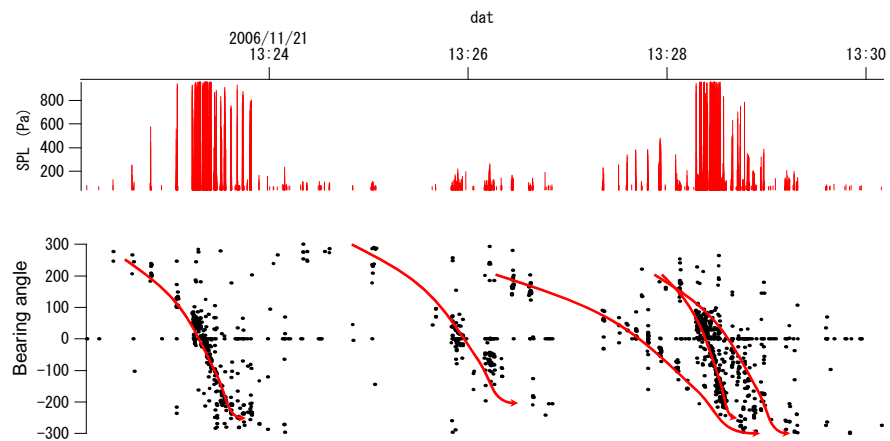
Yangtze finless porpoise
The only freshwater population of finless porpoise

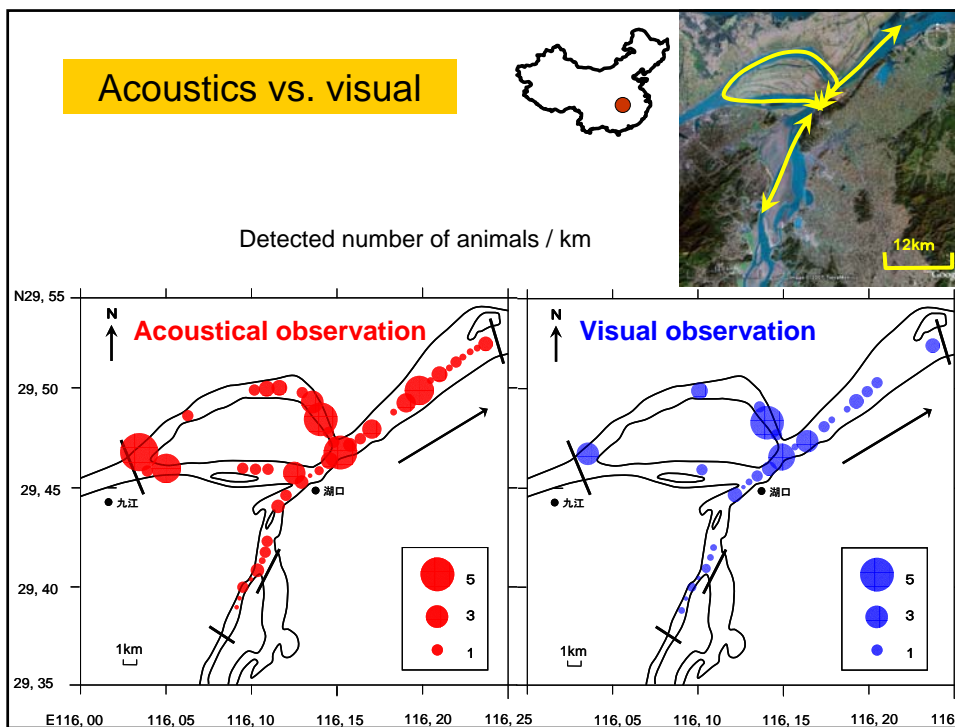
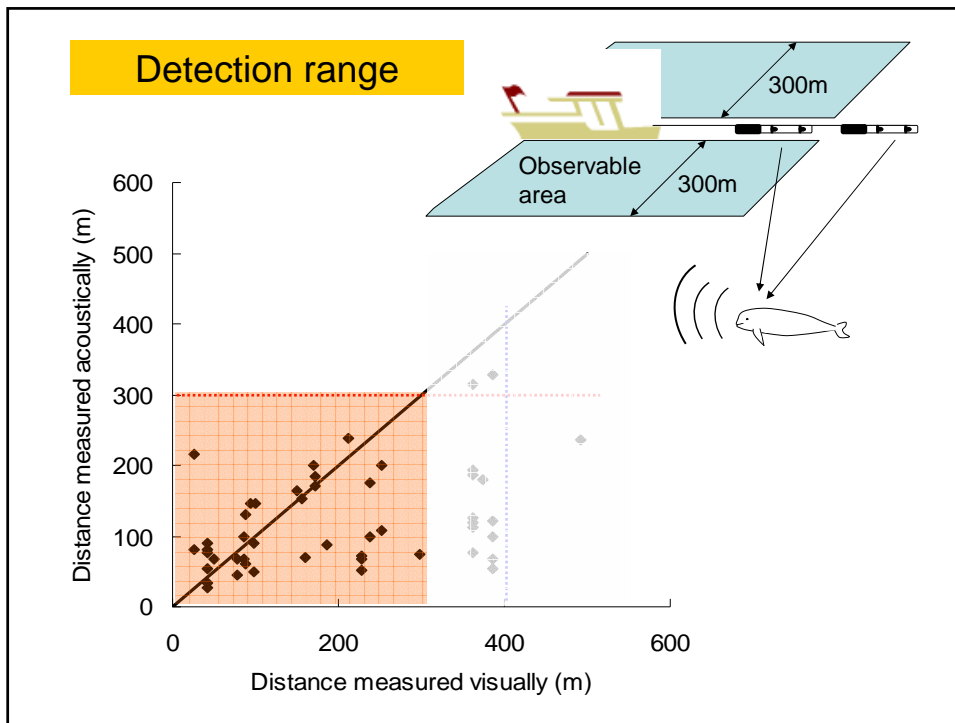


2. Count target animals



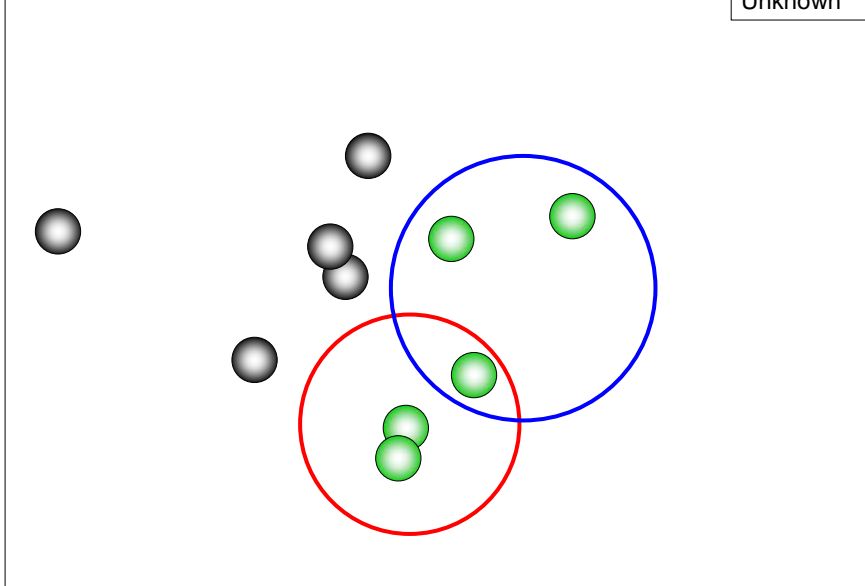
2. Count target animals





How many we missed?

Observable
Unknown



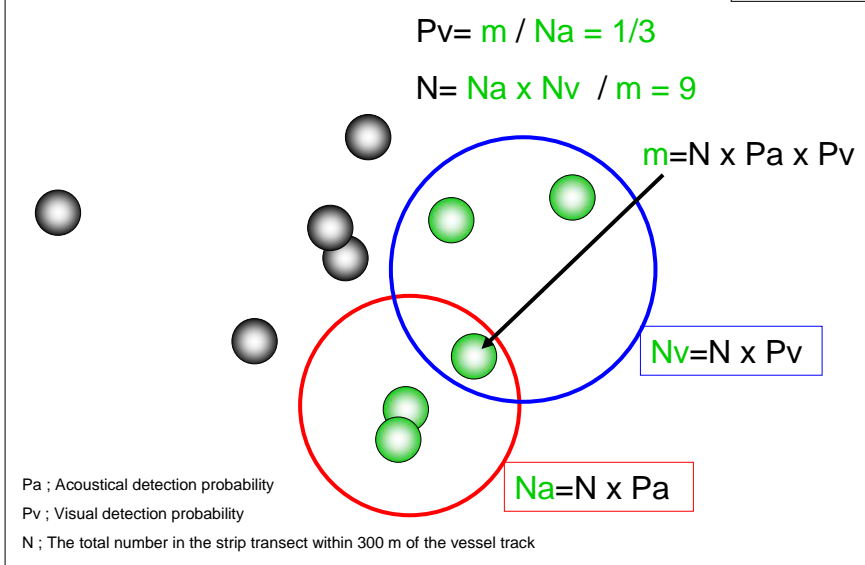
How many we missed?

$$P_a = m / N_v = 1/3$$

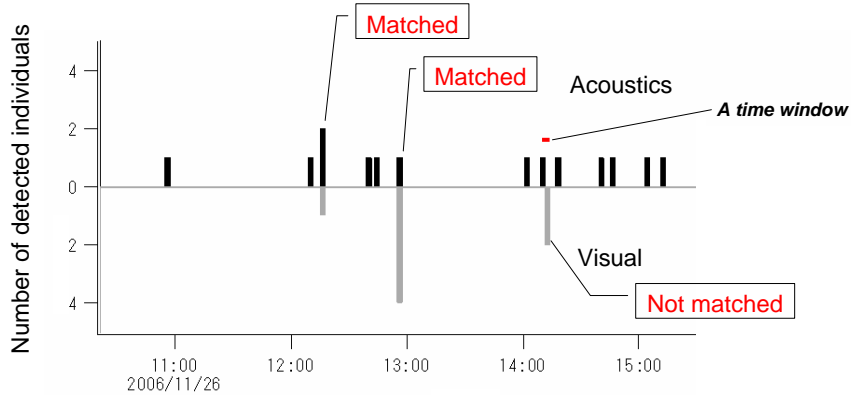
$$P_v = m / N_a = 1/3$$

$$N = N_a \times N_v / m = 9$$

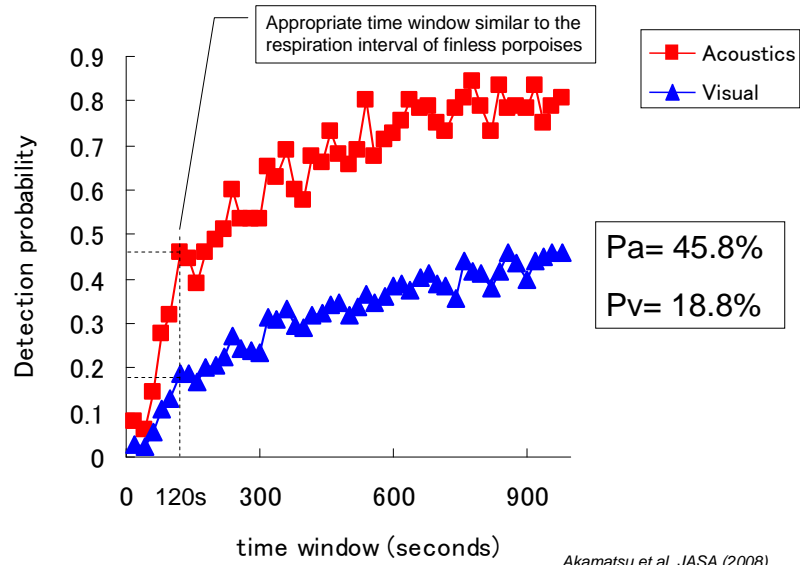
Observable
Unknown

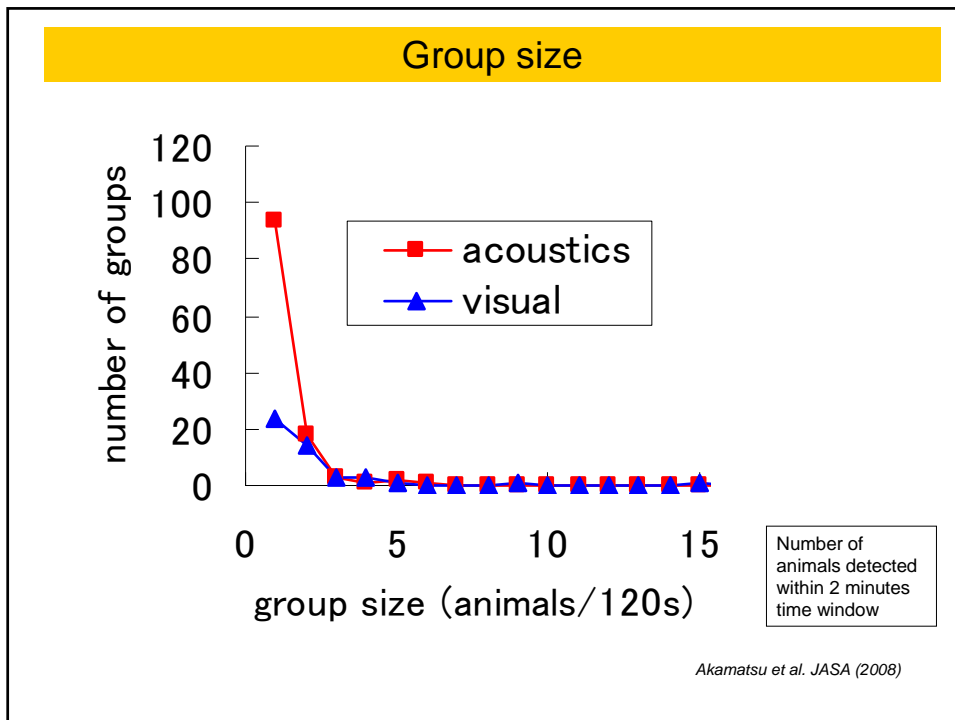


How many we missed?



Detection probability





Population size of finless porpoises between Yichang to Shanghai

Observable
Calculated

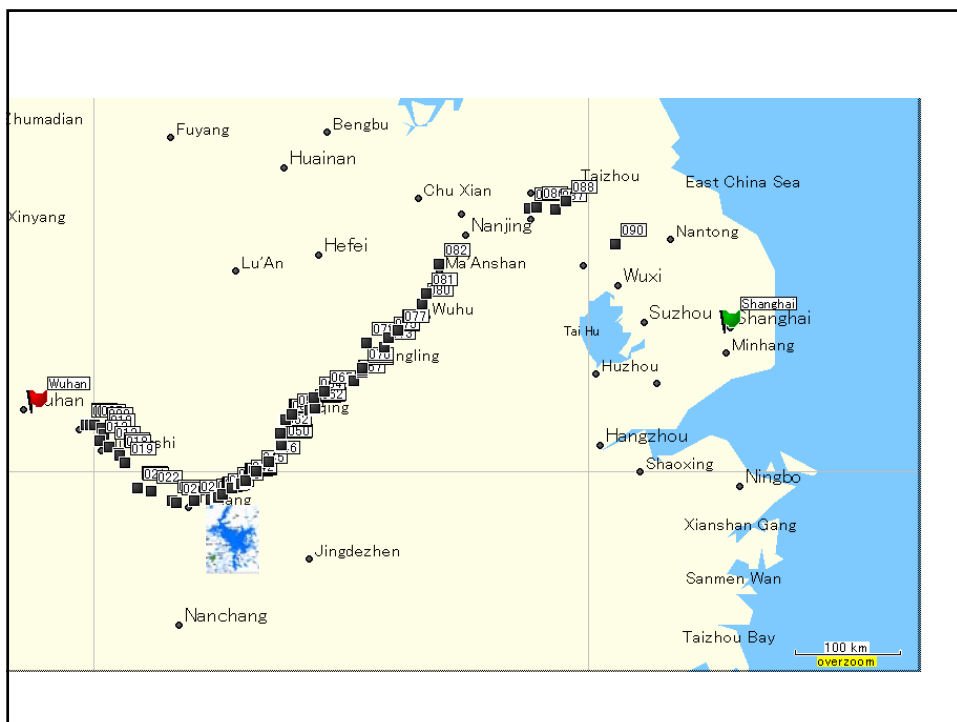
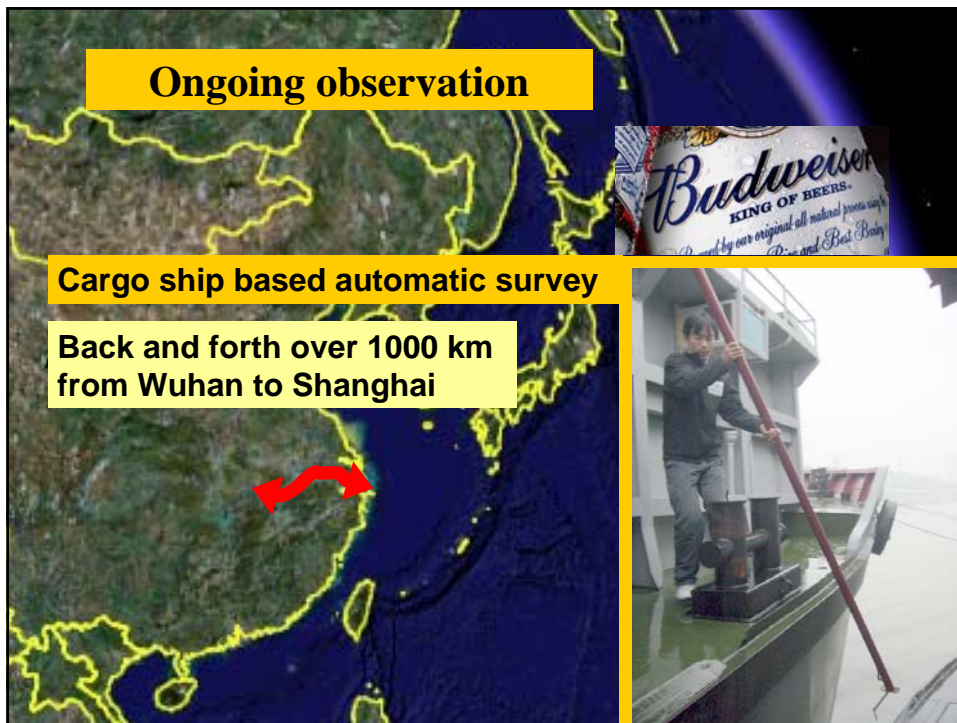
Pa= 45.8%
N = 445 = 204 / 0.458

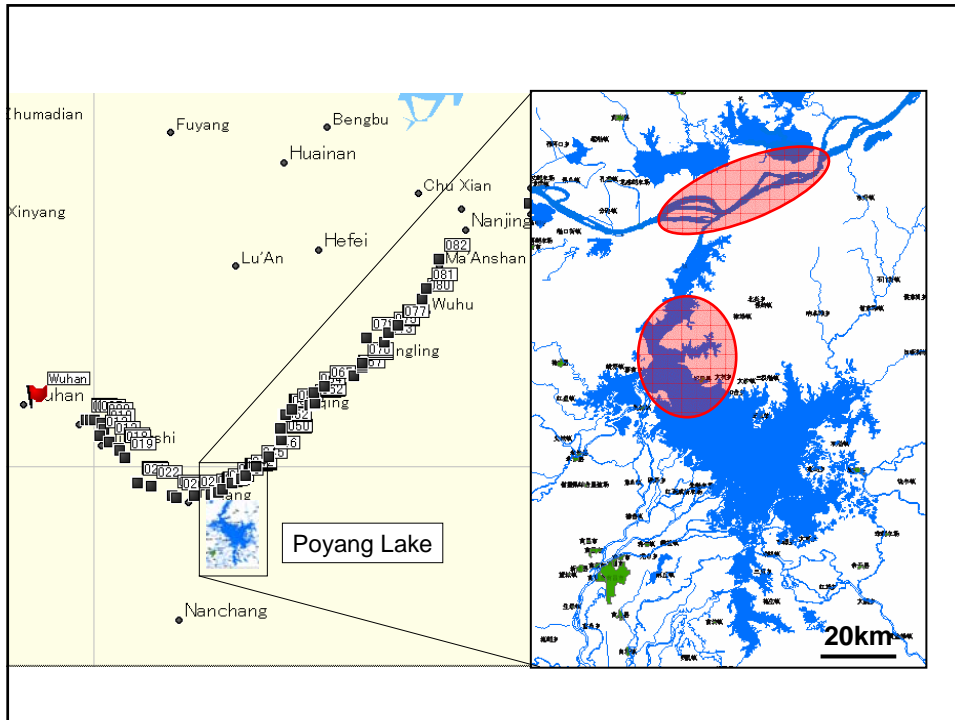
Population size = Density x Area

Density = 0.436 porpoises/km², where L=1700km, w=600m
 Area= 1700-3400 km², where L=1700km, W=1-2km


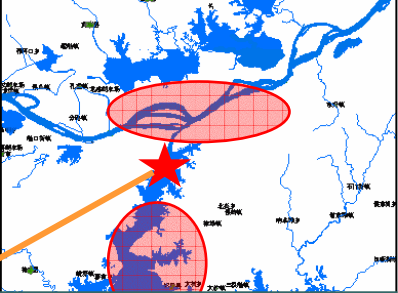
Estimated Population size = 742 – 1,483
This study

Independent visual estimation = 1,111 (CV=0.15)
Zhao et al. Biological Conservation (2008)


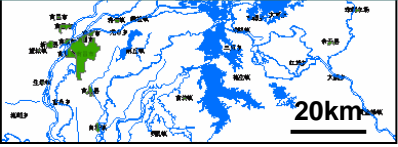


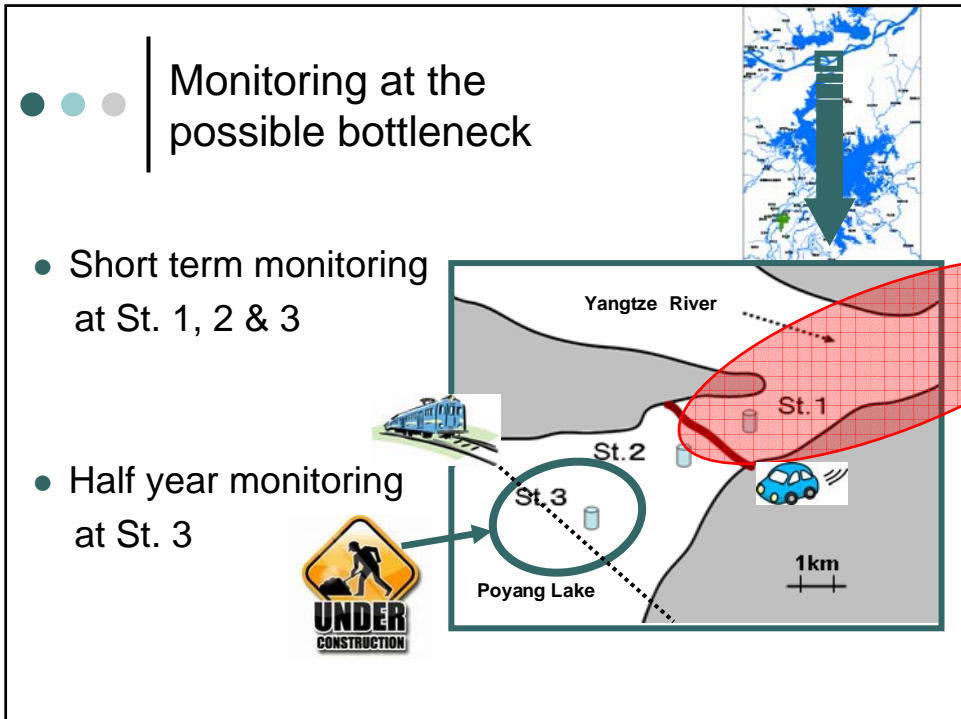


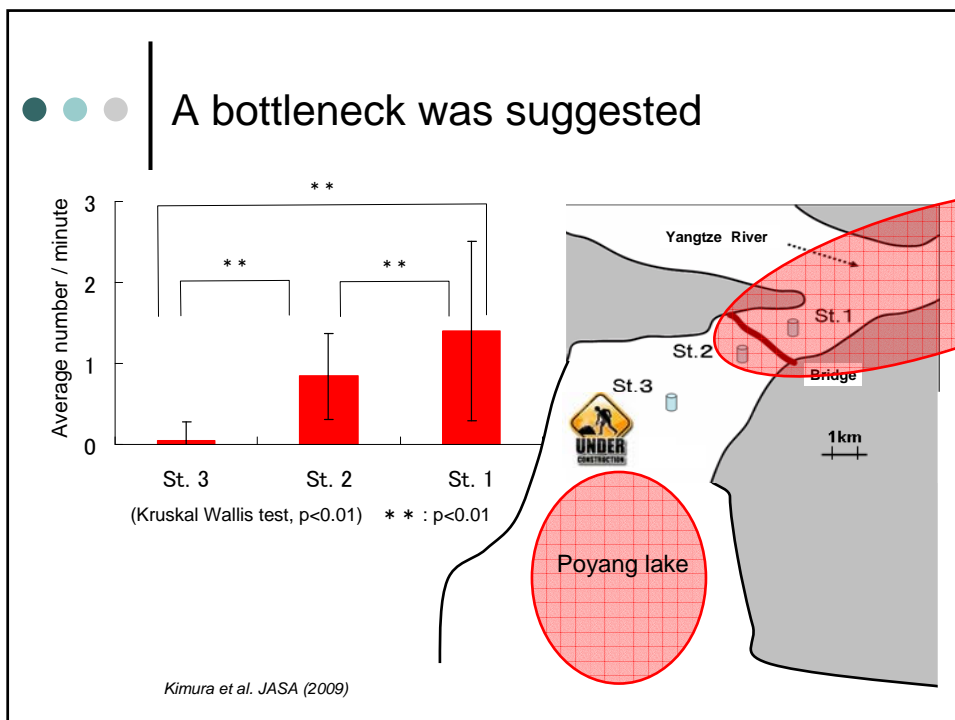
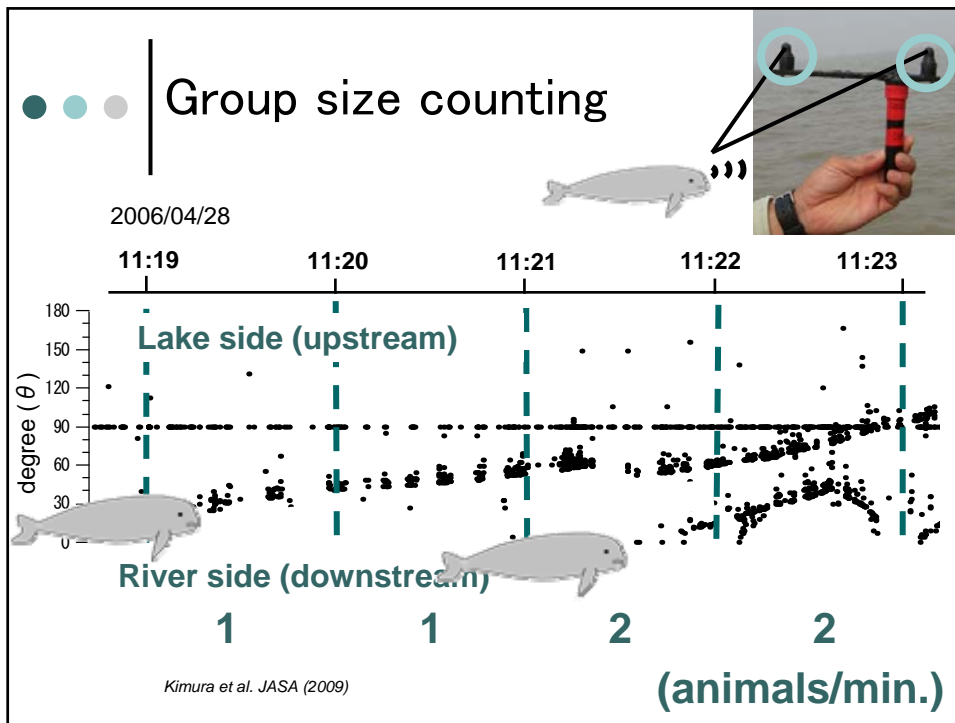
● ● ● | A bottleneck?

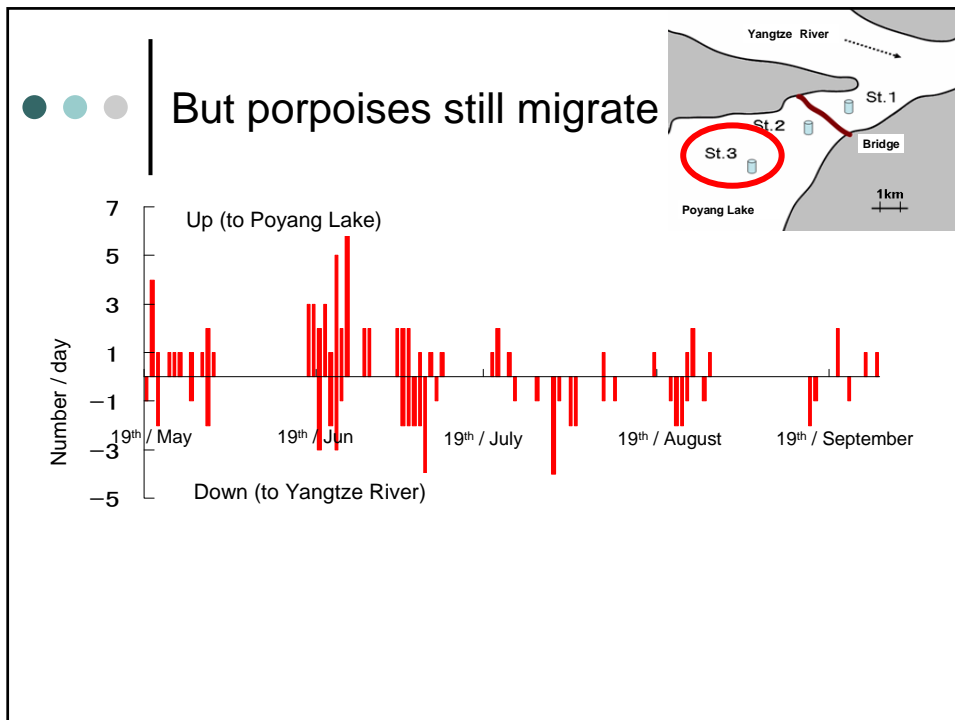



our question
Are the populations going to be fragmented?







Conclusions

- 1. Yangtze finless porpoises could be counted acoustically by towing and stationary stereo pulse event recorders.**
- 2. Acoustics was powerful method to observe isolated animal in the low density area.**

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Acknowledgements

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