Baseline status of the Indo-Pacific humpback dolphin, *Sousa chinensis*, in the Gulf of Thailand: What do we know and what will we need?

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My journey

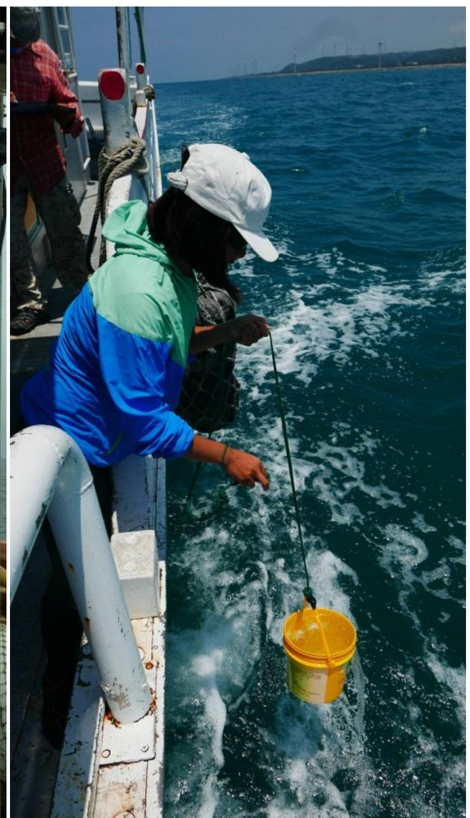
Beijing, 2011
China
IHB, Wuhan
2008-
2013
2013
2011
2012
2012
DEBFS
NTOU
2012-14
TIO
2014
IEEB,
NTU
2009-11
SU
2014
DO, QU
2013-
SYSU
SWIMS, HKU
2014-15
??
2015-
Taiwan
2013
2014
SIDSSE, CAS
2013-
South
China Sea
2015
Thailand
Vietnam
PSU
2014-

This is what we expect

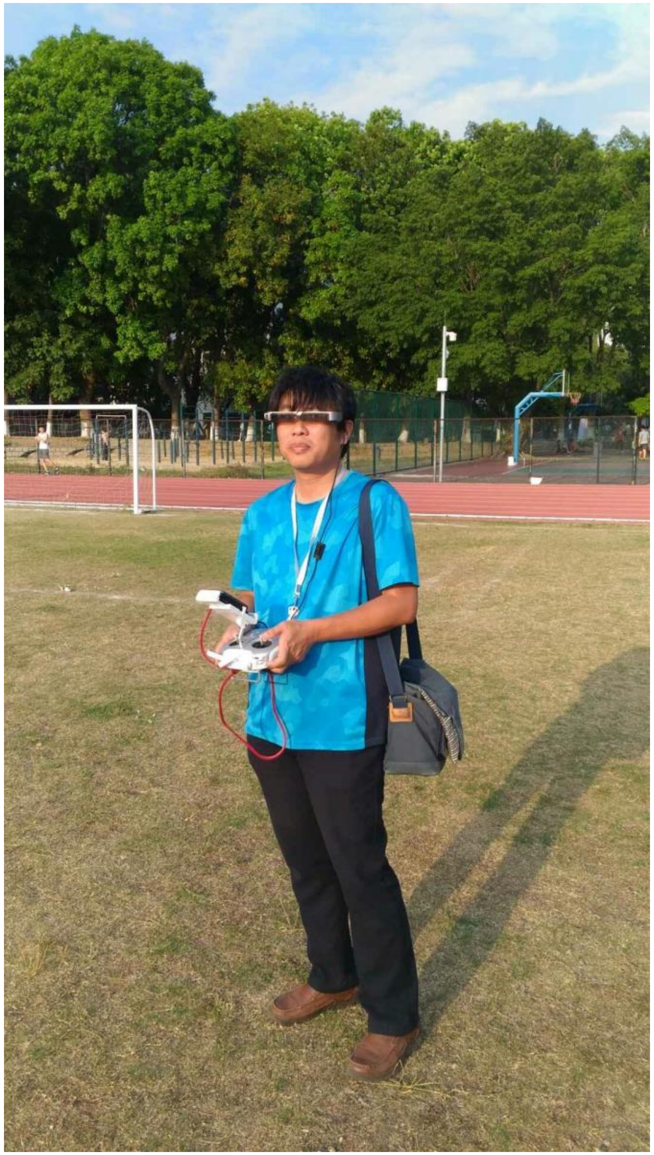
Qinzhou University

This is what we frequently met

Field works

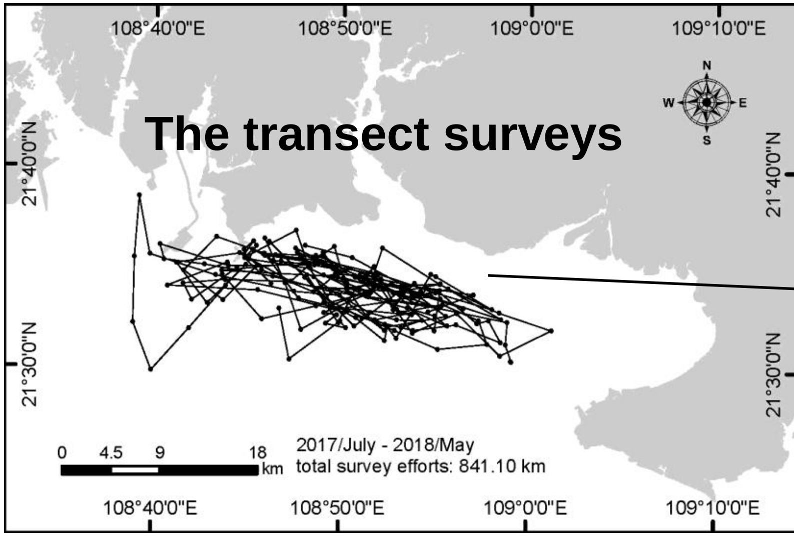


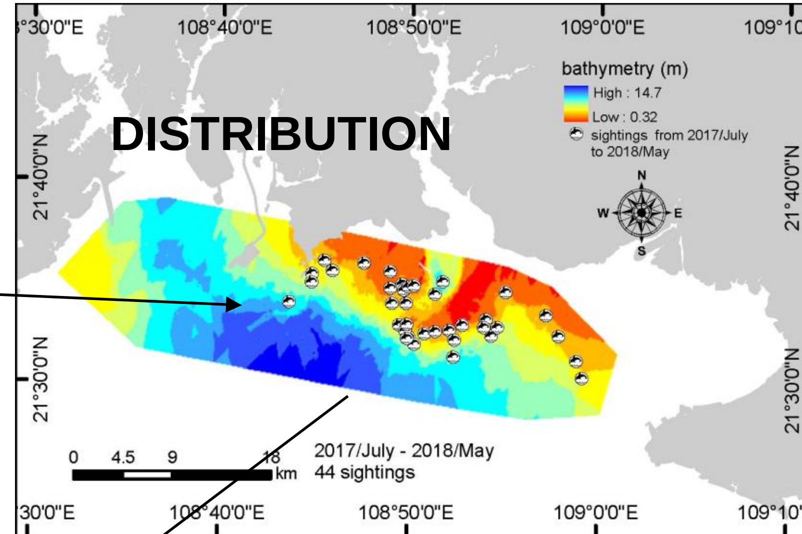
Some new techs



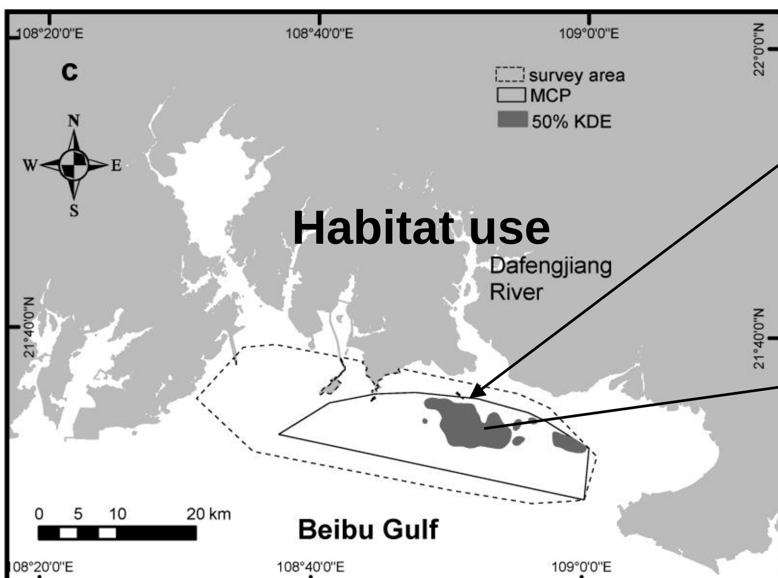
Videos by drone

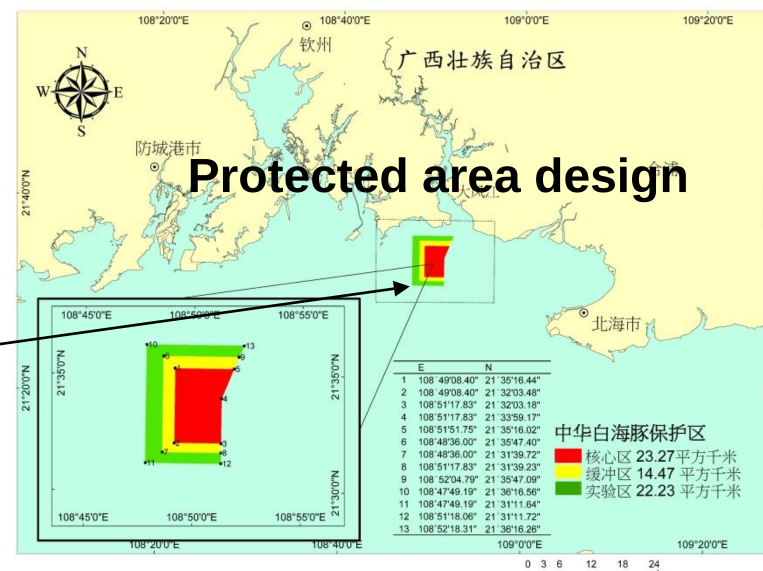
For what we did these surveys?





Wu et al 2017





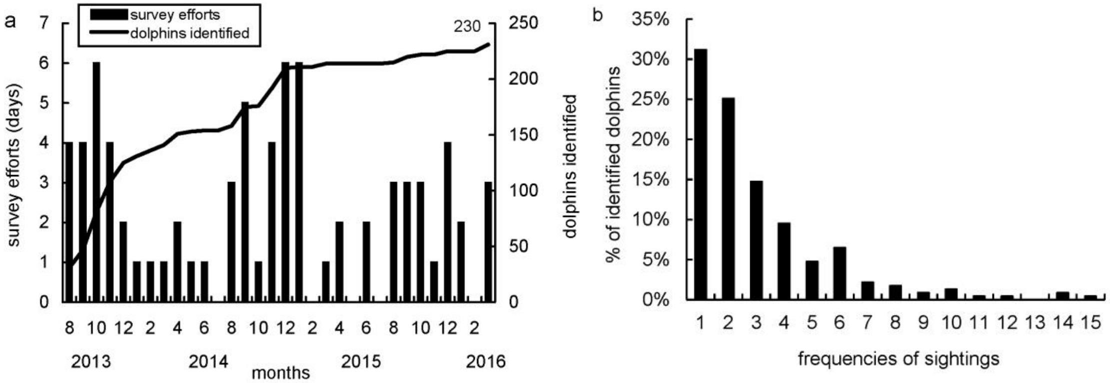
	E	N
1	108°49'08.40"	21°35'16.44"
2	108°49'08.40"	21°32'03.48"
3	108°51'17.83"	21°32'03.18"
4	108°51'17.83"	21°33'59.17"
5	108°51'51.75"	21°35'16.02"
6	108°48'36.00"	21°35'47.40"
7	108°48'36.00"	21°31'39.72"
8	108°51'17.83"	21°31'39.23"
9	108°52'04.79"	21°35'47.09"
10	108°47'49.19"	21°36'16.56"
11	108°47'49.19"	21°31'11.64"
12	108°51'18.06"	21°31'11.72"
13	108°52'18.31"	21°36'16.26"

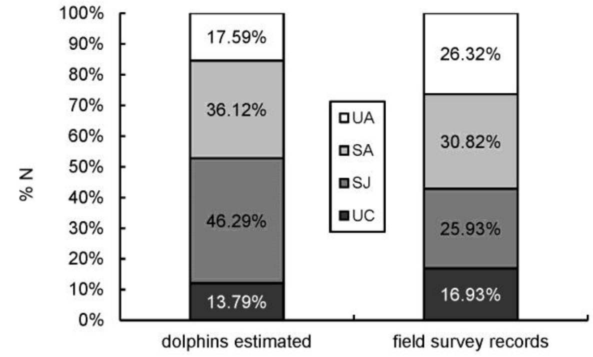
Why do we photo?

Dr. Haiping Wu, unpublished data

What can photo-ID surveys tell us?

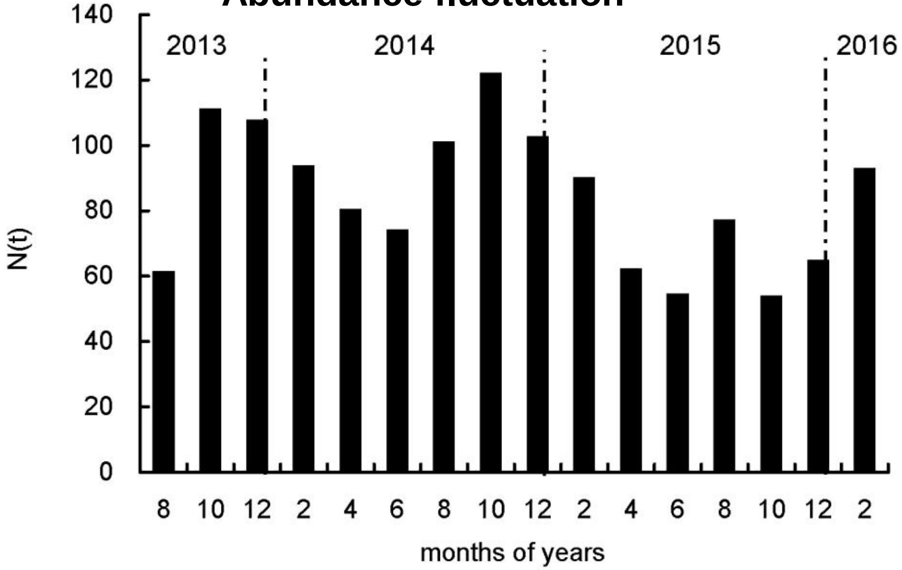
Dr. Haiping Wu & Chongwei Peng, unpublished data

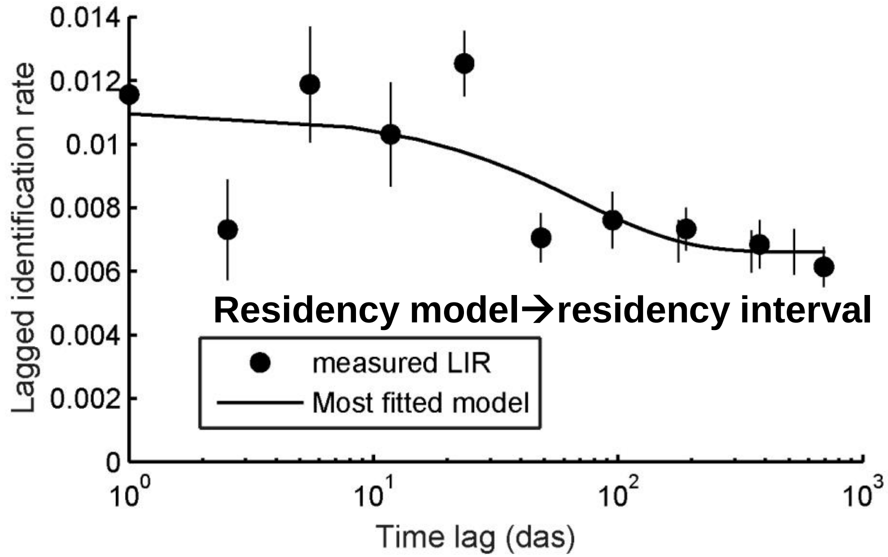




Age structure→demography

Abundance fluctuation





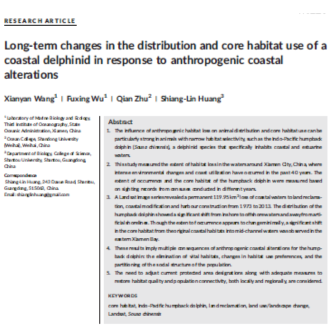
Residency model→residency interval

What do these ‘baselines’ represent?

papers?

Biological conservation

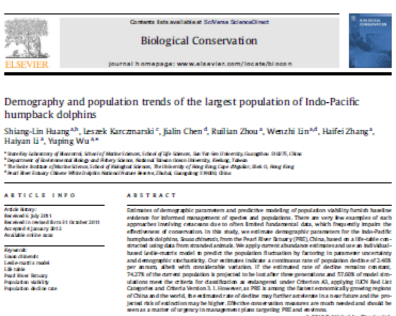
- **Species protection**: endangered, threatened, endemic, rare, precious
- **Biodiversity conservation**: species diversity, indicator species, umbrella species, key habitats
- **Ecosystem integrity**: functions, integrity


RESEARCH ARTICLE

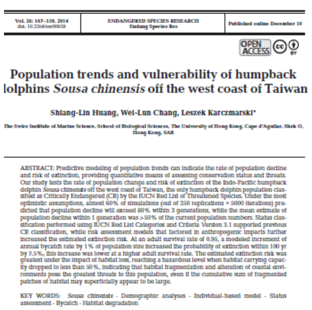
Long-term changes in the distribution and core habitat use of a coastal delphinid in response to anthropogenic coastal alterations


Estuarine, Coastal and Shelf Science

Impact of long-term habitat loss on the Japanese eel *Anguilla japonica*


Biological Conservation

Demography and population trends of the largest population of Indo-Pacific humpback dolphins


Population trends and vulnerability of humpback dolphins *Sousa chinensis* off the west coast of Taiwan

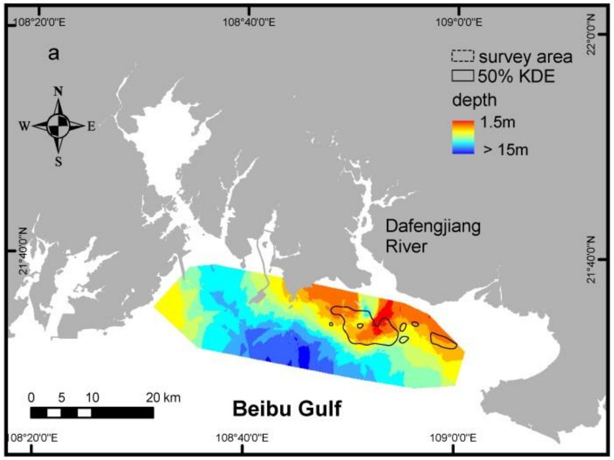

Biological Conservation

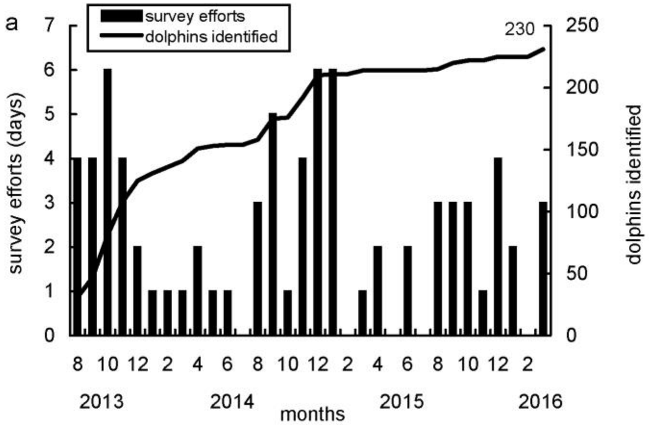
Saving the Yangtze finless porpoise: Time is rapidly running out

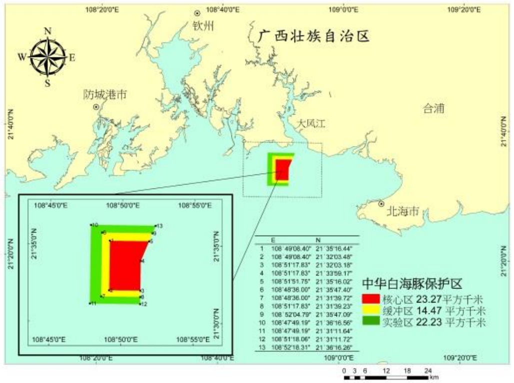
STEPS

- **S**ites, **s**pecies and **s**urrogates to be protected—oceanographic characteristics of key habitats
- **Threat** identification (extent, frequency, intensity)-intense coastal alterations, climate changes
- **Evaluation**: **status**, impact and risks, functions and values
  1. economic values (fisheries, mining, energy…)
  2. species diversity, endangered animals
  3. CO_2 fixation, nutrition functions, biomass production, carrying capacity
- **P**: **P**lanning (HPA, SCP)
- **S**: social conscious and stakeholder attitudes

Researches for conservation







- **(S) baselines: N, m, q, distribution, critical habitats**
- **(T) Long-term trends:** dN/dt, habitat changes
- **(E) assessments:** PE, TE (PVA, RA, …)
- **(P) policies: status,** PA design, long-term monitoring, management and community collaboration
- **(S) stakeholder baselines**: questionnaires

Why is above information needed?

IUCN Red List Categories and Criteria (IUCN, 2001)

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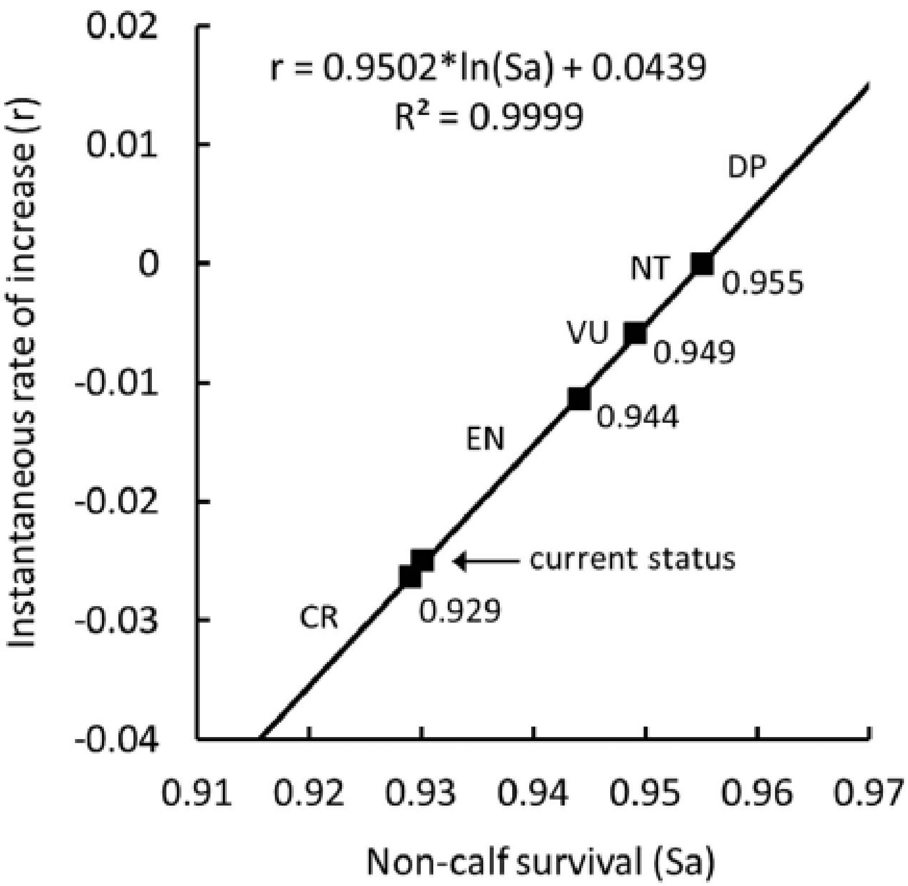
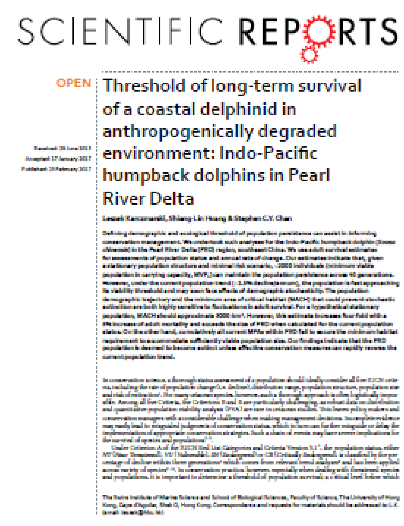


- Five criteria (**A, B, C, D, E**)
- **Population size** (C, D)
- **Distribution** (B)
- **Rate of decline**, demography (A, C)
- **Viability** (D, E)



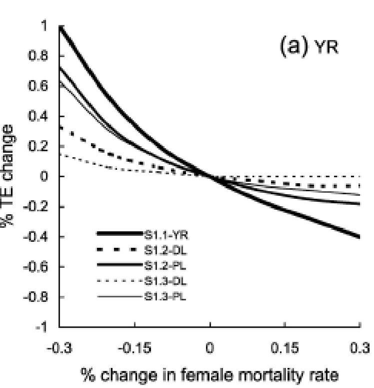
SCIENTIFIC REPORTS

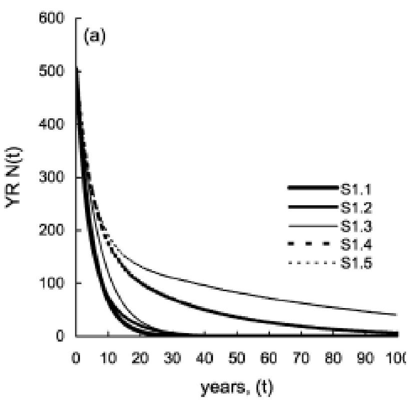
OPEN

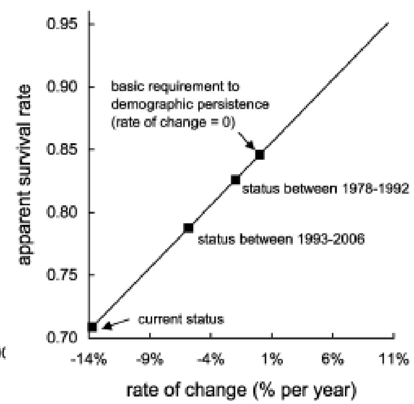
Threshold of long-term survival of a coastal delphinid in anthropogenically degraded environment: Indo-Pacific humpback dolphins in Pearl River Delta

Viability (Criteria D, E)

- A measure of risk to location extinction,
- probability of extinction (PE)
- **PE** = f(**population size**, **survival rate**, **reproductive rate**, **threats-strength and frequency**)
- Population viability analysis (PVA)





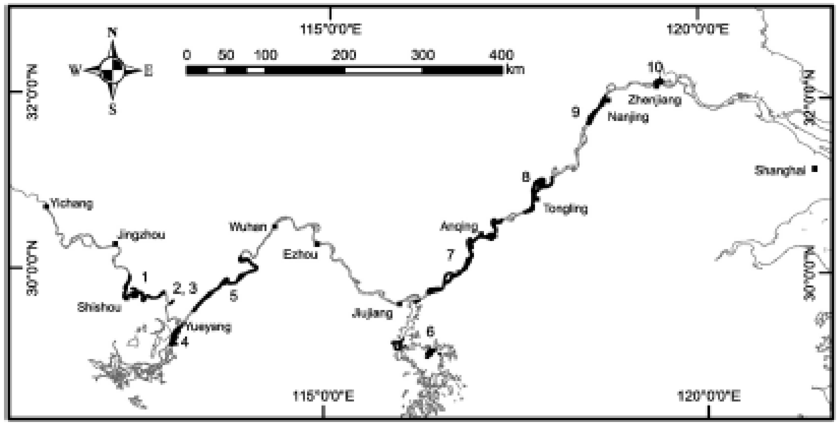


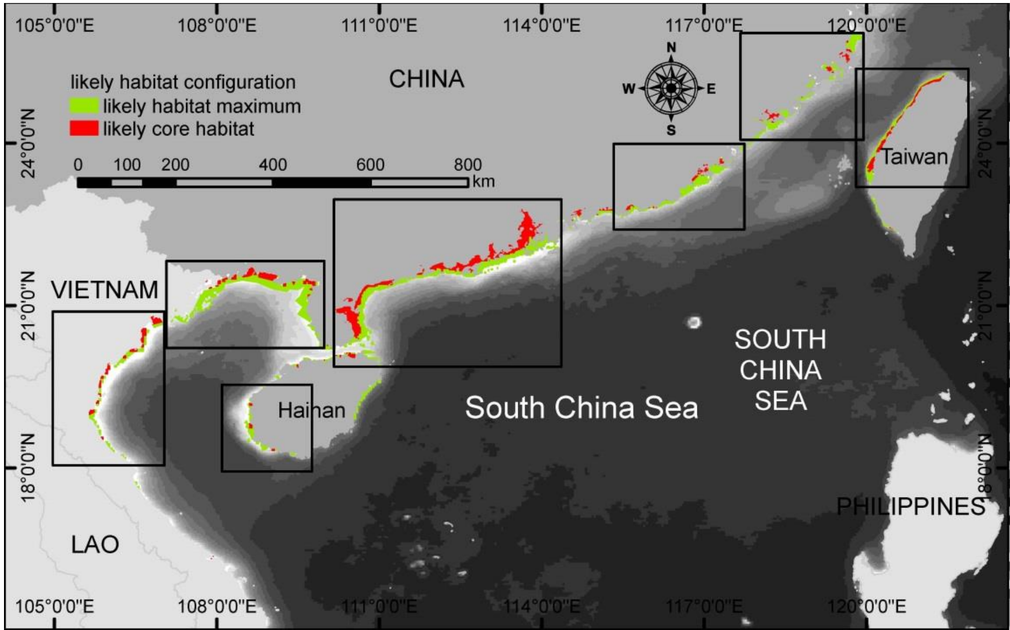
Population size (Criteria C, D)

- Number of **adults** (adult females)
- Transect, photo-ID (CMR) analyses
- Demographic unit: number, connectivity →
- distribution

Distribution (Criterion B)

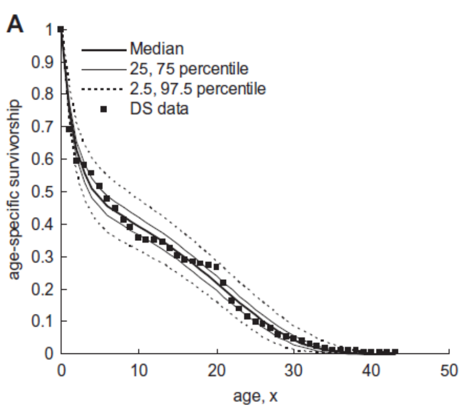
- Extent of occurrence (B1a): measured by MCP (minimum convex polygon)
- Extent of occupancy (B1b): associated with 50% (or 25%) KDE (kernel density estimate)
- Demographic unit

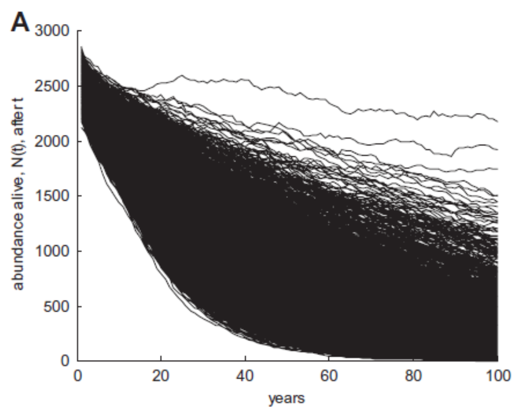


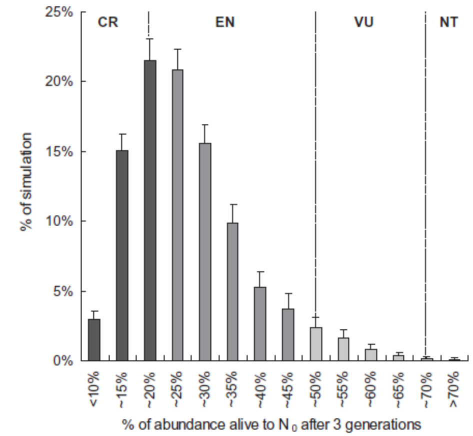


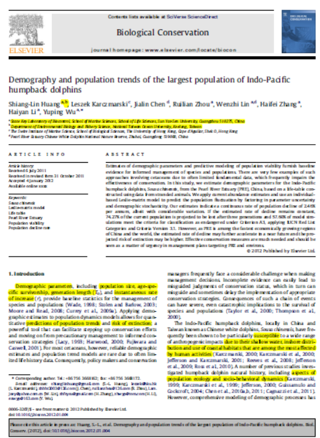
Rate of decline (Criteria A, C)

- **Generation length** (humpback dolphin = 20-22 years): 1, 2, 3 generations, or 100 years
- Change of N, demographic and trend analysis
- f(survival rates, reproductive interval, reproductive span, brood size)








Biological Conservation

Demography and population trends of the largest population of Indo-Pacific humpback dolphins

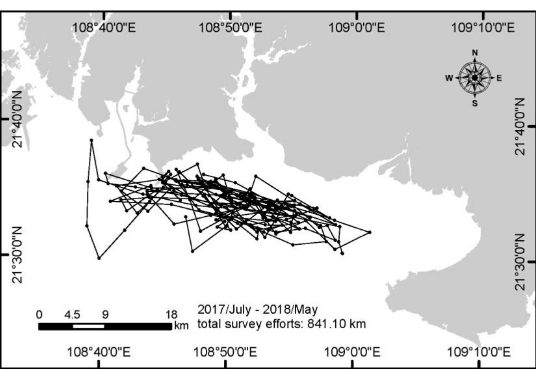
IUCN Red List Categories and Criteria (IUCN, 2001)

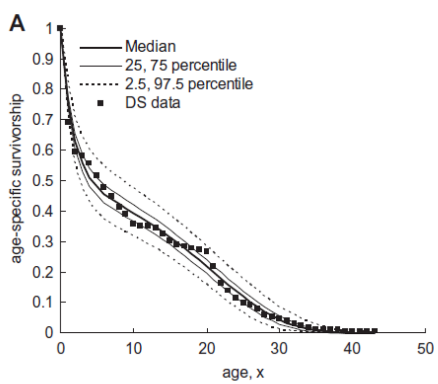
Criteria and baselines

- **Population size** (C, D)
- **Distribution** (B)
- **Rate of decline** (A, C)
- **Viability** (E)

Baselines and surveys

- **Photo-ID** → N
- Transect → **MCP, KDE**
- Photo-ID, life table → **s, r**
- **Demography analysis, PVA** → PE



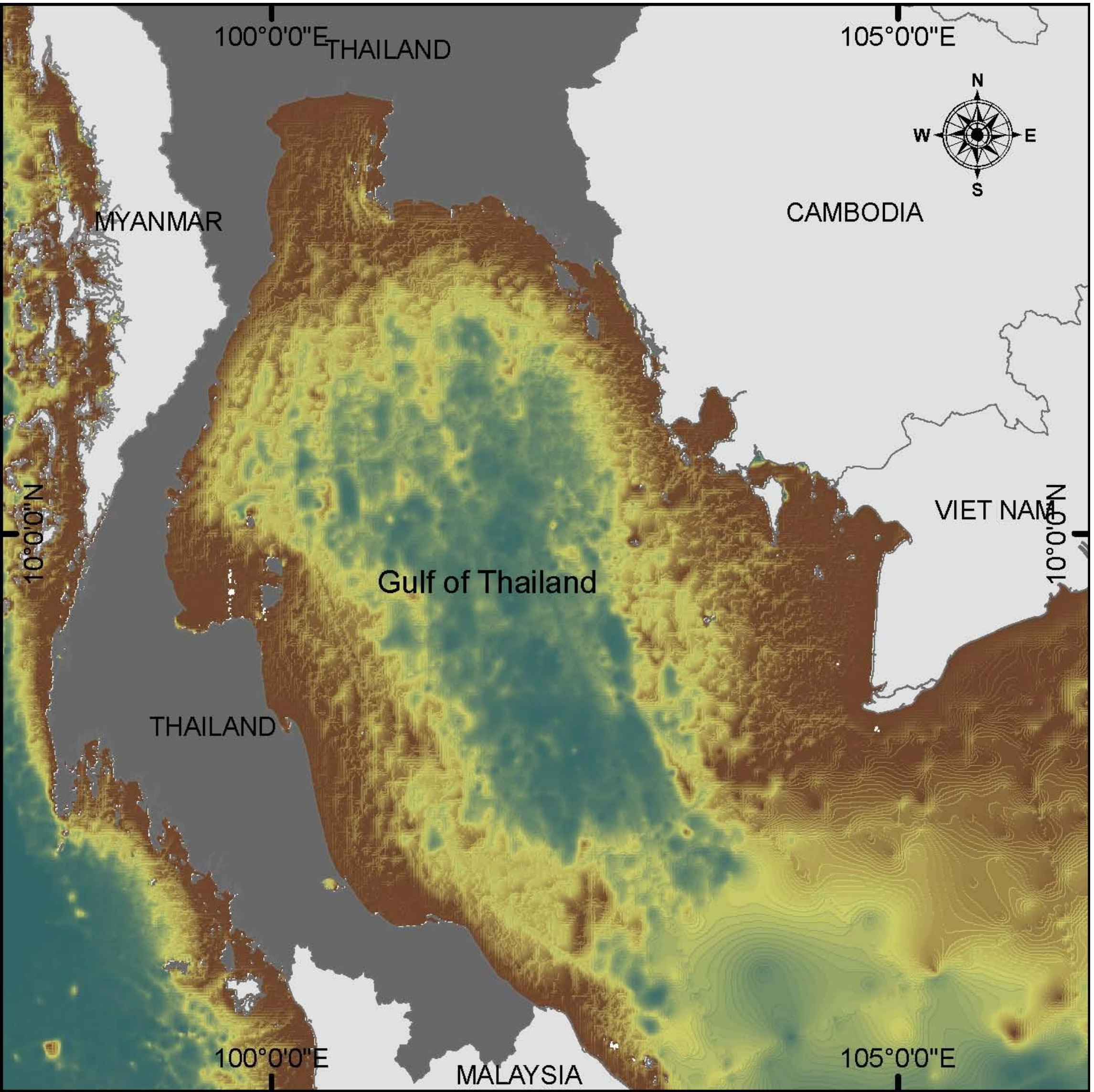


Dr. Haiping Wu, unpublished data

Let’s go back to Gulf of Thailand

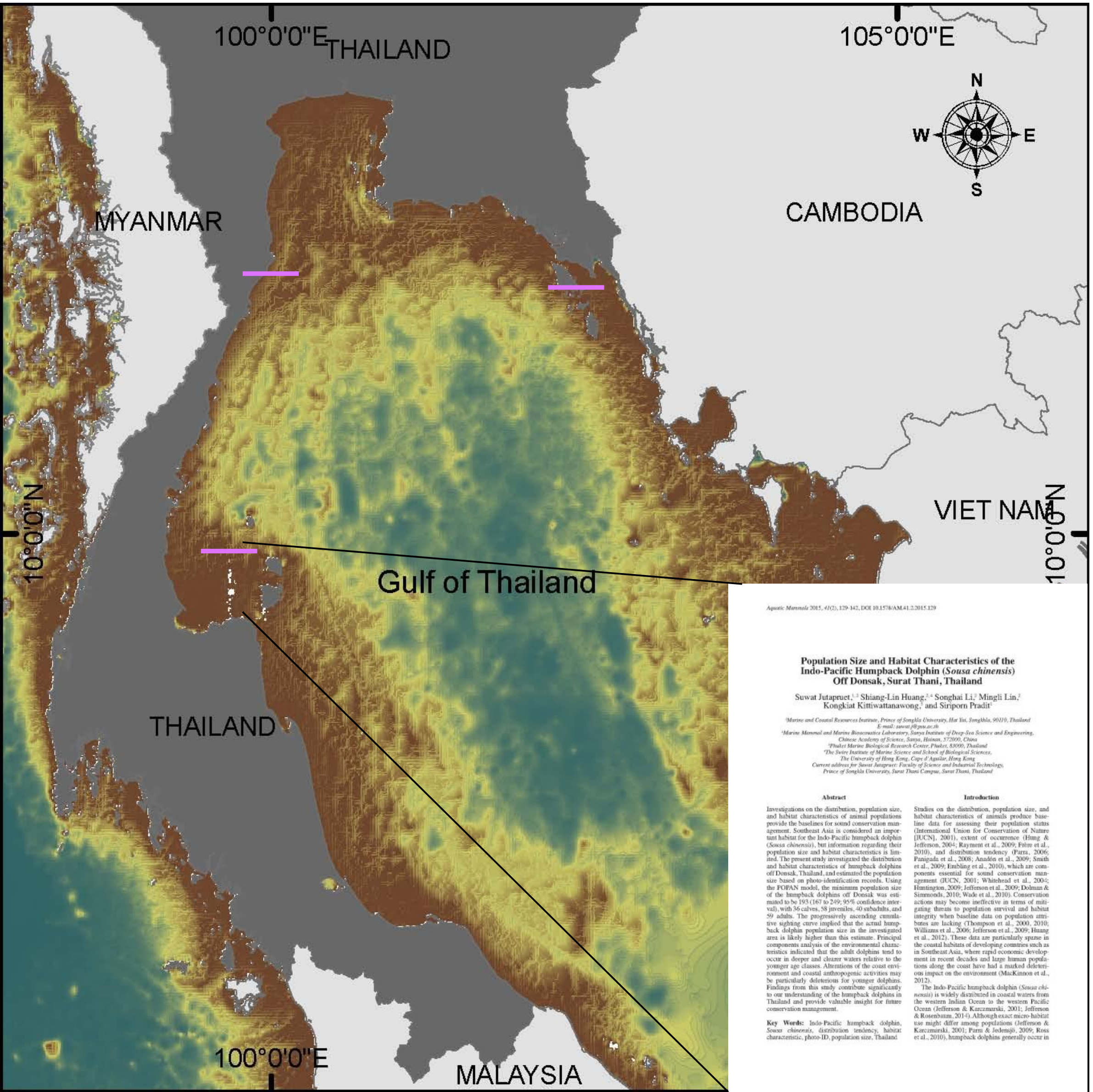
What’s the humpback dolphin’s current status?

Scale problem



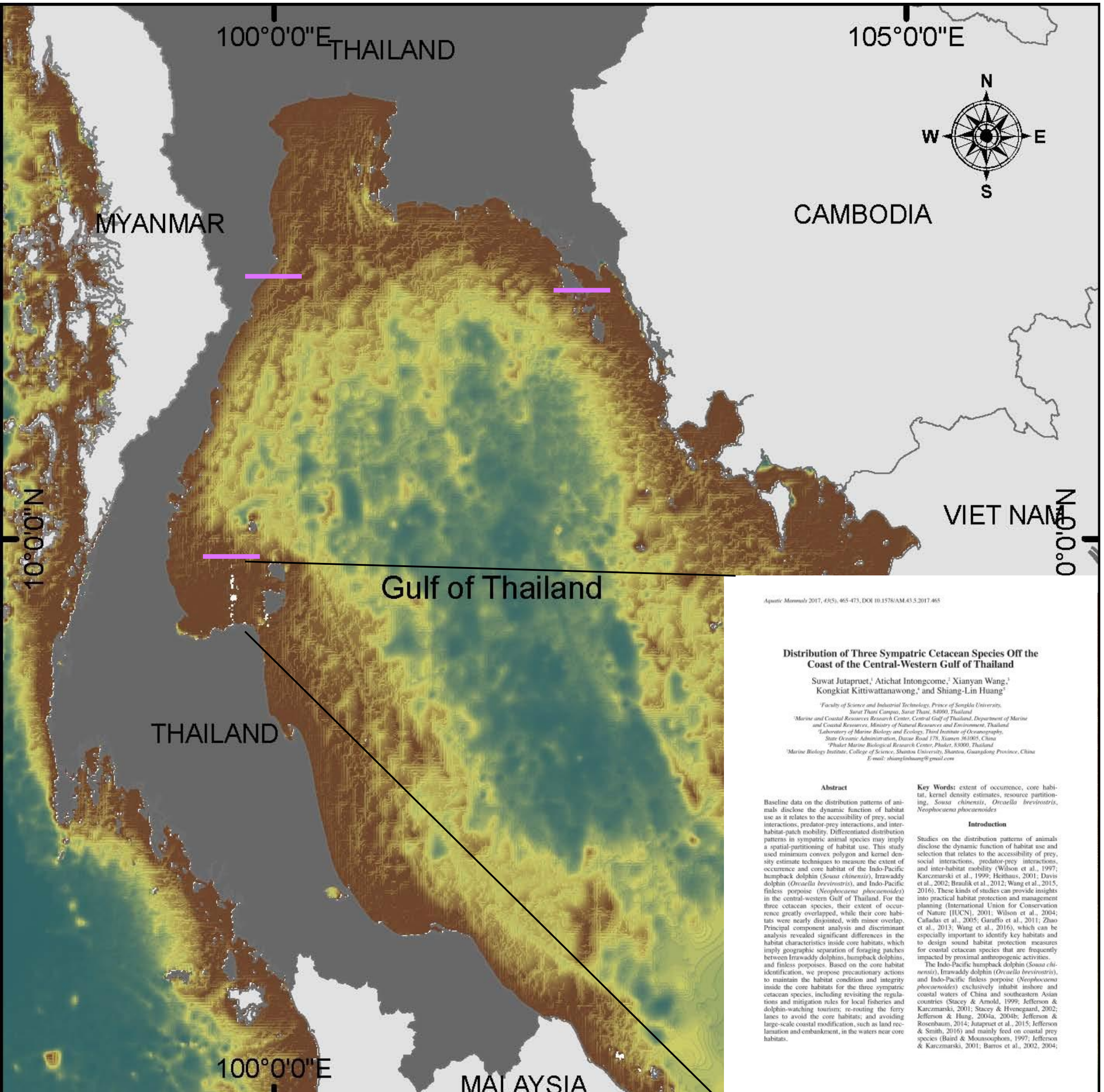
- Spatial: **Gulf of Thailand**
- **Demographical**: ?? (connectivity, occurrence sites)
- **→ great information gaps in population structure (connectivity) and occurrence sites**

Humpback dolphin status in Thailand — population size



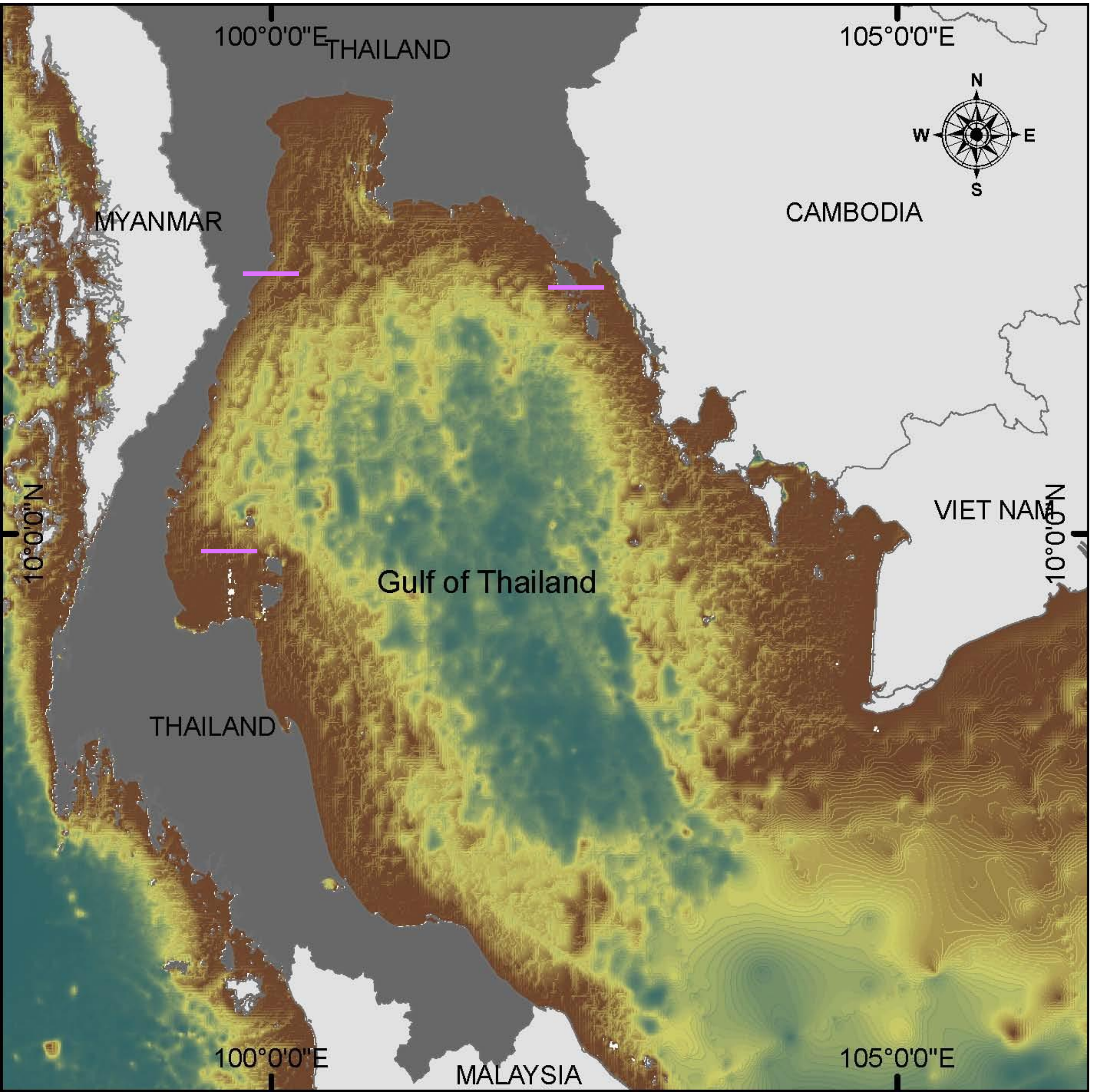
- Criterion C, D
- Donsak + Khanom: ~ 200 (Jutapruet et al. 2015)
- Others: no abundance estimates
- No further distribution information
- → **DD** (Data Deficient)
- → information gaps: **likely distribution ranges, regional abundance estimates**

Humpback dolphin status in Thailand — Distribution



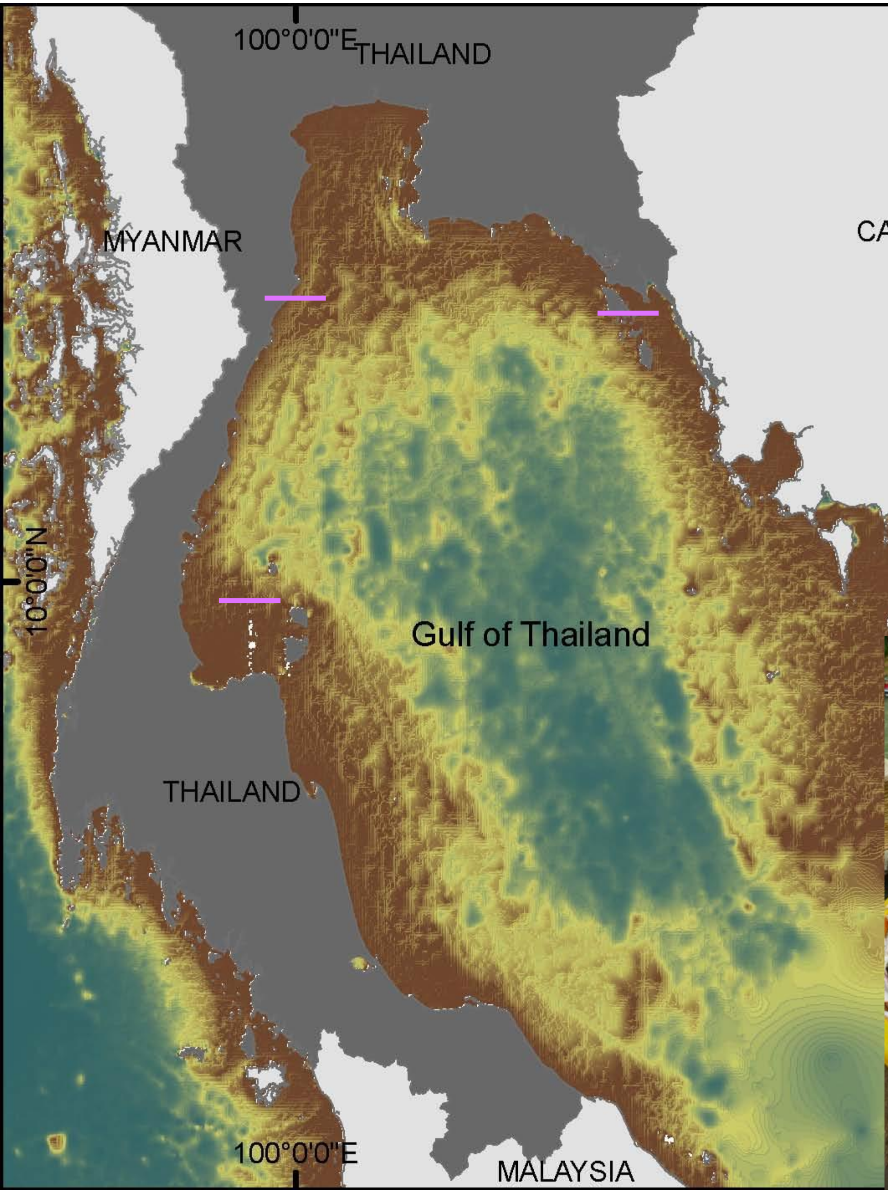
- Criterion B1a
- MCP, KDE: Surat Thani (Jutapruet et al. 2017)
- Others: no data
- → **DD** (Data Deficient)
- → information gaps: **likely distribution ranges, regional MCP and KDE**

Humpback dolphin status in Thailand — rate of decline, viability



- Criterion A, C, E
- Baselines: survival rates, reproductive rates, population demography
- NO DATA
- → **DD** (Data Deficient)
- → information gaps: **survival rate, reproductive rate, life history estimates**

Humpback dolphin status in Thailand — Likely Threats

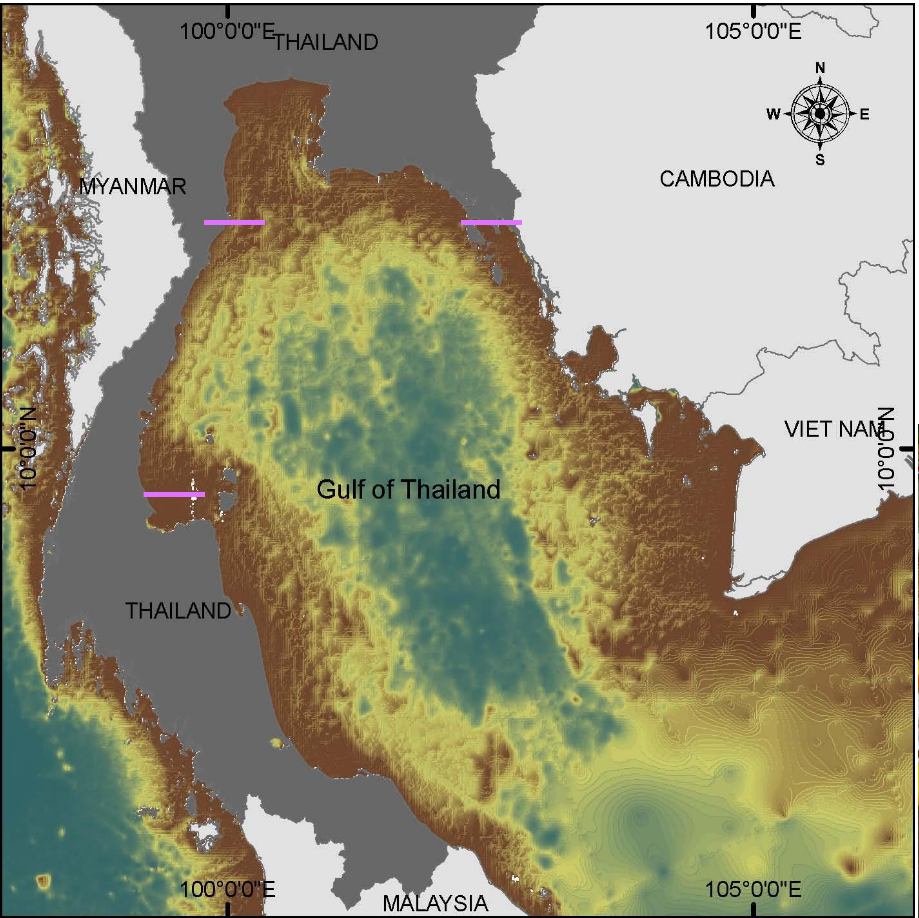


- Fishery (bycatch, prey depletion)??
- Pollution??
- **Dolphin watching??**
- **Coastal alteration: likely insignificant**
- **→ great information gaps → DD**

Humpback dolphin status in Thailand — Summary

- Status: **DD (Data Deficient) over Criteria A-E**
- **information gaps in**

1. likely distribution ranges
2. population structure and connectivity
3. regional abundance estimates
4. regional MCP/KDE
5. threats identification

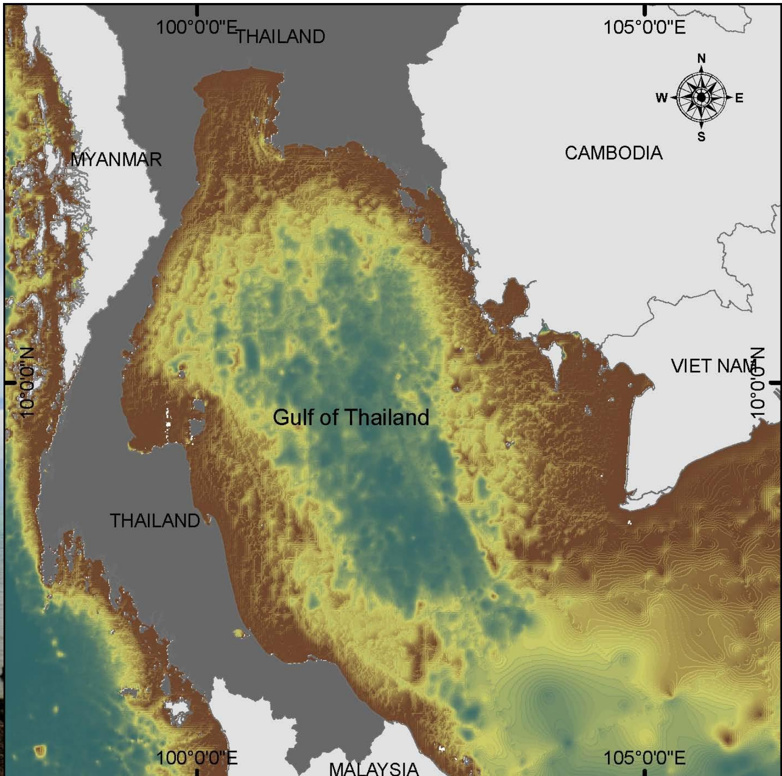


What should we do to bridge information gaps?

Researches enriching baselines

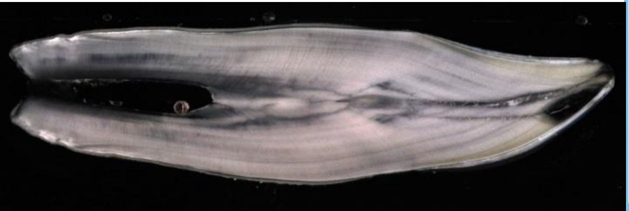
Information gaps

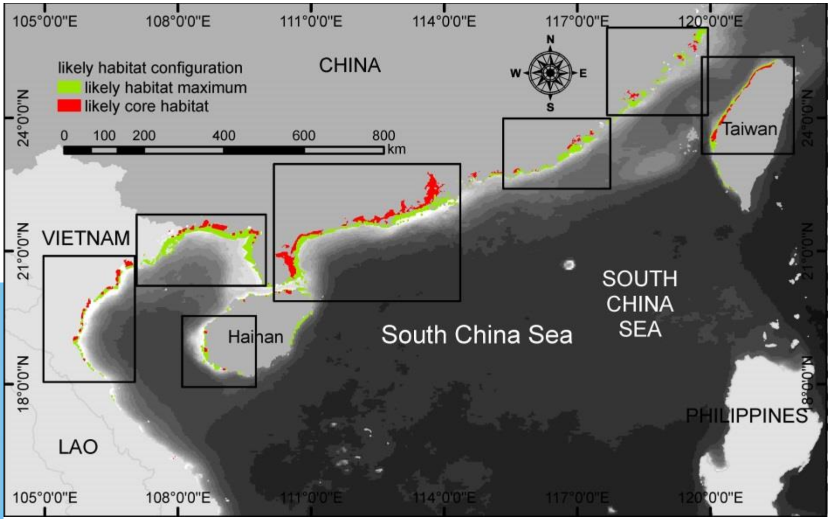
- likely distribution ranges
- population structure and connectivity
- regional abundance estimates
- regional MCP/KDE
- threats identification



Researches needed

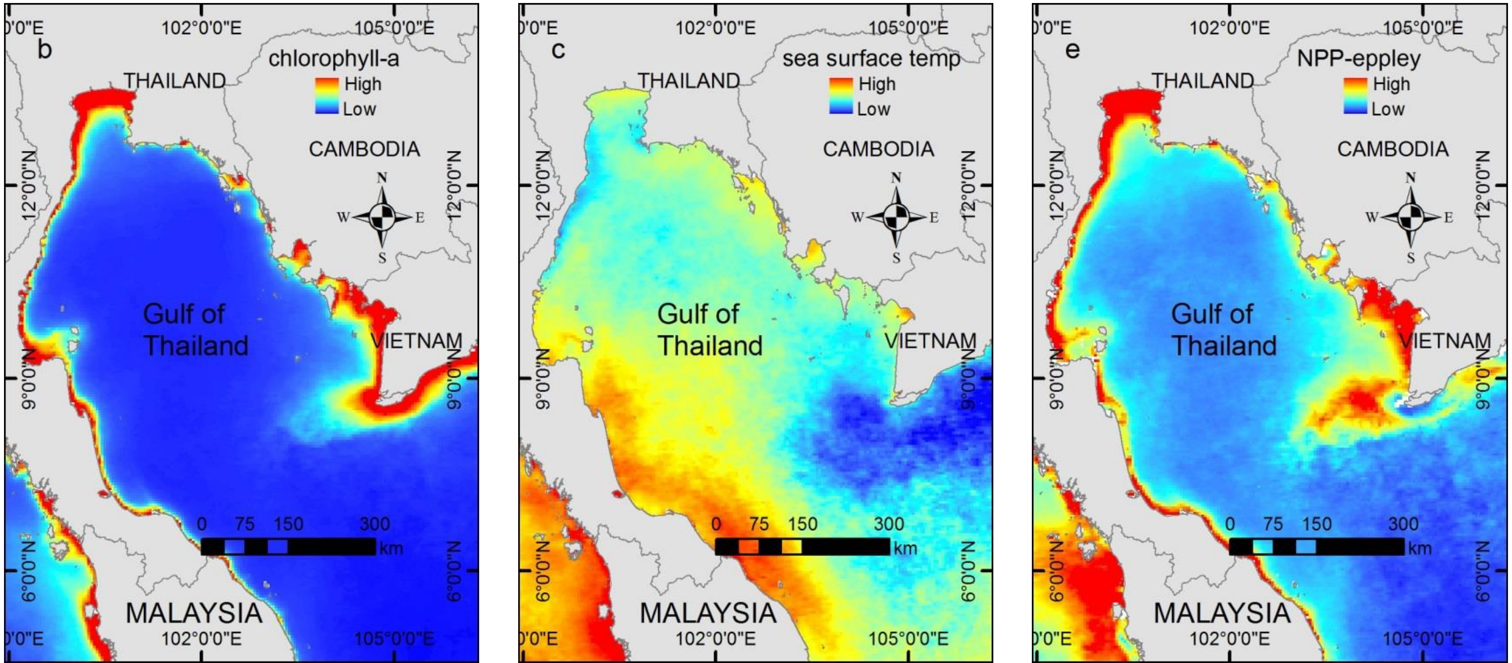
- **SDM →** extrapolate likely habitats (e.g. Huang et al., 2018) (ongoing now)
- **Stranded carcasses collection →** age, reproductive status → life history, demography (e.g. Huang et al., 2012); DNA specimen → population structure
- **Transect + photo-ID surveys**: estimating N (e.g. Jutapruet et al., 2015), mapping MCP, KDE (Jutapruet et al., 2017); verifying SDM predictions
- **Fishery statistics: monitoring bycatch**





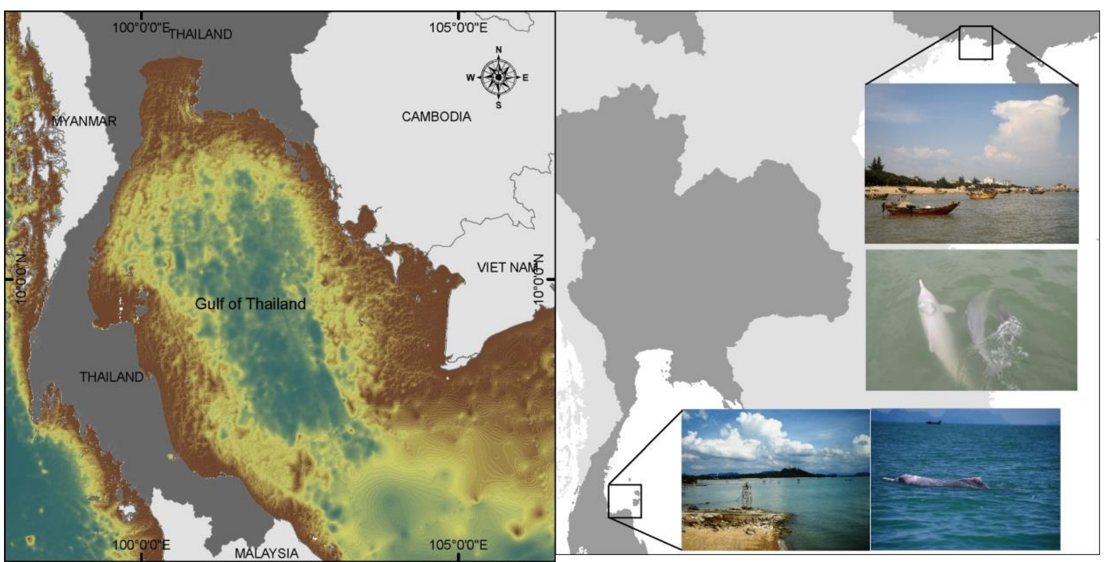
New techniques

- Satellite remote sensing: coastline, ocean color
- Drones: real-time (or quasi-real-time) large scale monitoring, number counting



International collaborations

- Population baselines across national boundaries (connectivity, distribution, abundance)
- Protection measures: protected area networks, stakeholder participations



Thanks for your attention

- Dr. **HP Wu, Dr. Y Hsu, C Peng QU**
- Dr. XY Wang, **TIO, China**
- Prof. D Wang, Dr. Z. Mei **IHB, China**
- Dr. S Jutapreut, **PSU, Thailand**
- **Dr. C.-J. Yao, NMNS, Taiwan**
- **Prof. W. Liu, Dr. C.-C. Wang, Mr. D. Lin, STU, China**
- **OPCFHK, Tongda ECC**

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