Whistles source levels of Indo-Pacific humpback dolphins (*Sousa chinensis*) in China

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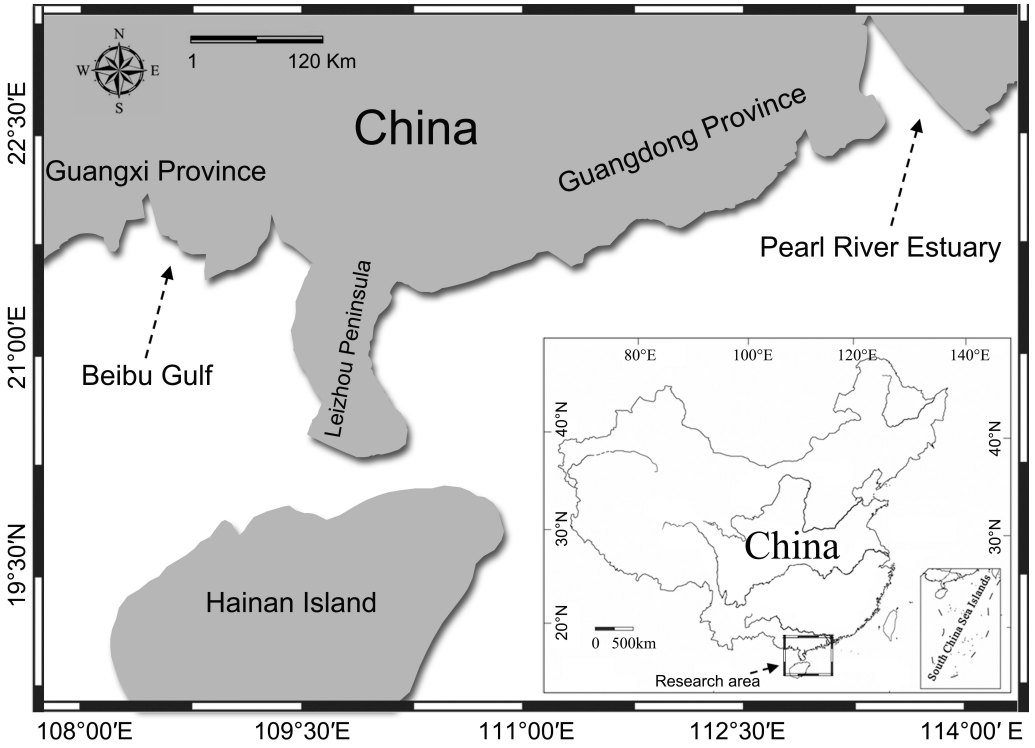
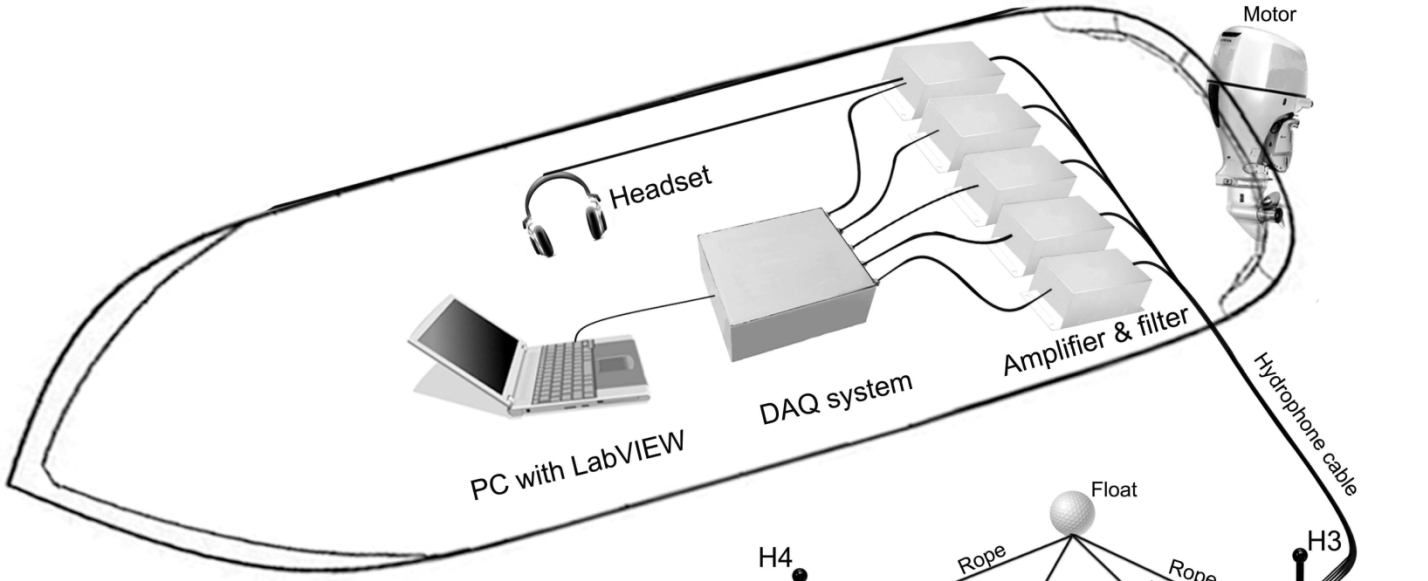
The Indo-Pacific humpback dolphins (*Sousa chinensis*) is widely distributed throughout the shallow, coastal of the Southern China Sea (Jefferson et al 2014)

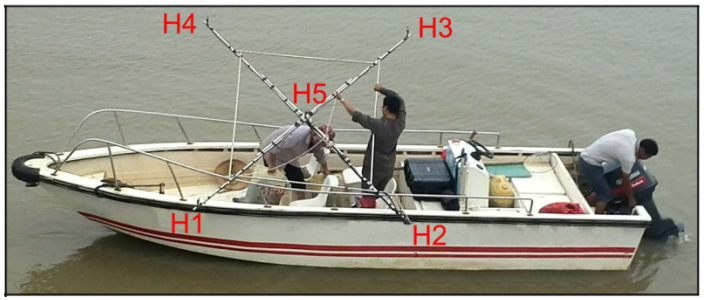
Pink dolphin in Hongkong

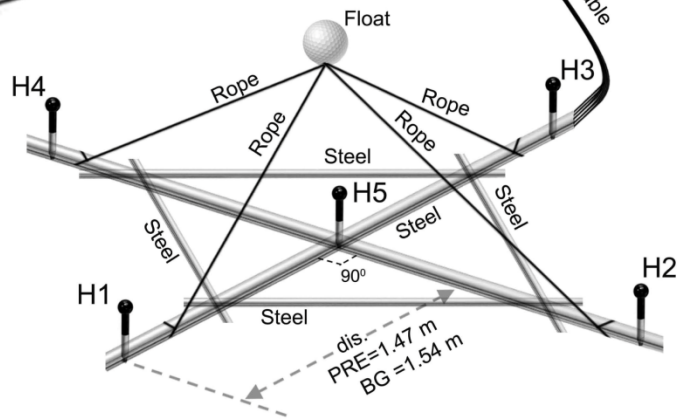
- Grade One National Key Protected Animal in China
- Protection of the animal and regulation of noise pollution is currently constrained by sparse data on the animal vocalization characteristics such as the whistle source level



Map of the study area

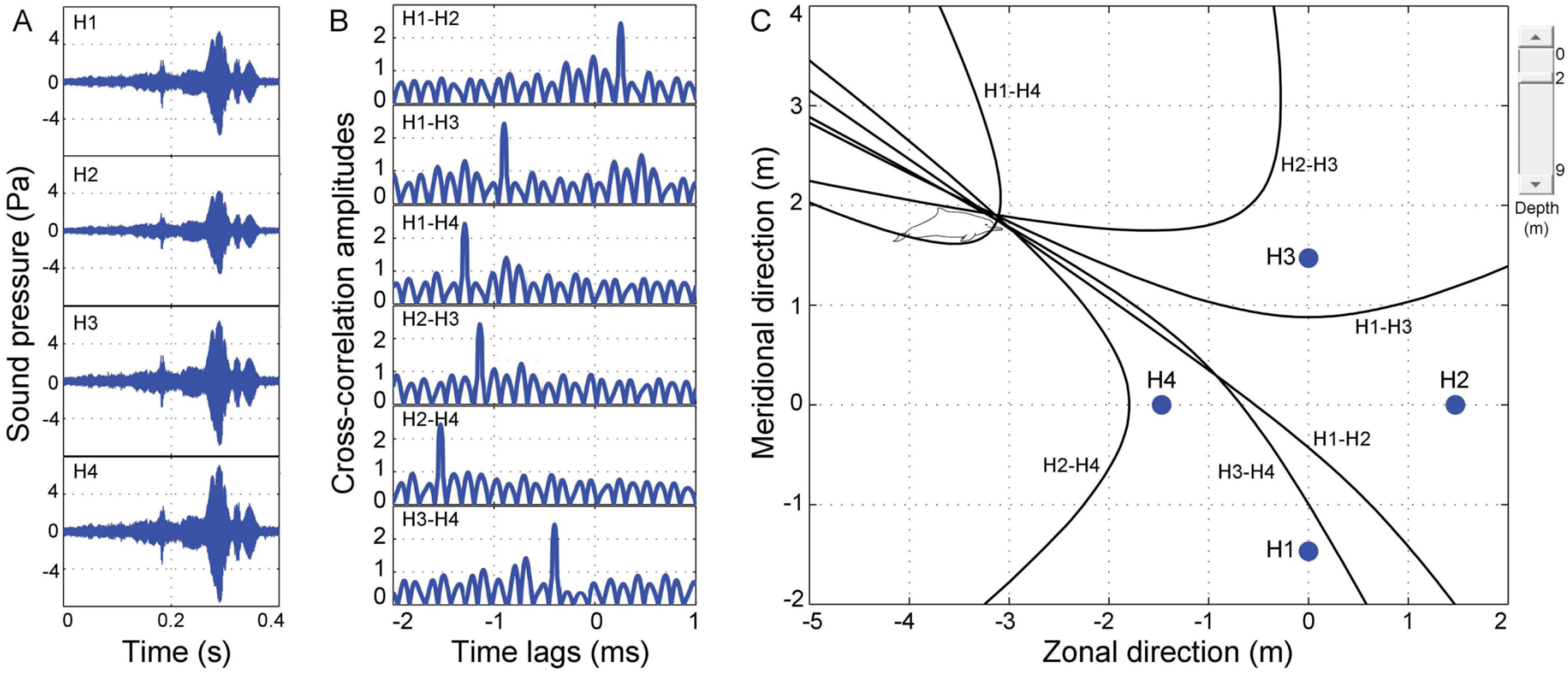






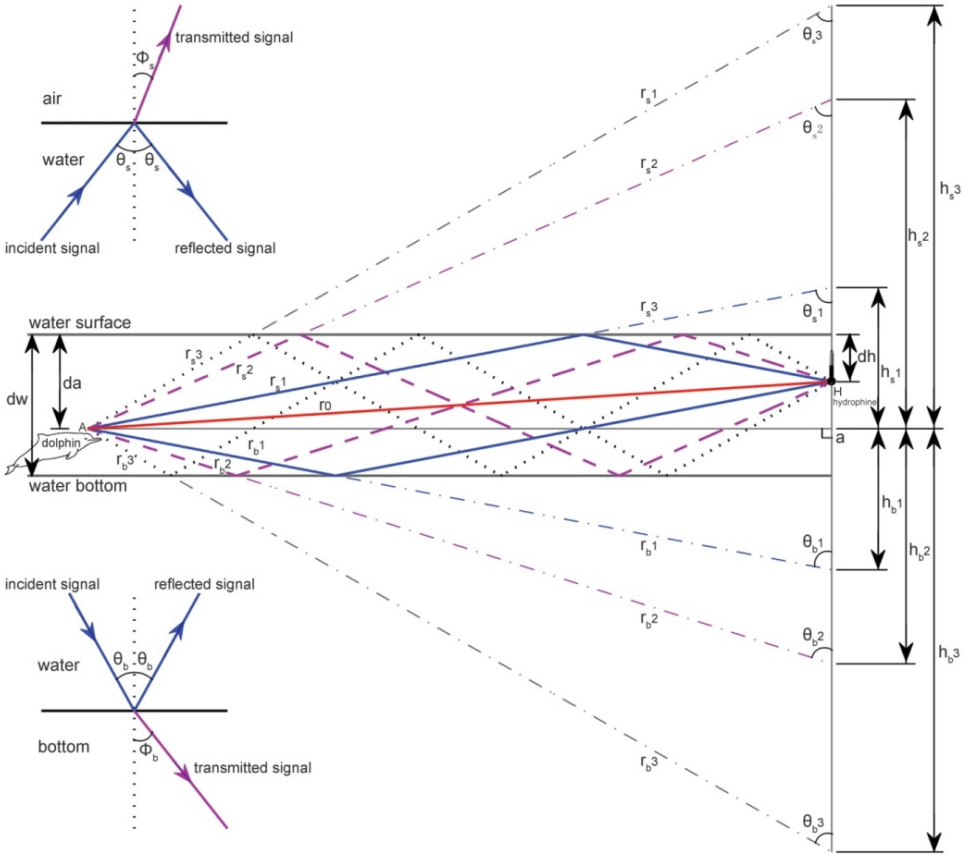
Array design: Two-dimensional cross-shaped 5 hydrophone array

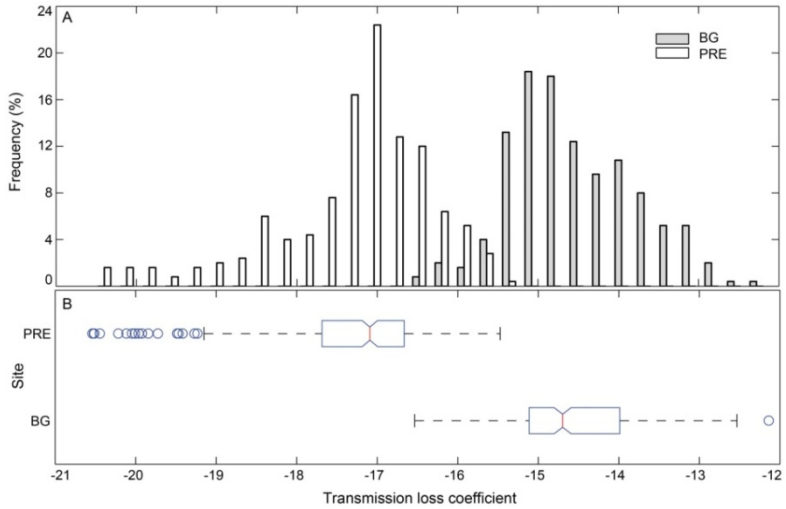
Schematic of dolphin localization



Waveform cross correlation

Hyperbola fixing





Shallow water sound propagation
Multi-path propagation modelling

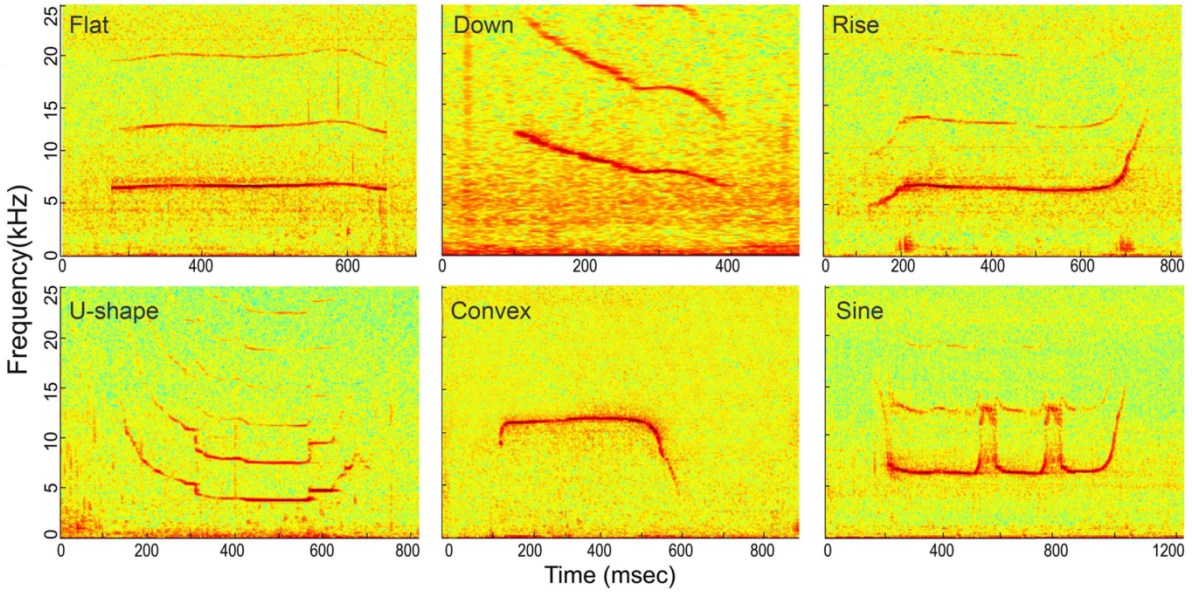
- **PRE :-17.3 ± 1.0 (mean ± SD)**
- **range: from -20.5 to -15.5**
- **BG: -14.6 ± 0.8 (mean ± SD)**
- **range: from -16.5 to -12.1**

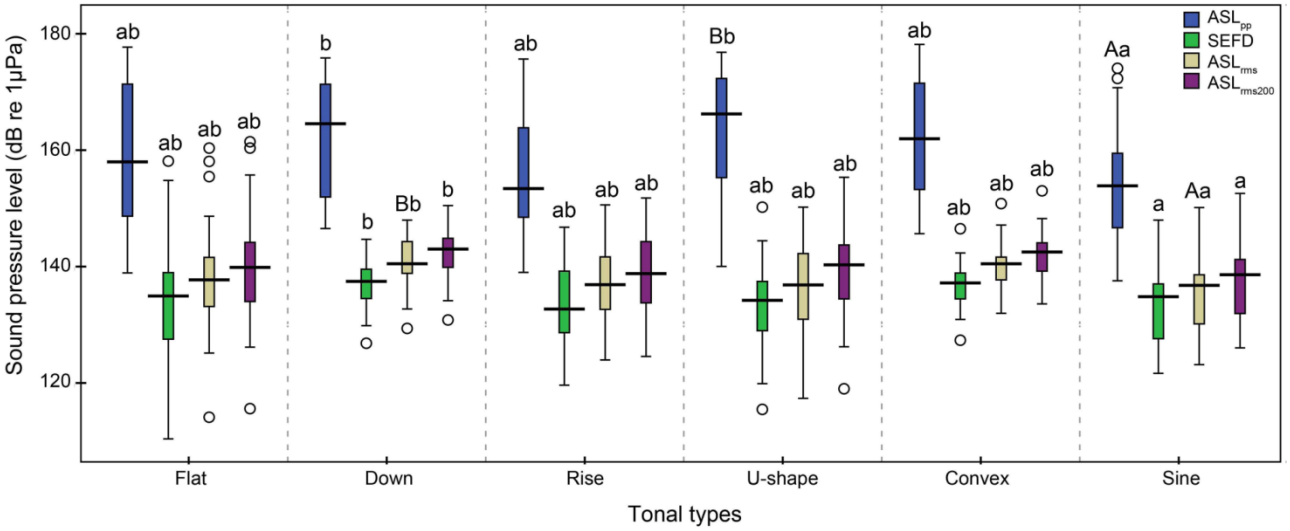
Results

	PRE(n=33)		BG(n=209)			
	mean±SD	Range	mean±SD	Range	z	p
ASL_{pp}	157.1±9.4	138.9-177.0	161.3±13.4	137.6-178.3	-1.1	0.26
ASL_{rms}	138.5±6.8	125.2-158.1	137.2±7.0	114.1-160.4	-0.8	0.42
ASL_{rms200}	140.3±7.3	126.3-160.4	139.3±6.9	115.6-161.4	-0.4	0.66
SEFD	135.2±7.4	120.7-154.8	134.0±6.8	110.4-158.1	-0.7	0.46

PRE: Pear-River Estuary; BG: Beibu Gulf

ASLs: apparent source levels; SEFD: source energy flux density


Flat
Down
Rise
U-shape
Convex
Sine
Frequency(kHz)
Time (msec)


Sound pressure level (dB re 1μPa)
Tonal types
Flat
Down
Rise
U-shape
Convex
Sine
ASL$_{pp}$
SEFD
ASL$_{rms}$
ASL$_{rms200}$

Application:

(1) evaluating the appropriate noise exposure level for *Sousa*

(2) expanding the application of passive acoustic monitoring strategy, such as in the scope of local population abundance estimation.

(3) estimating active communication range