

Modern methods in cranes and Black-faced Spoonbill research



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Chi Yeung (Jimmy) Choi
蔡志扬 18-May-2026

East Asia

Asian Flyway

Barrow

Yalu
E

Bohai Bay

Shanghai

Fujian

Shenzhen

Hong Kong

Jiangsu

Taichung

Pacific
Ocean

Gladstone

Brisbane

Sydney

Melbourne

Foxton

Miranda



Content

- ↓ Application of waterbird monitoring techniques in migratory bird conservation and habitat management (community or individual level)
- ↓ Application of satellite tracking techniques in migratory bird conservation and habitat management (individual level)

Waterbird monitoring techniques in migratory bird conservation and habitat management

Common goals of waterbird monitoring programme

- 1) Understand species occurrence, abundance and distribution of a certain area
- 2) Monitor population trend
- 3) Evaluate the success of conservation intervention



Methods in Waterbird monitoring

- 1) Field survey
- 2) Surveillance camera
- 3) Radar
- 4) Ringing and resighting



- ↓ Importance of long-term monitoring
- ↓ Collaboration between conservation practitioners, researchers and birdwatchers
- ↓ Detailed records (survey route, time, effort and resource division)

Field survey



Field survey

- 1) The most common and traditional approach
 - 2) Flexible, comparable
- BUT
- 3) Require high recognition skill
 - 4) Involves long-term investment on time and personnel

Could be done in an area with little prior data accumulation



The International Black-faced Spoonbill Census 2008 and 2009

Hong Kong Bird Watching Society

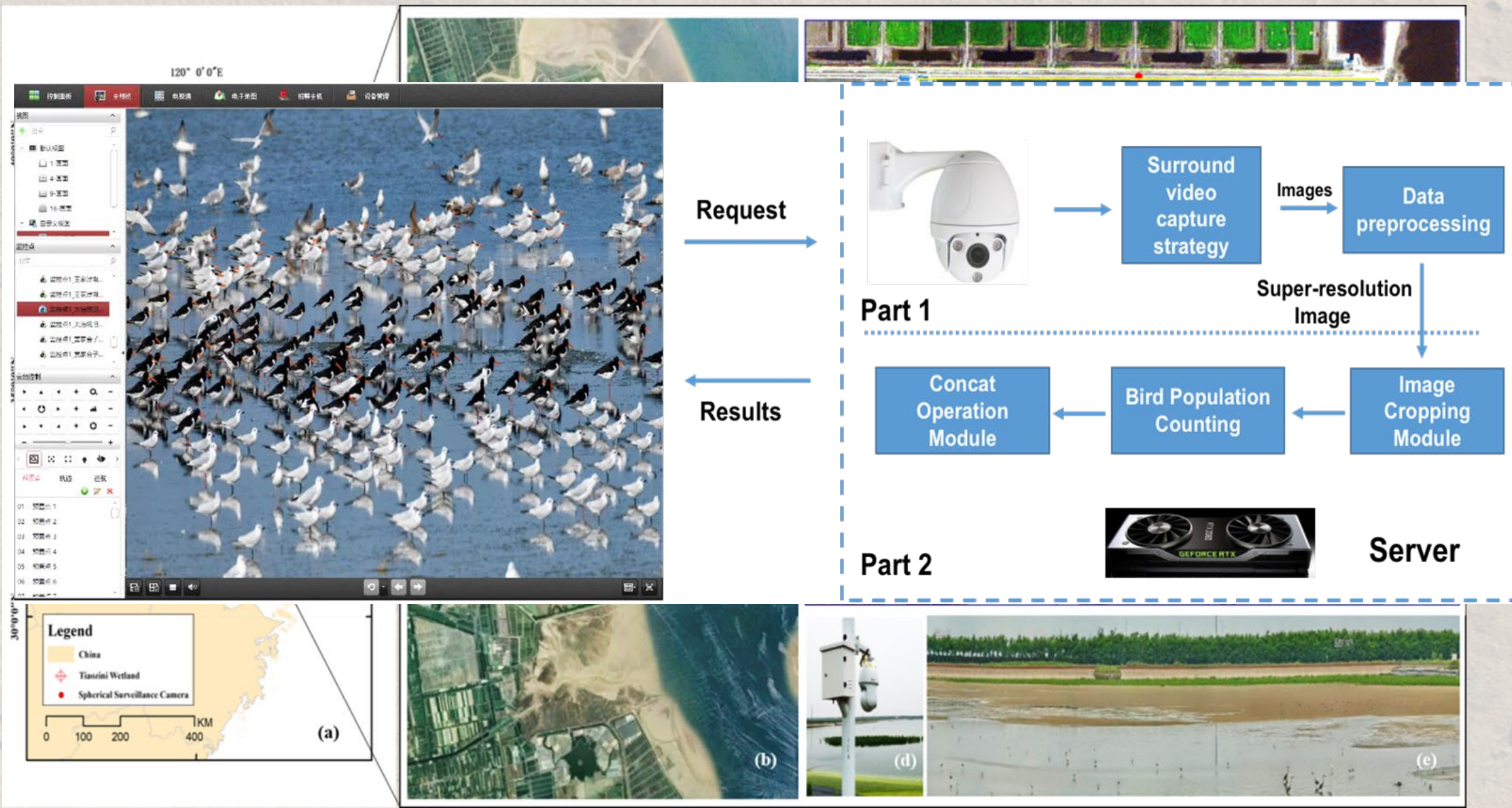
Organized by:



Sponsored by:



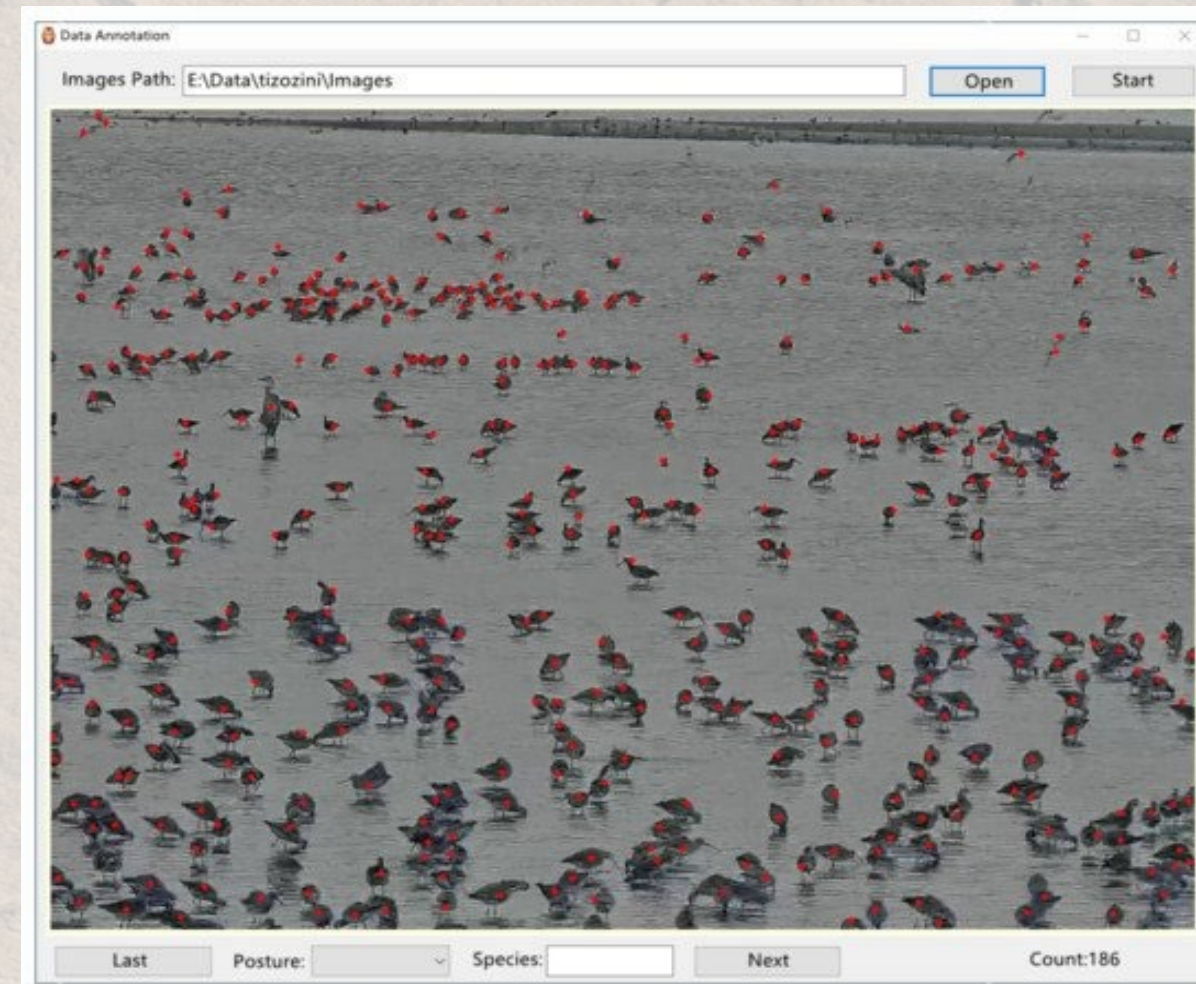
Surveillance camera



Surveillance camera

- 1) Fast, high efficiency
- 2) Long-term monitoring
- 3) But fixed in position
- 4) Needs high resolution image
- 5) Computer power
- 6) Difficult to identify species accurately

Suitable in waterbird-concentrated areas lack observers or difficult to access



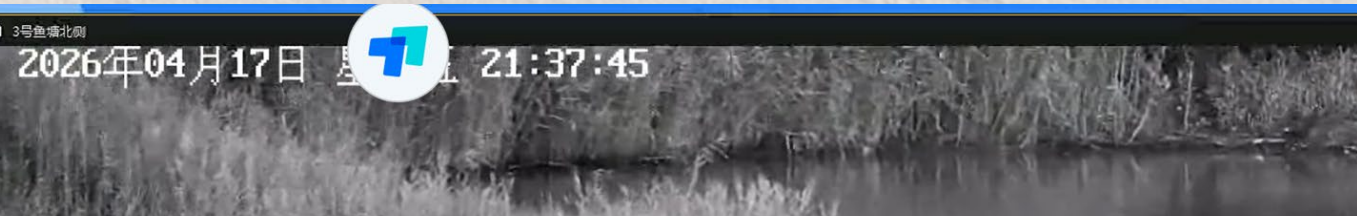
P:203.7 T:4.9 Z:4



三角洲五号



Infra-red / thermal camera



Radar (weather radar, bird-specific radar)

(a) Radar monitoring

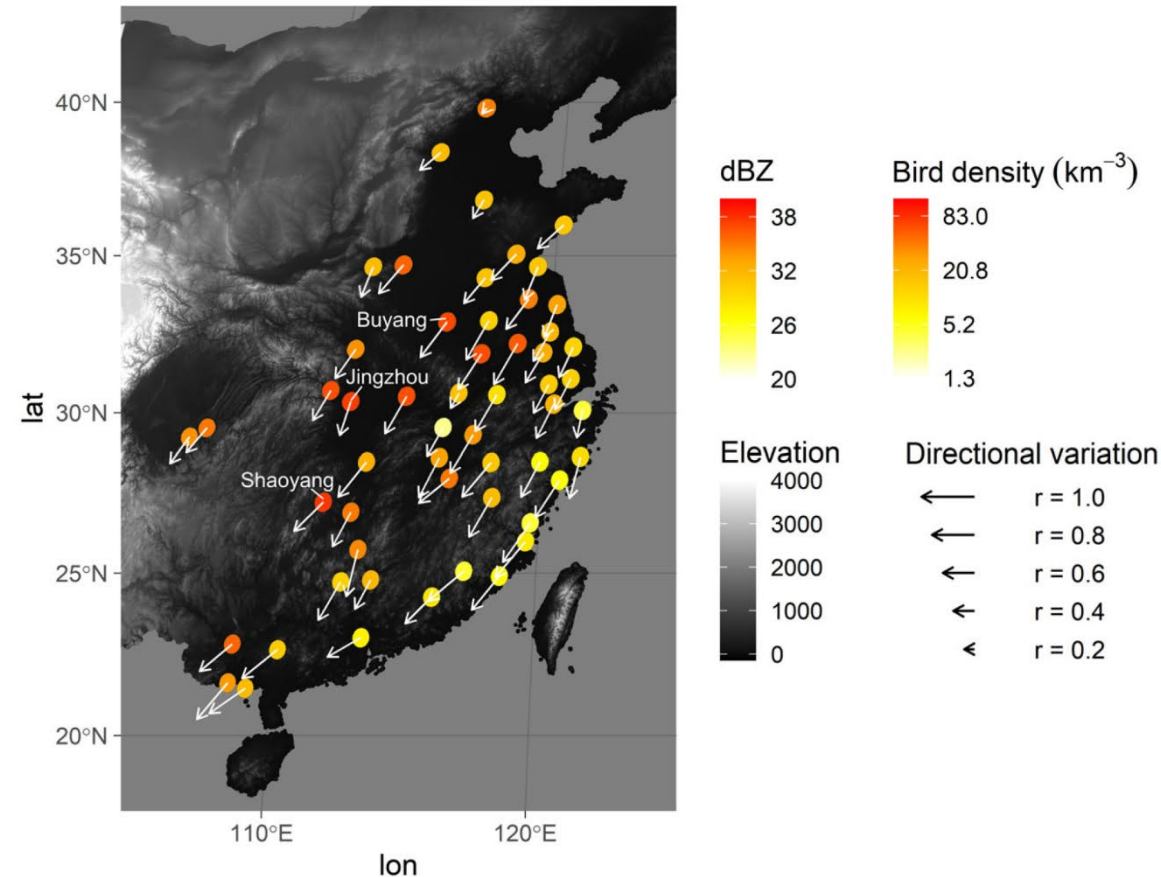
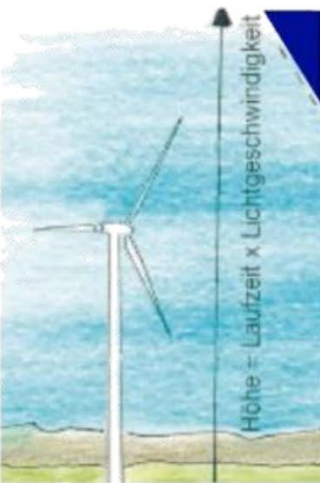


Figure 6. The pattern of animal migration extracted from a set of Chinese weather radars during October 2017. The Biological VIR is log-transformed and multiplied by 10, hence displayed in dBZ and also converted to bird density (birds km⁻³), assuming all signals are birds. The arrows represent the associated mean movement direction at each location and the length of the arrows represents the mean vector length (r).



Radar

- 1) Works continuously and automatically
- 2) Very expensive
- 3) Very specific
- 4) Could not recognize species



3D 固定式



3D 车载式



3D 移动拖车式



Ringling, field observation



©Tom Munson

© Jan van der Kam

Ringling, field observation

- 1) Monitor survival rate
- 2) Estimate population size
- 3) Require long-term investment, personnel, time and funding



The **application** of waterbird monitoring techniques in migratory bird conservation and habitat management

Waterbird abundance



© Kinni

CR



CR

© Jan van der Kam



EN



Far Eastern curlew
大杓鷸, dà shāoyù
Numenius madagascariensis

© Craig Brelsford

CR



VU

The use of waterbird count data

- Identify Ramsar sites (64 sites in 2021)
- Wetlands that support a total of >20,000 waterbirds regularly
- Wetlands that support >1% of the population of a waterbird species / subspecies regularly



Mao *et al.* 2021
J.Rem.Sens

(a)

高原鹬 Upland Sandpiper

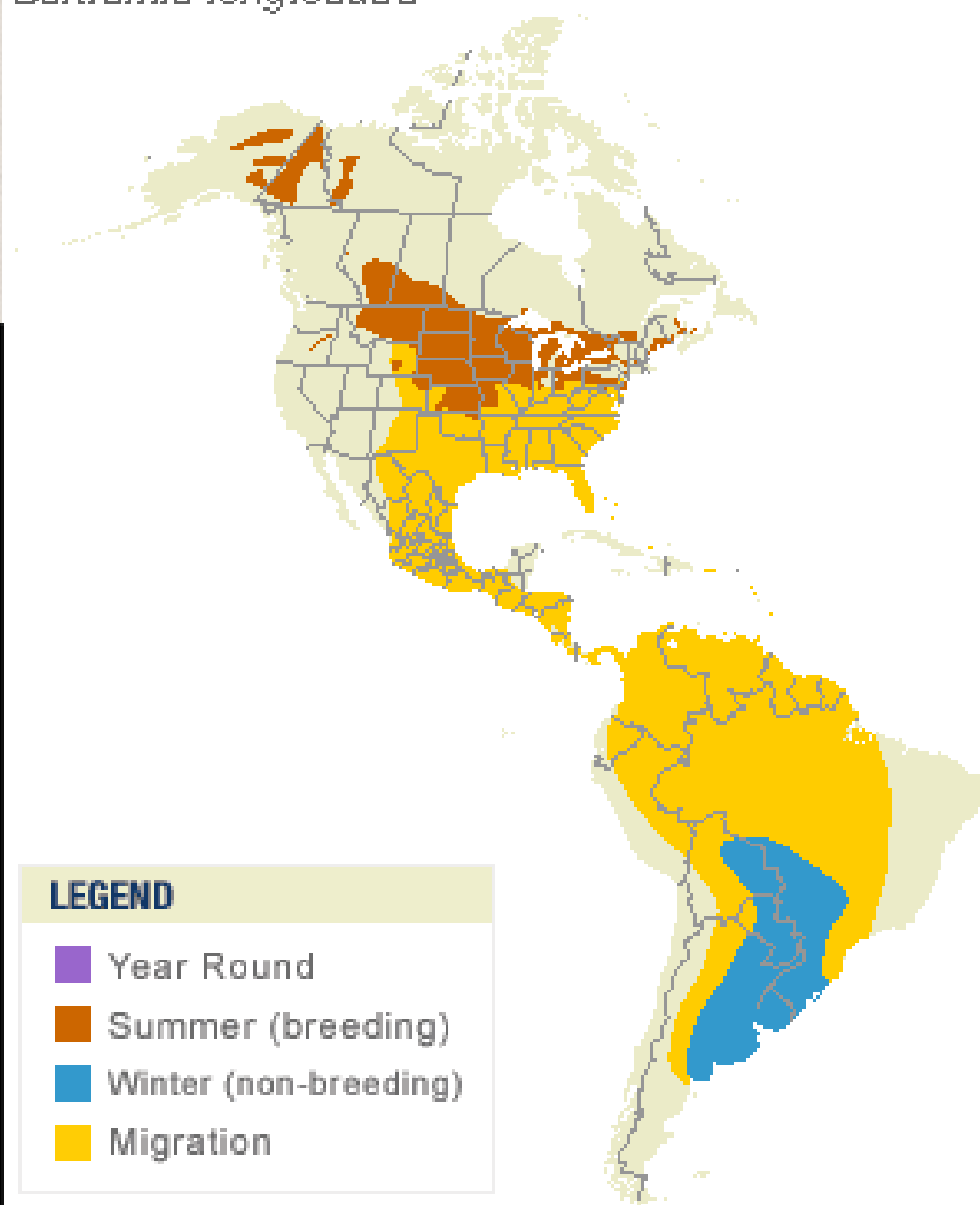
Upland Sandpiper
Bartramia longicauda



LEGEND

- Year Round
- Summer (breeding)
- Winter (non-breeding)
- Migration

Map by Cornell Lab of Ornithology
Range data by NatureServe

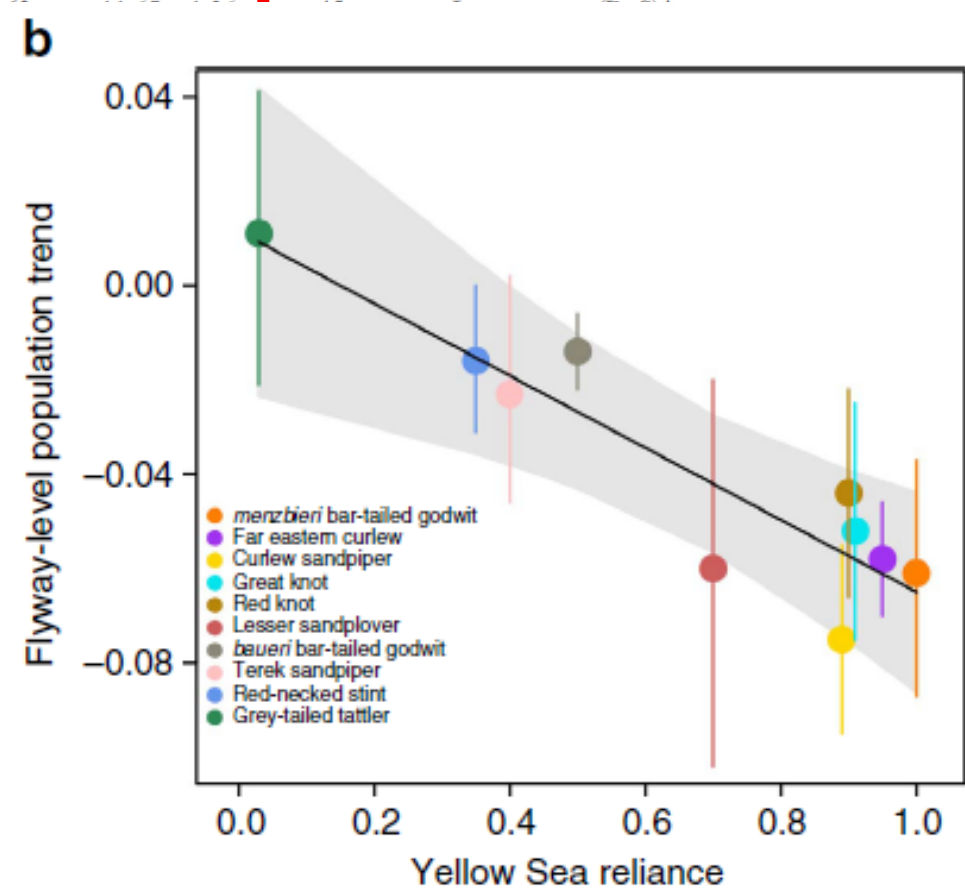
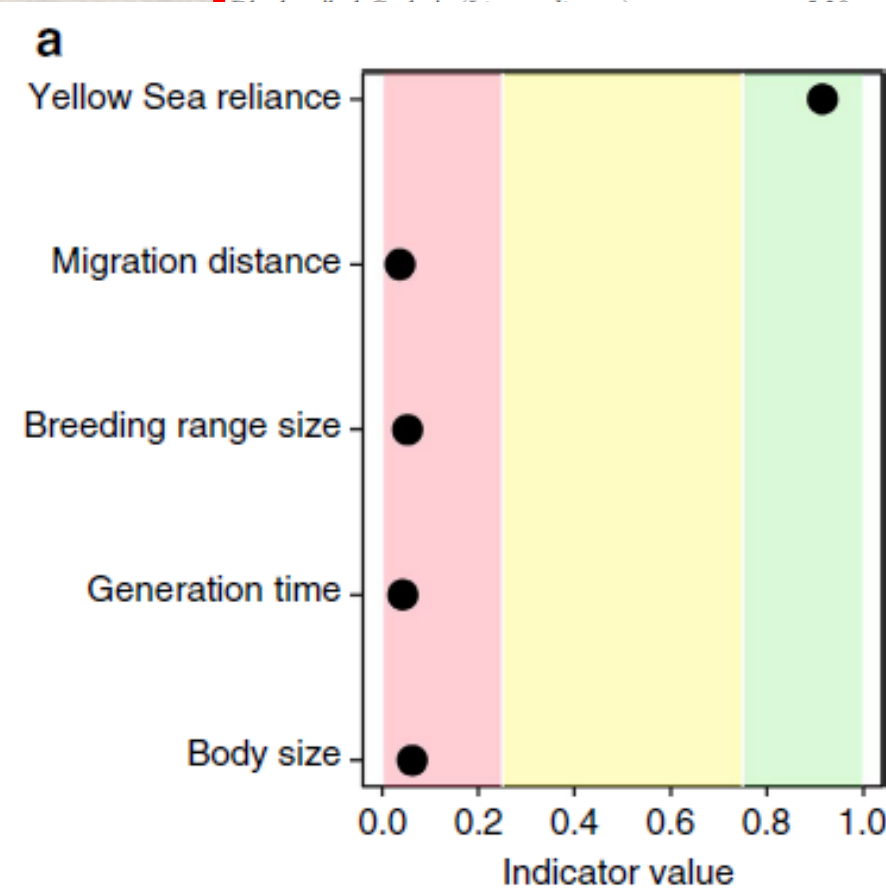


The application of waterbird count data



↓ Identify the drivers behind population trends

Species	Slope	s.e.	95% CI	Flyway (%)	Sampling	Latitude	Longitude	Quality
Migratory species								
Curlew Sandpiper (<i>Calidris ferruginea</i>)	-9.53	0.67	-11.01, -8.37	65	High	(D-S)**	(D-W)***	***
Lesser Sand Plover (<i>Charadrius mongolus</i>)	-7.16	0.80	-8.91, -5.8	17	Low	(D-N)*	(D-E)**	*
Sharp-tailed Sandpiper (<i>Calidris acuminata</i>)	-5.73	1.47	-7.93, -2.16	90	Modest	(D-S)***	(D-W)*	*
Terek Sandpiper (<i>Xenus cinereus</i>)	-5.40	1.07	-7.42, -3.22	40	Modest	(D-N)*	(D-E)*	n.s.

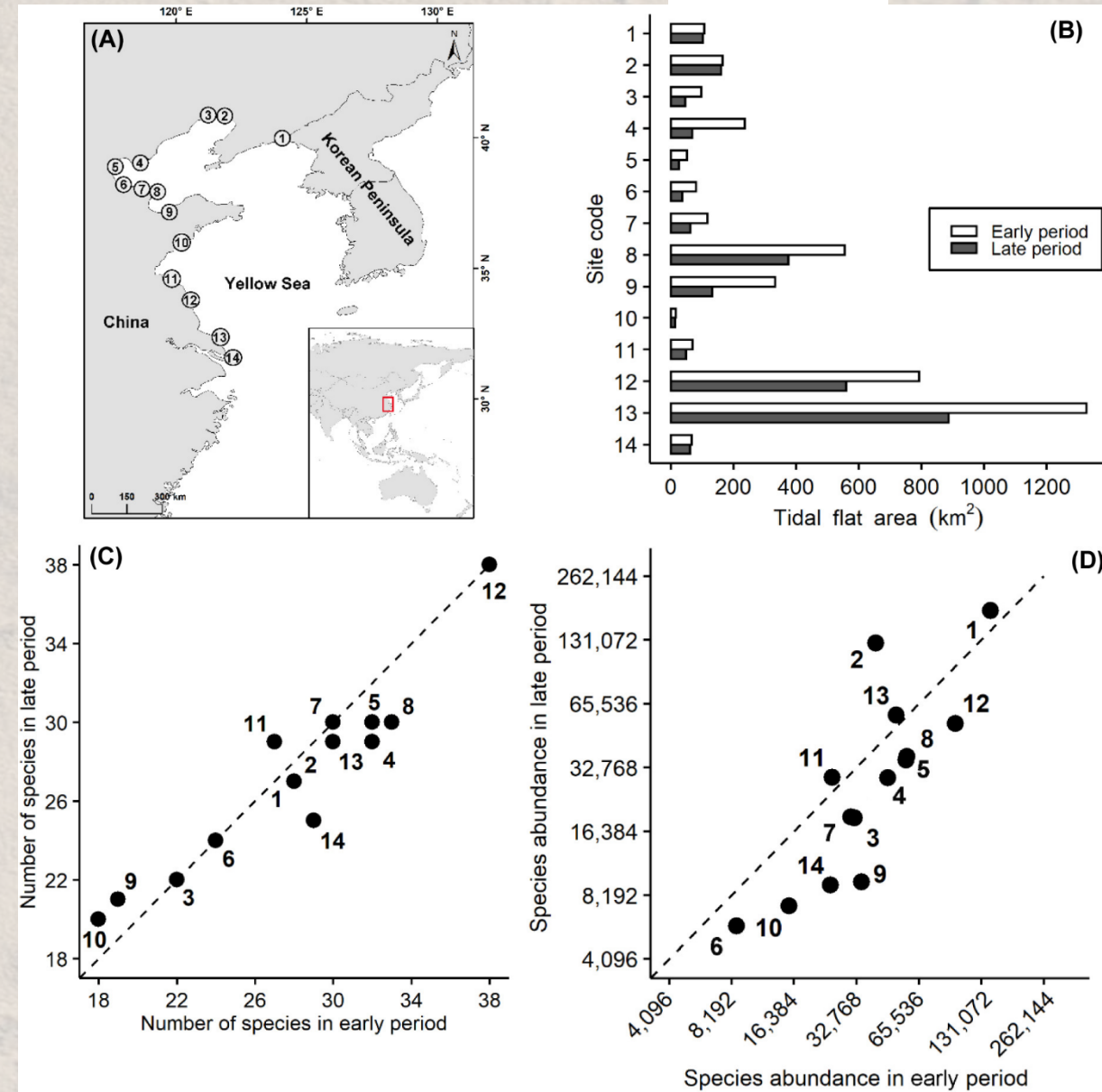


Clemens *et al.* 2016 *Emu*

Studds *et al.* 2016
Nature Communication

The application of waterbird count data

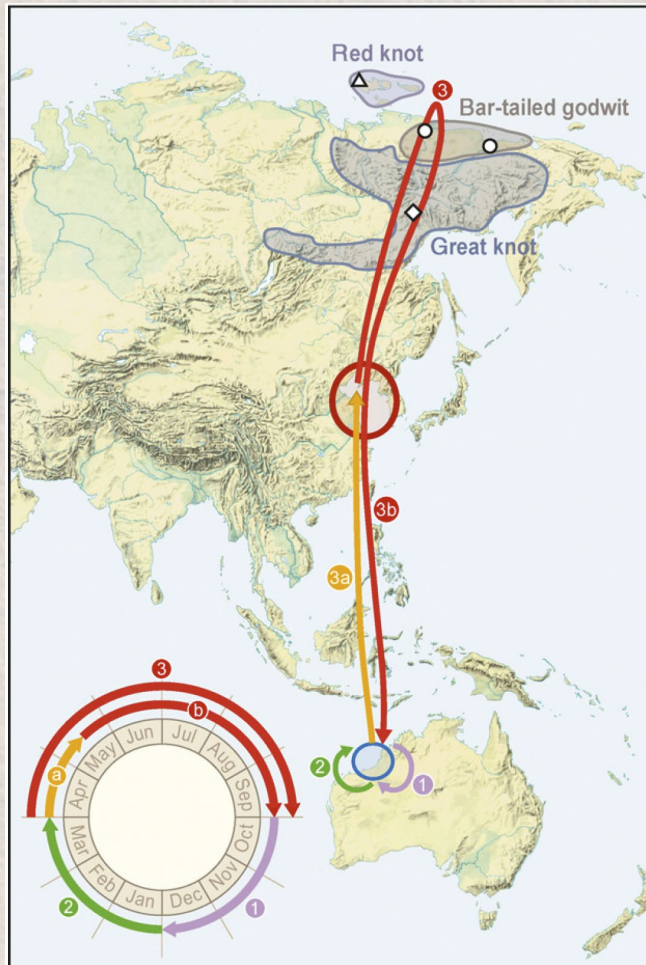
- ↘ Extent of tidal flat decreased by 35.6% from 2000 to 2013, shorebird population decreased by 7.8%
- ↘ Significant difference in shorebird composition between sites, but not between years for the same site
- ↘ Protect a nearby site may not compensate the loss of a nearby wetland



The application of ringing and resighting data

Piersma, Lok *et al.* 2016
J. Applied Ecology

- Survival monitoring



The loss of tidal wetlands in the Yellow Sea

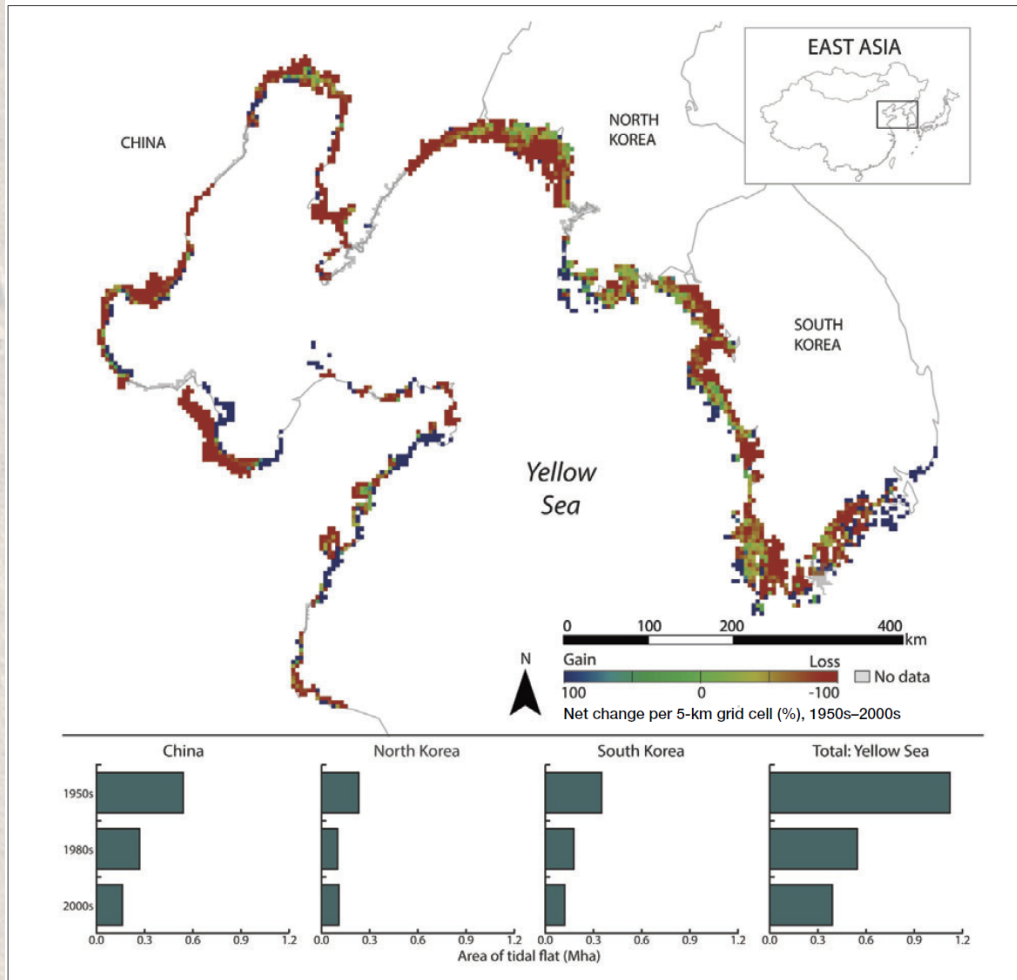


Figure 1. Change in tidal flats in the Yellow Sea between the 1950s and the 2000s, mapped at a 5-km grid resolution. Net change between the two time periods is shown on a color ramp from blue (total gain) to red (total loss).

Murray *et al.* 2014 *Front. Eco. Env.*

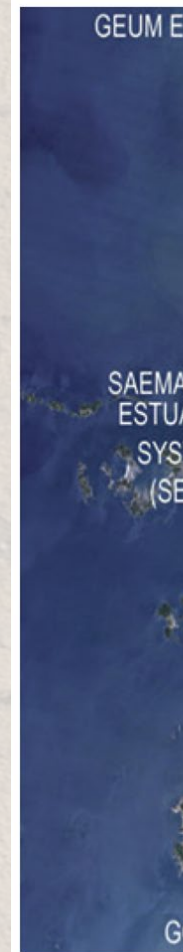
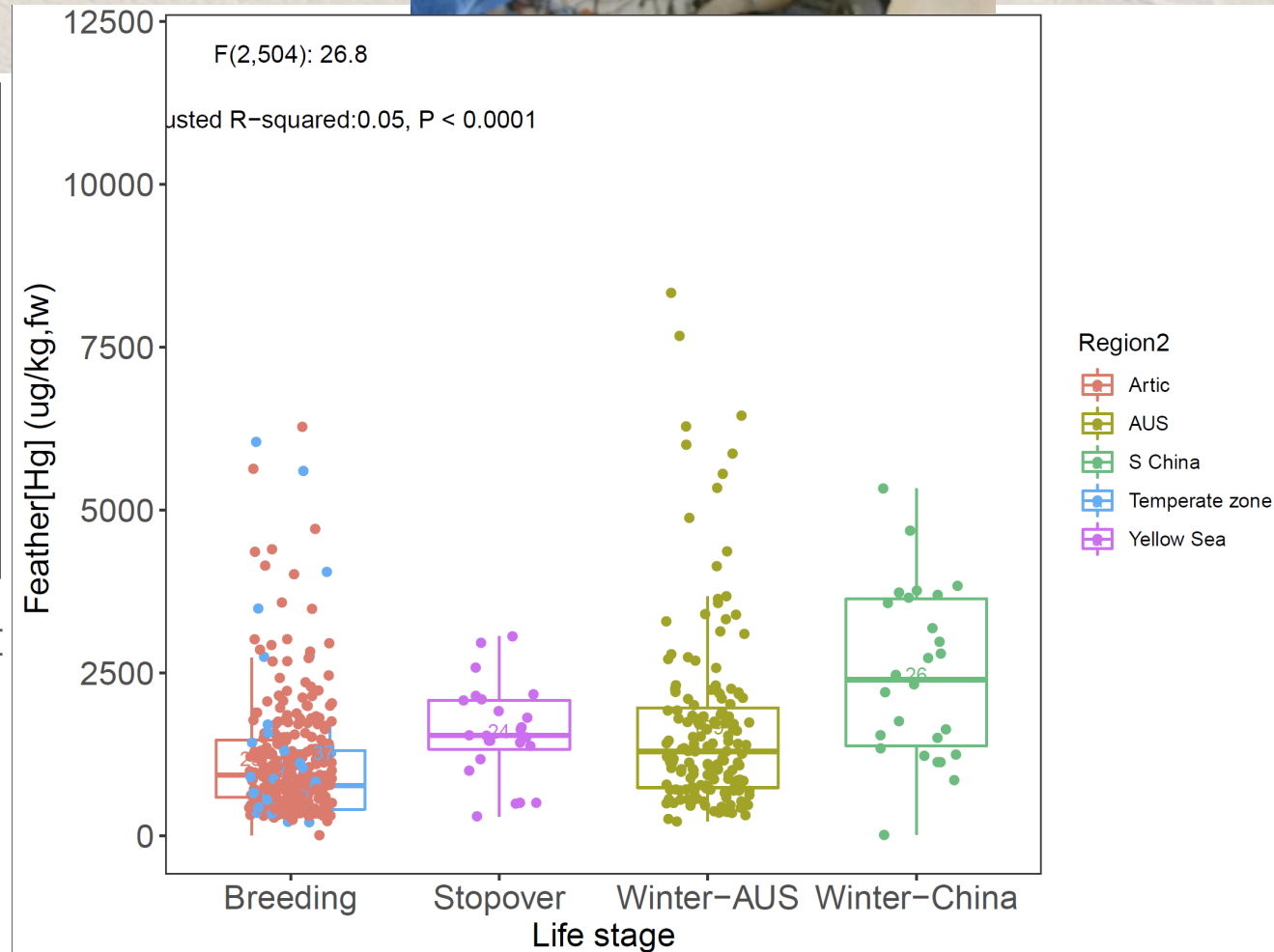
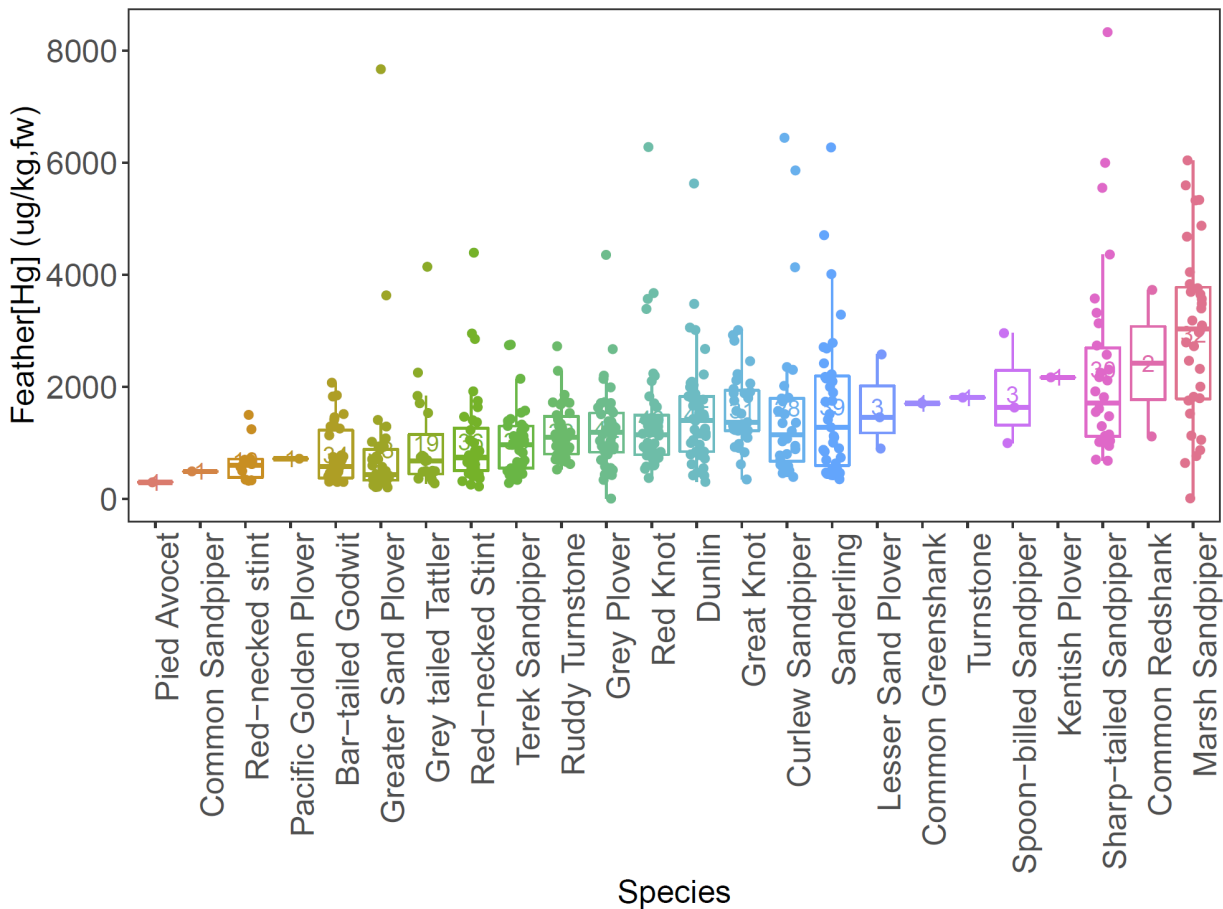


Fig. 1 The SSMP Saemangeum seawall images, reproduced with



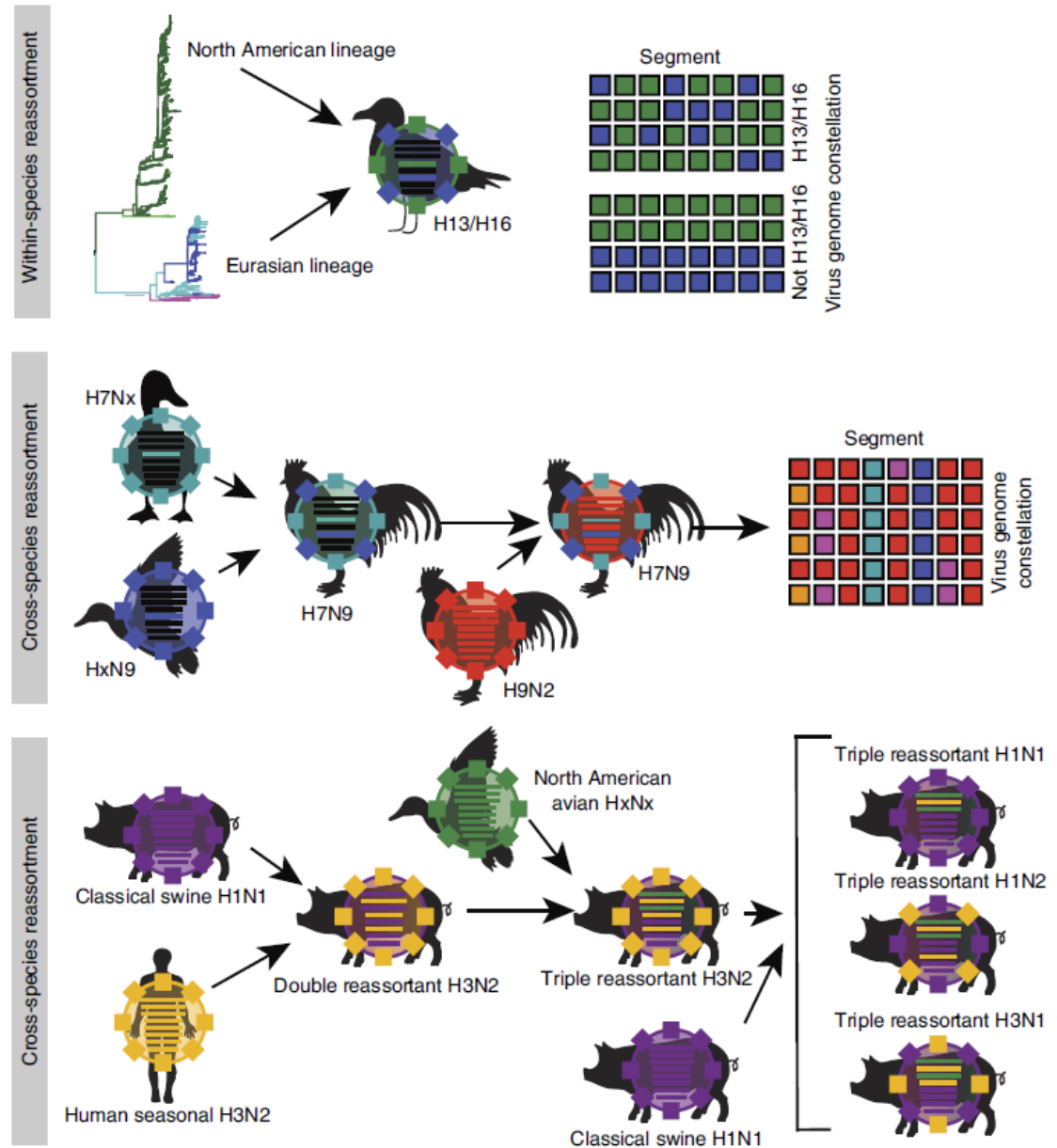
The use of ringing data

- Pollutant contamination



The use of ringing data

Avian influenza monitoring



Waterbird monitoring programme

Waterbird monitoring programme

Long-term monitoring require consistent method to ensure that the results are comparable

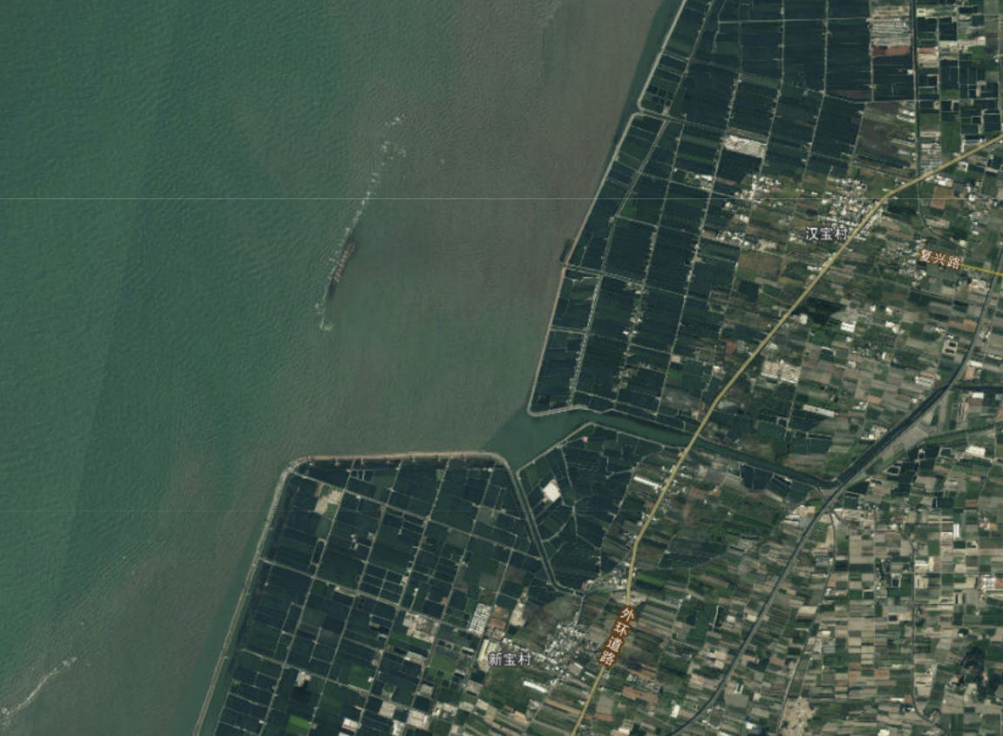
- location
- route
- method
- timing
- frequency
- personnel

No universal approach / one-size-fit all

**Understand your monitoring
subject is crucial !**

But

**There are details that you may pay attention
to**



足迹



分享



5

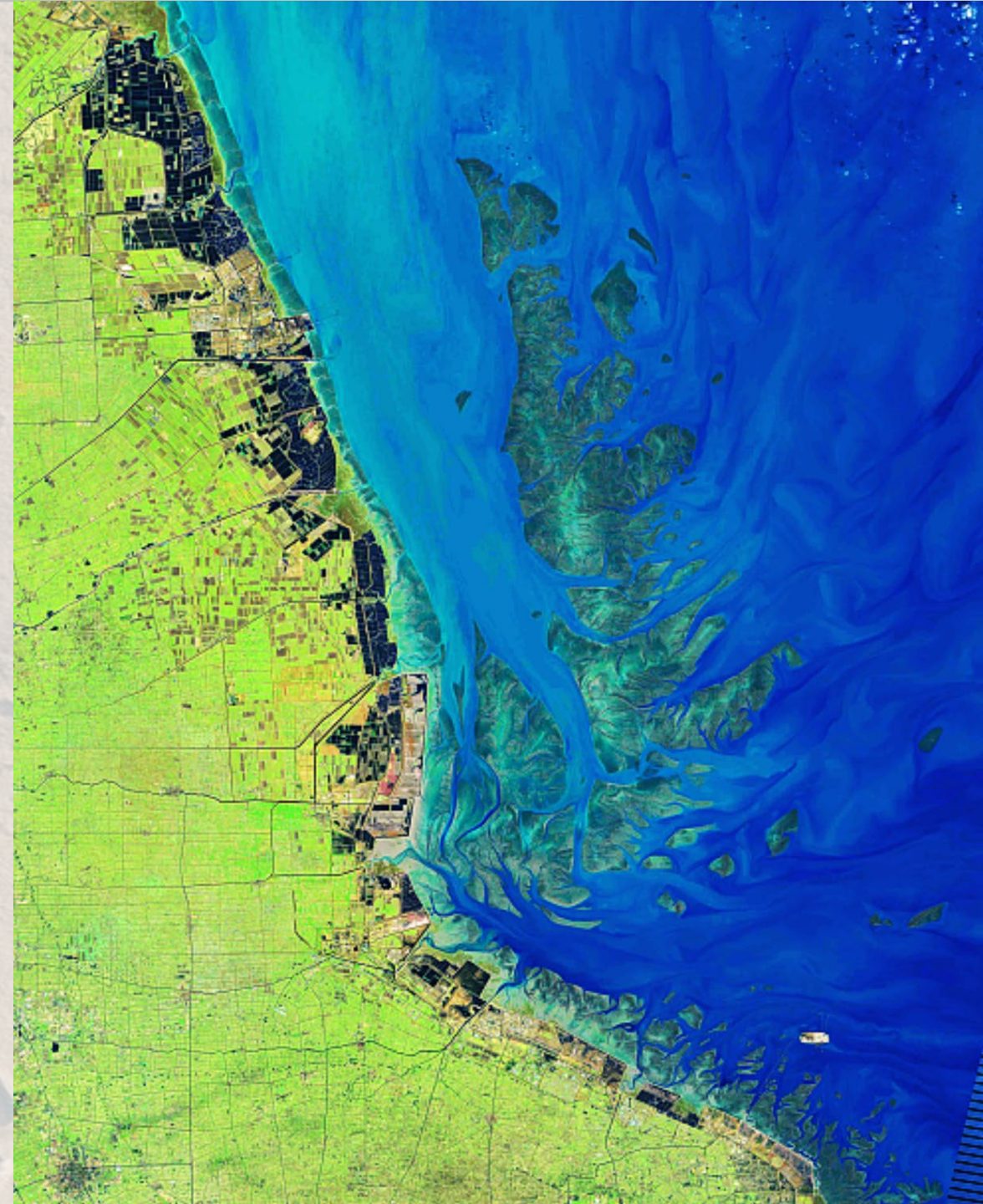


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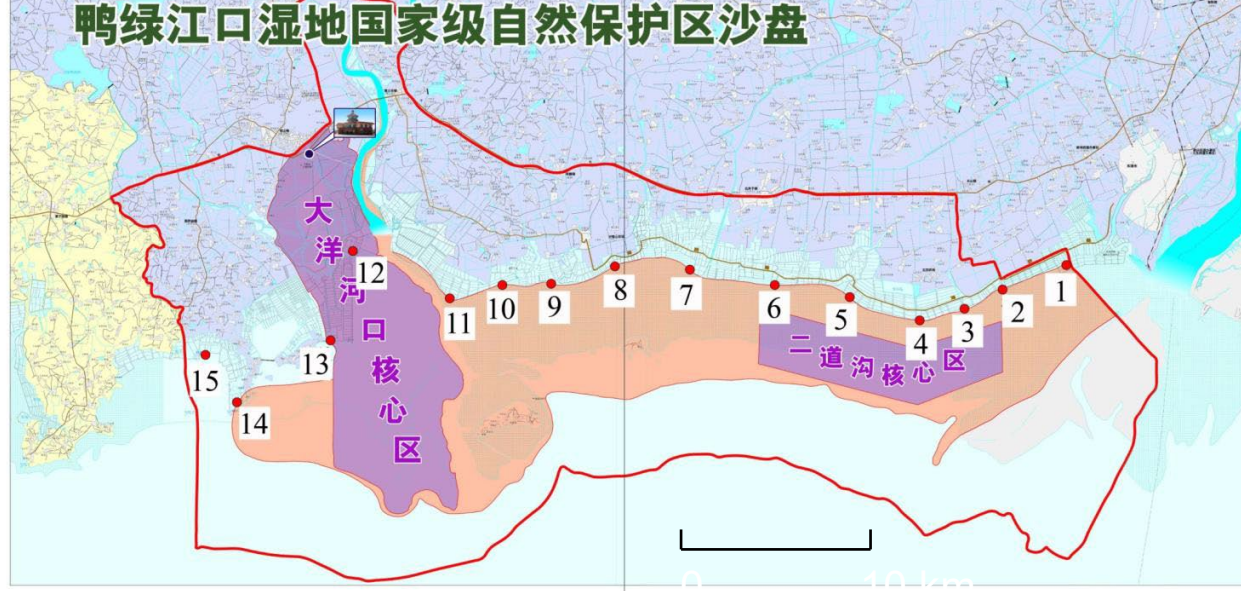
Understand the subject's preference



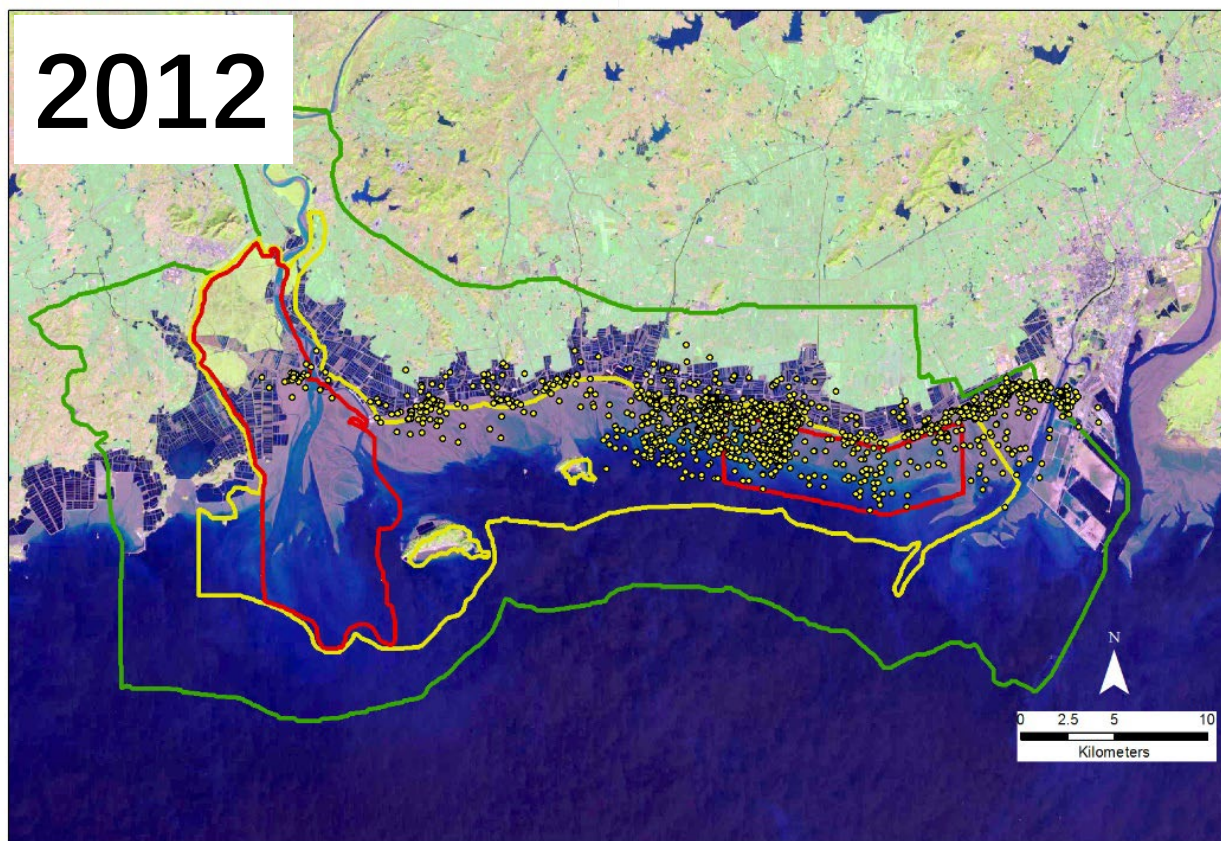
Monitoring range



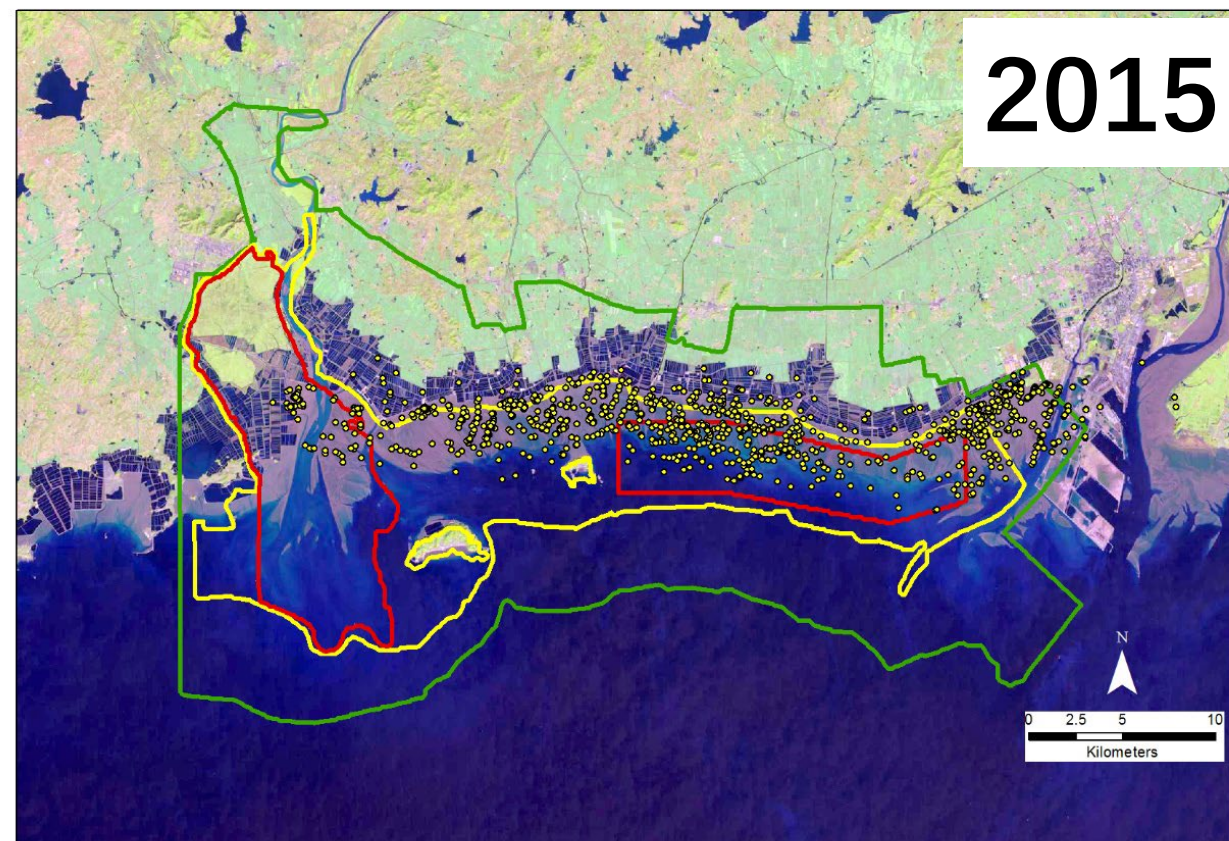
鸭绿江口湿地国家级自然保护区沙盘



2012



2015



Monitoring plan depends on the target species

Ensure the use of consistent method and make the results compatible, but need to be prepared to make adjustment



Take home messages

- ↓ Be clear of monitoring target and species
- ↓ Ensure the methods used are consistent, but be prepared to adapt
- ↓ Be aware of the limitations of monitoring waterbird population trend
- ↓ Long-term international collaboration is critical

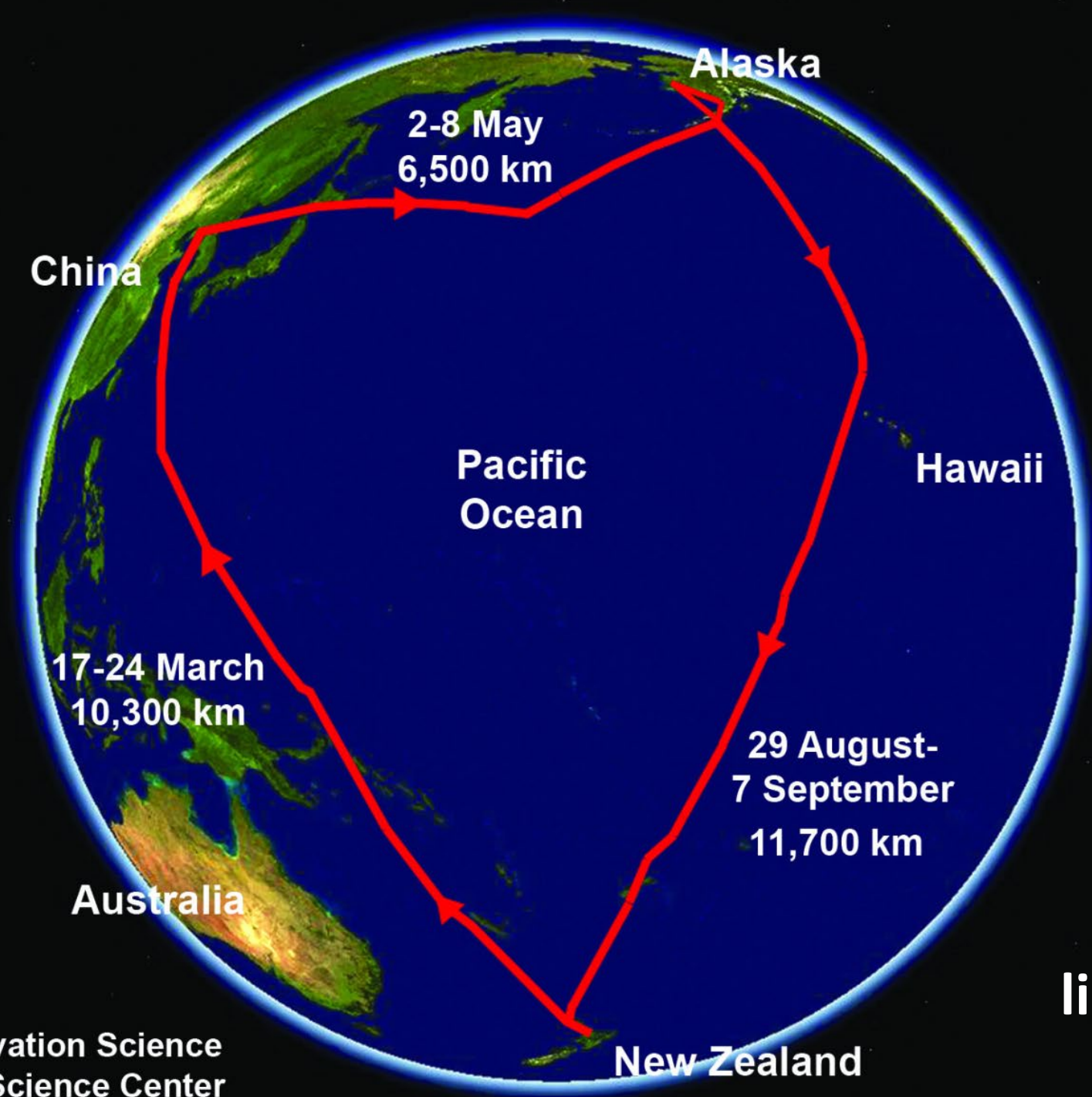


Satellite tracking techniques in migratory bird conservation and habitat management (individual level)

Limitations to traditional waterbird monitoring work

Temporal and spatial limitations





Source: Keith Woodley

↓ **Bar-tailed Godwit**

**Satellite tracking to
complement the
limitations of traditional
survey**

Tracking method - Ringing



Tracking methods

↓ Radio tracking

Cheap and light
but

Relatively low resolution and time-consuming

Suitable to apply when waterbird population is relatively stable (e.g. winter) to monitor their distribution and activity pattern



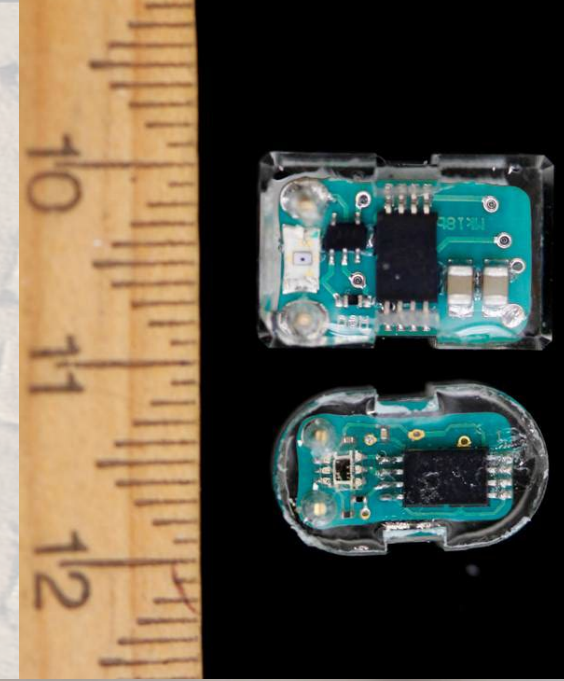
Tracking methods

↘ Geolocator

Cheap and light

But very low spatial accuracy,
often requires recapture to
download data

**Suitable for monitoring species
with high site fidelity to study
their migration behaviour and
pattern**



Source: Phil Battley

Tracking methods

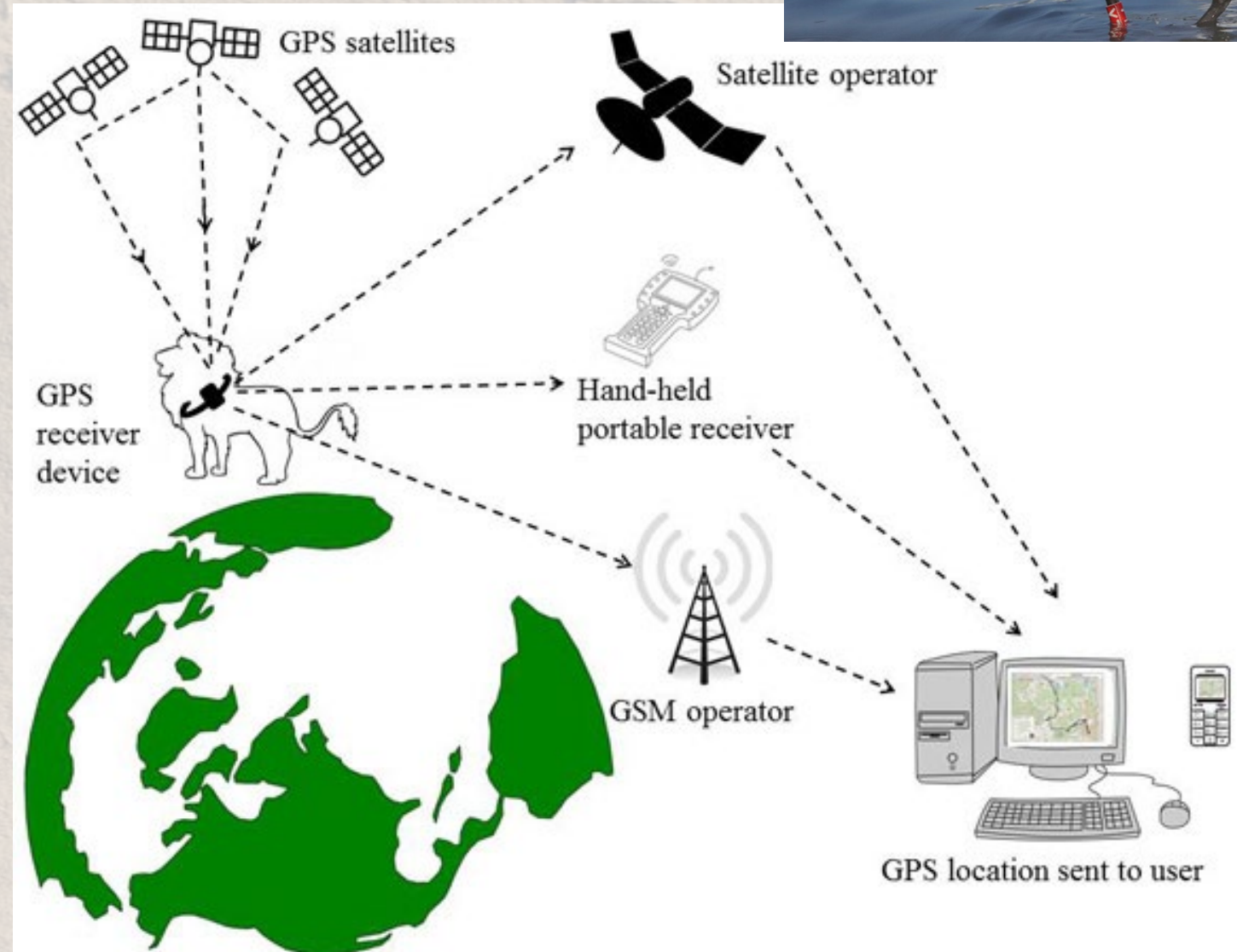
↓ Satellite tracking

High spatial and temporal resolutions

but

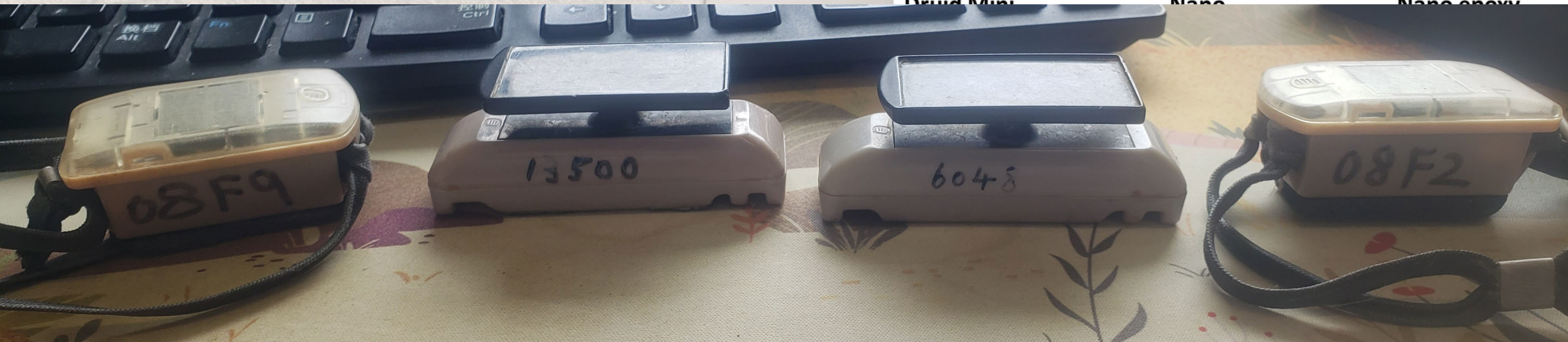
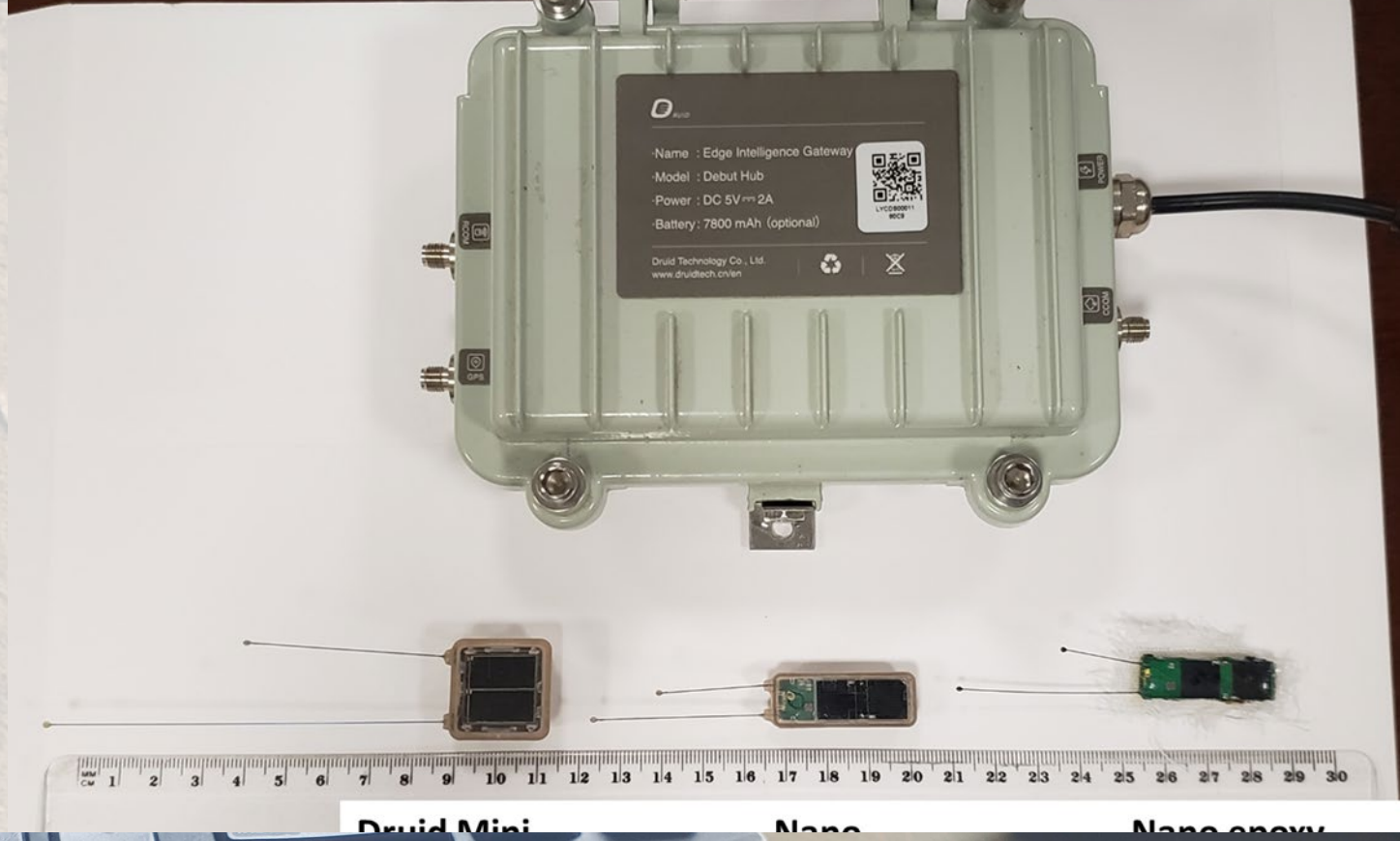
relatively expensive +
require regular checking

**Suitable for monitoring
relatively large sized
species**



Tracking devices

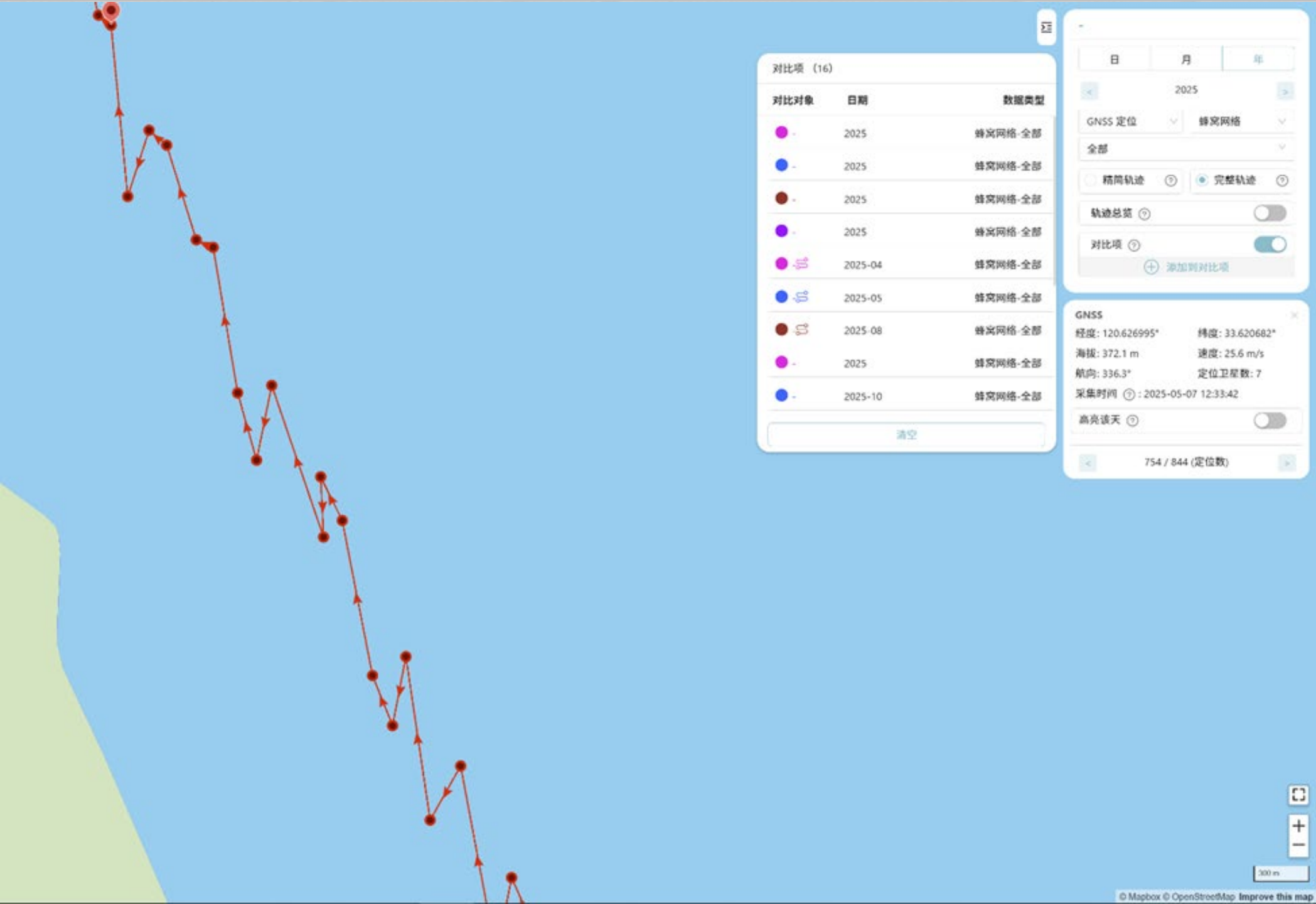
- location
- temperatures (env, body)
- speed, altitude, direction
- behaviour
- other physiological data



**BFS flight
path**

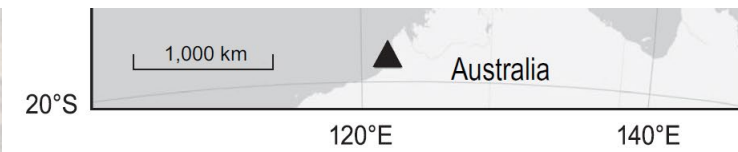
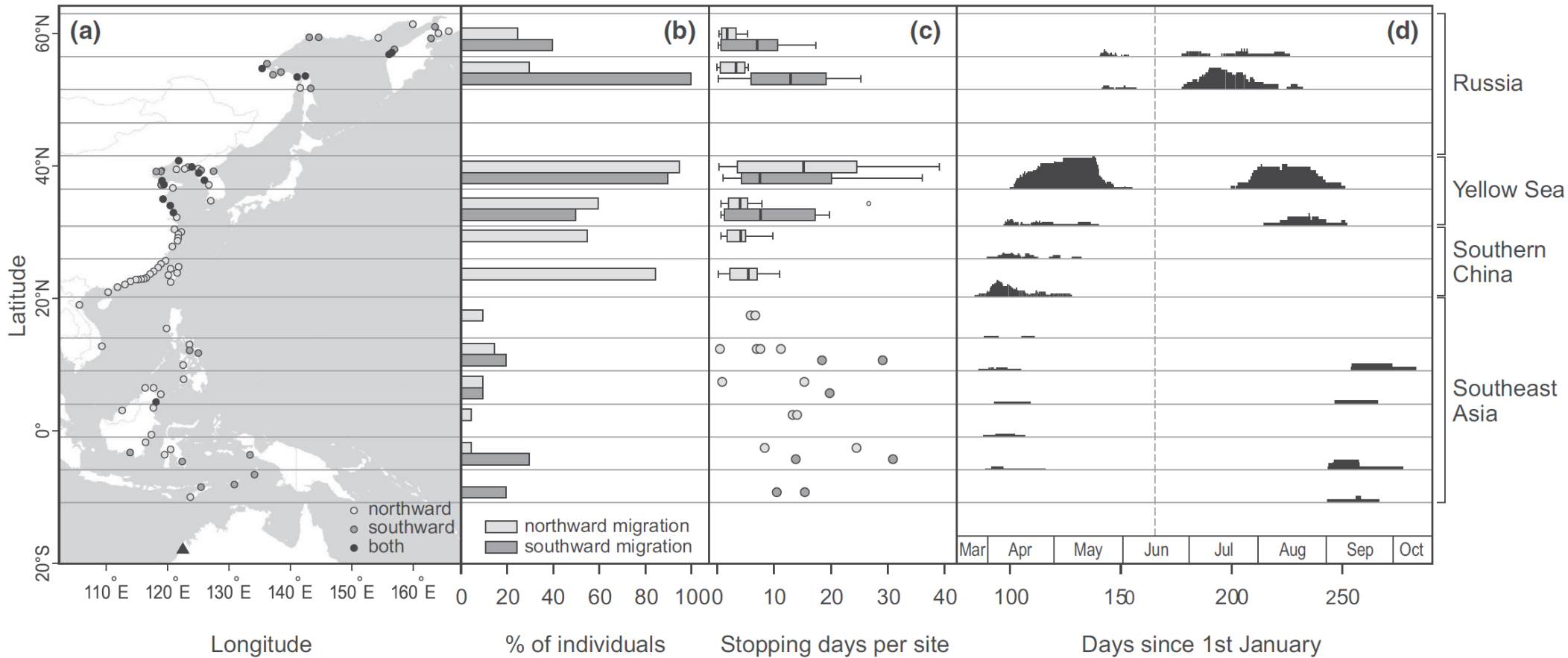


Common Redshank flight path



The **Application** of satellite tracking techniques in migratory bird conservation and habitat management (individual level)

Application of satellite tracking technology



Application of satellite tracking technology

↓ Monitor species home range,
activity pattern

↓ Protected Area boundary

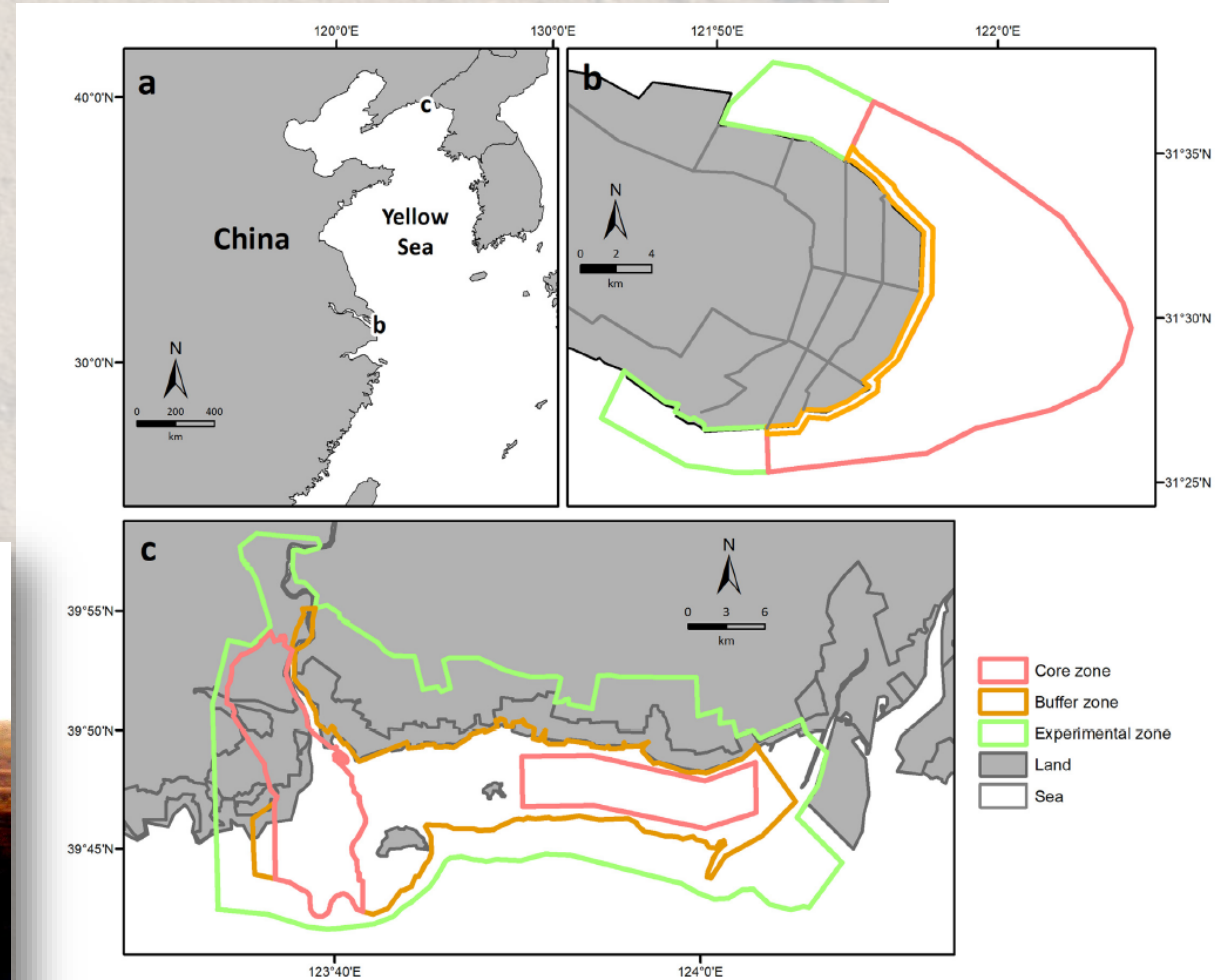
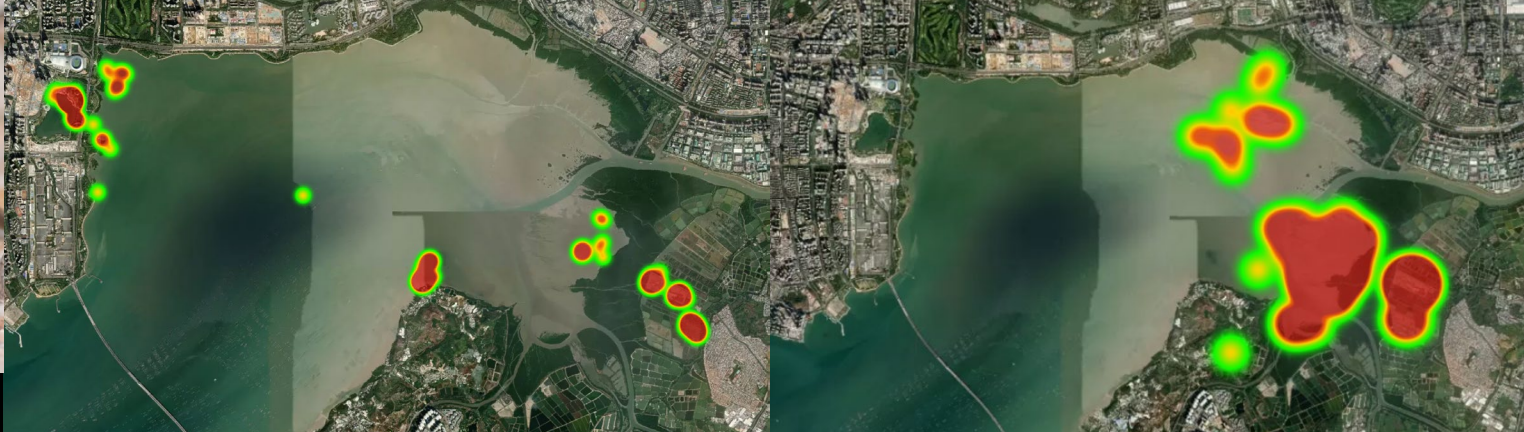


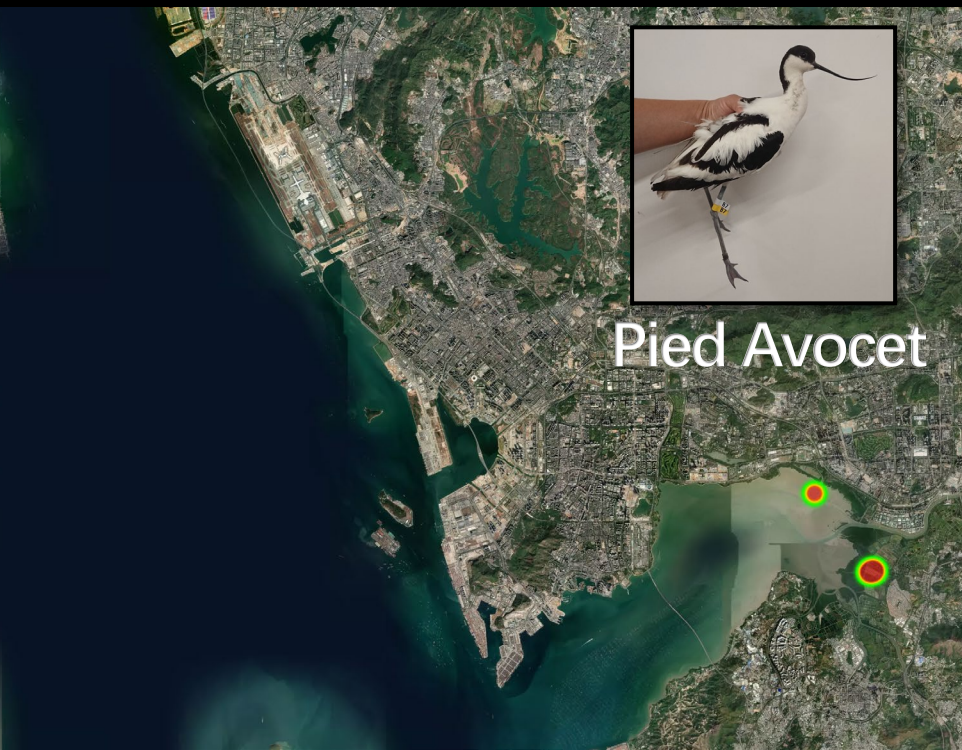
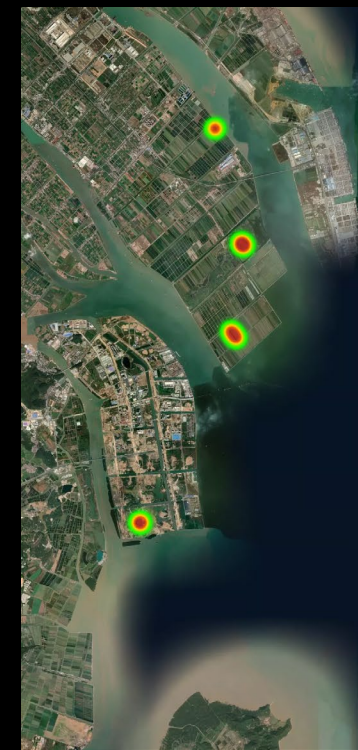
Fig. 1. Location in the Yellow Sea (a) and functional zones of (b) Chongming Dongtan National Nature Reserve and (c) Dandong Yalu Jiang Estuary Wetland National Nature Reserve. Letters in panel (a) indicate the location of (b) Chongming Dongtan and (c) Yalu Jiang. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)



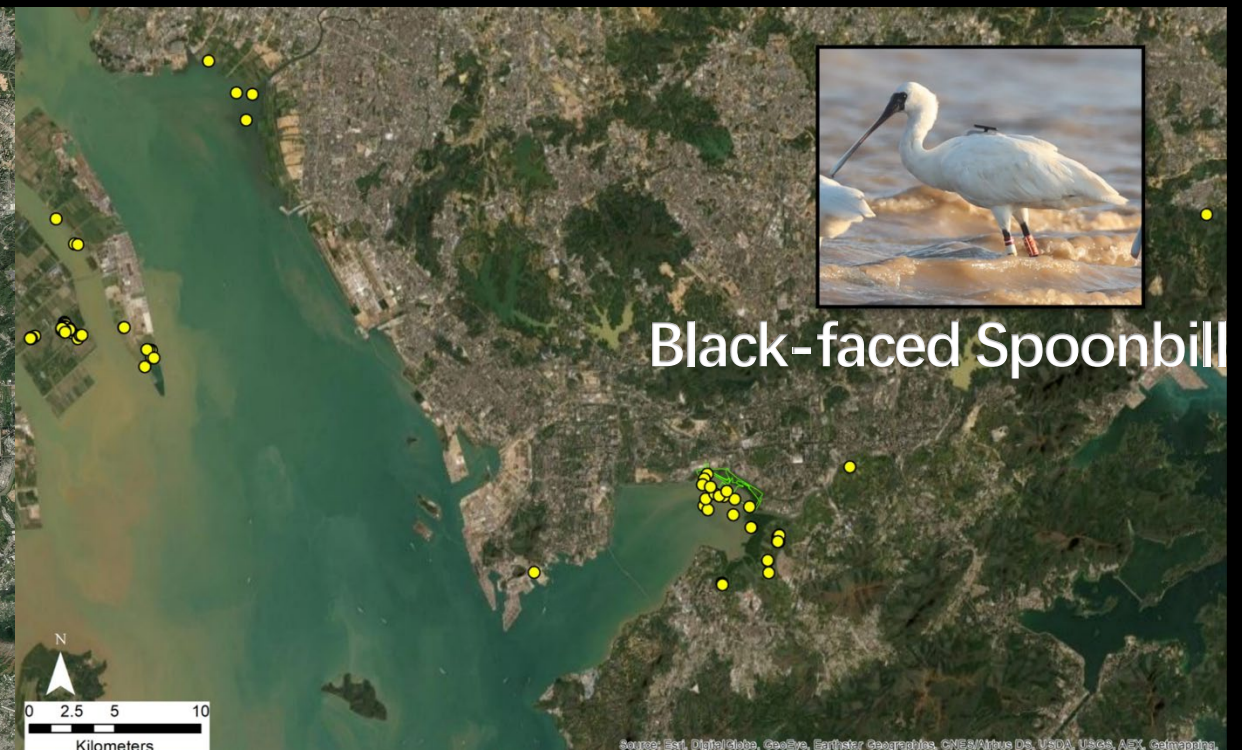
Lesser Sandplover



Common Redshank



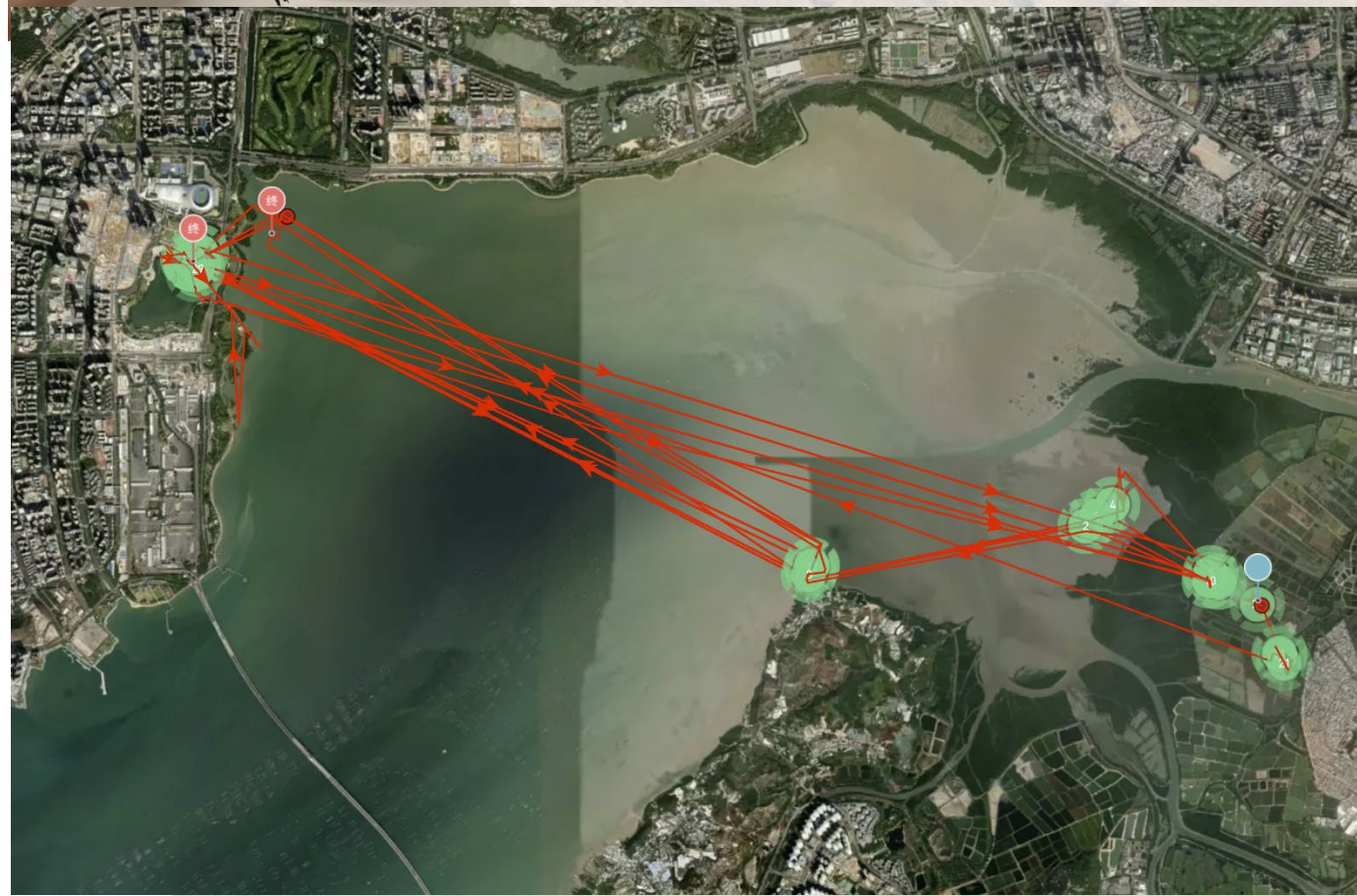
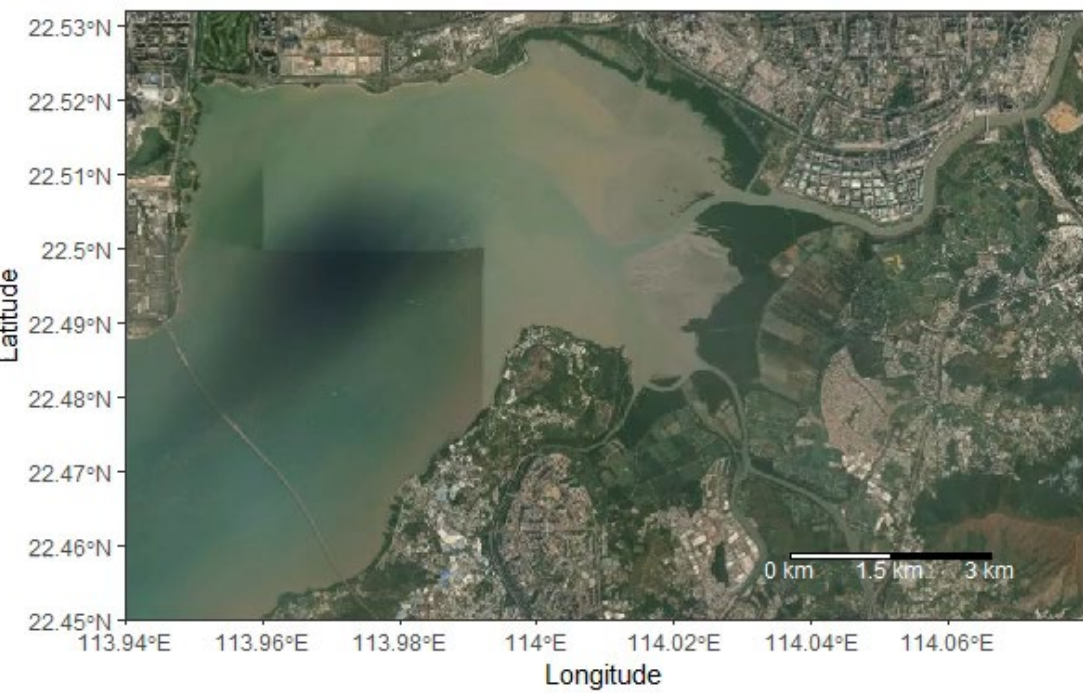
Pied Avocet



Black-faced Spoonbill



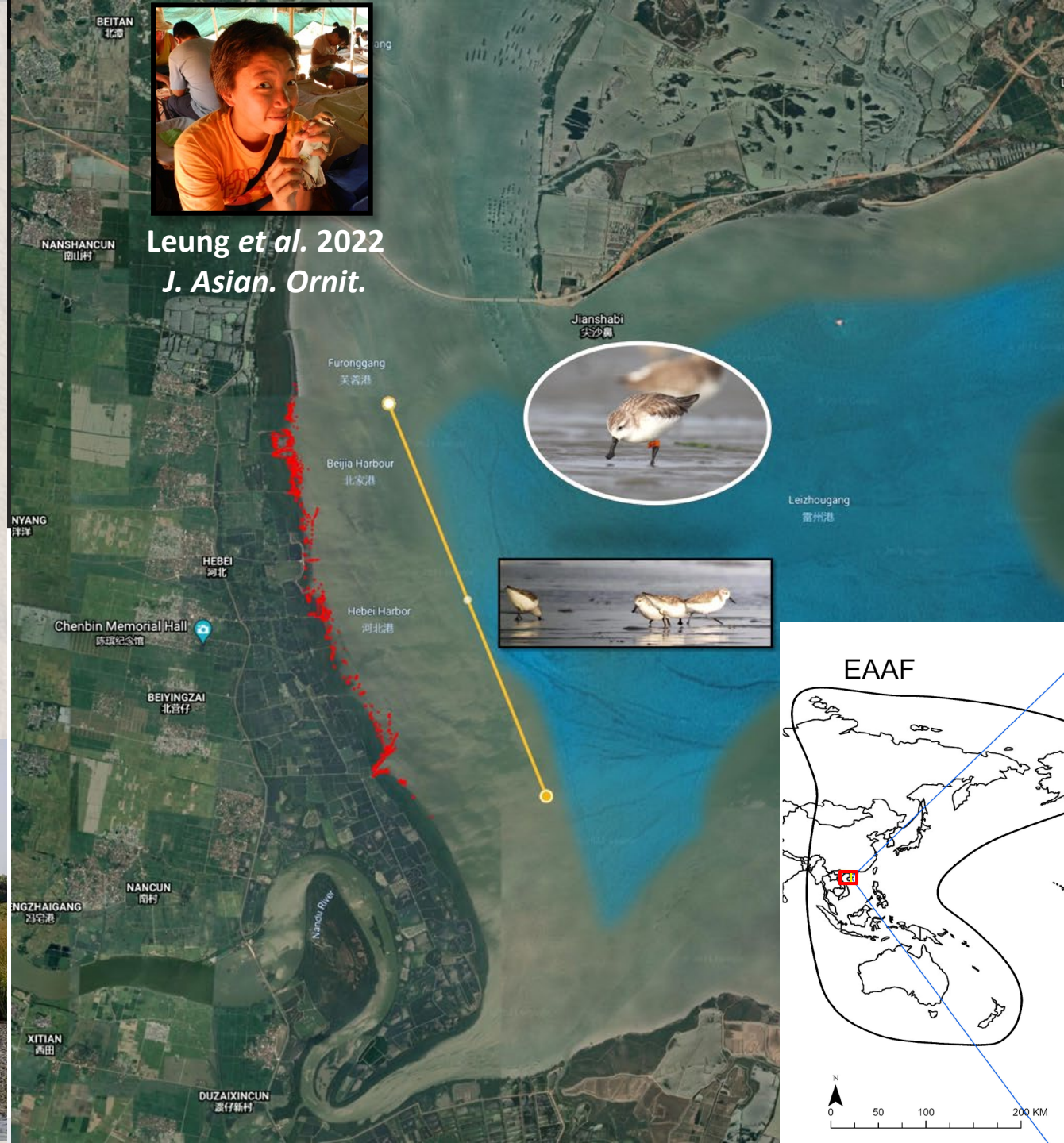
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, Aero, Composite



Applied values of movement data

Leizhou Peninsula *Spartina* eradication project

> 30 Spoon-billed Sandpipers were counted, 60 estimated



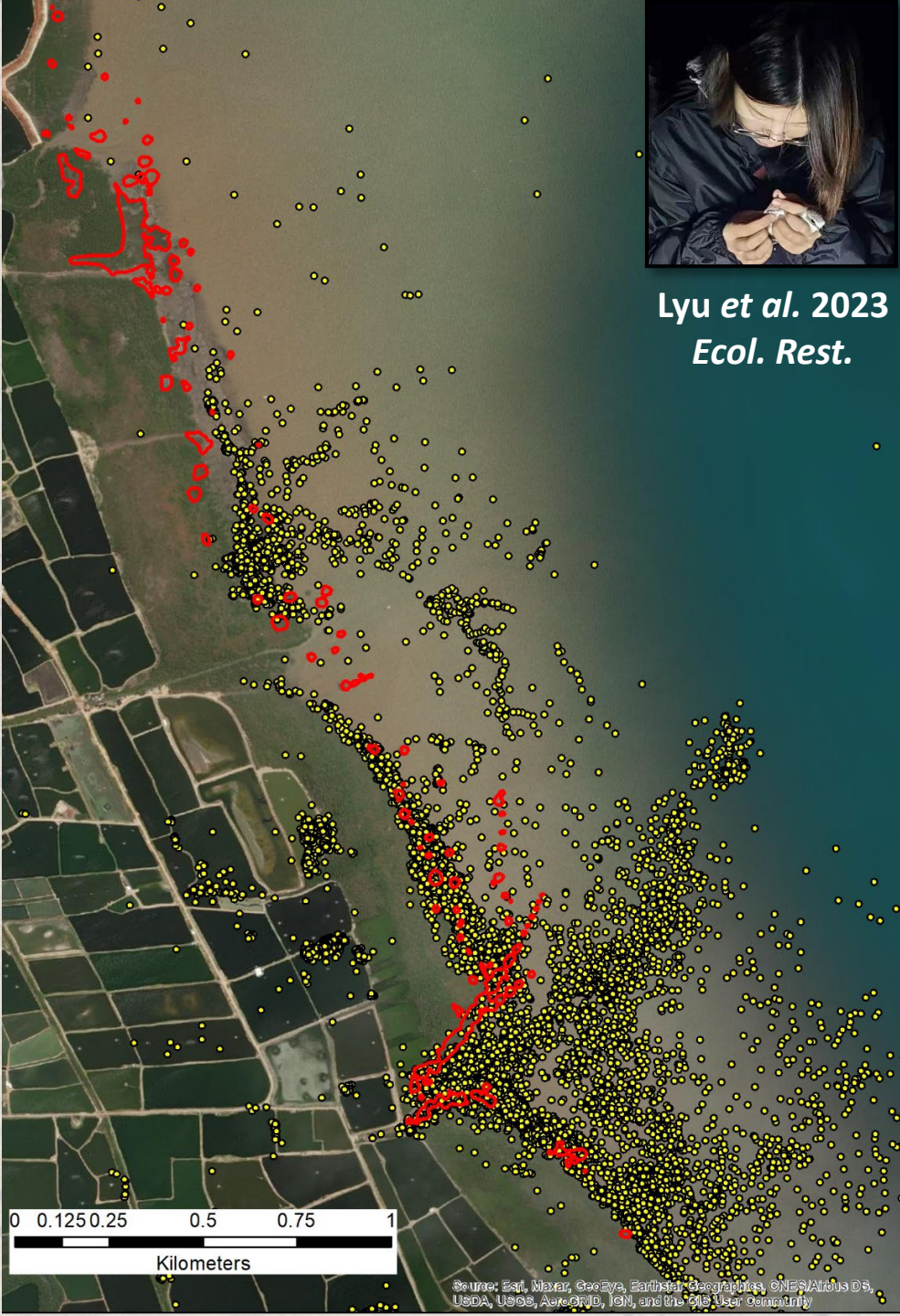
Evaluate the effectiveness of habitat restoration



Lyu *et al.* 2023
Ecol. Rest.

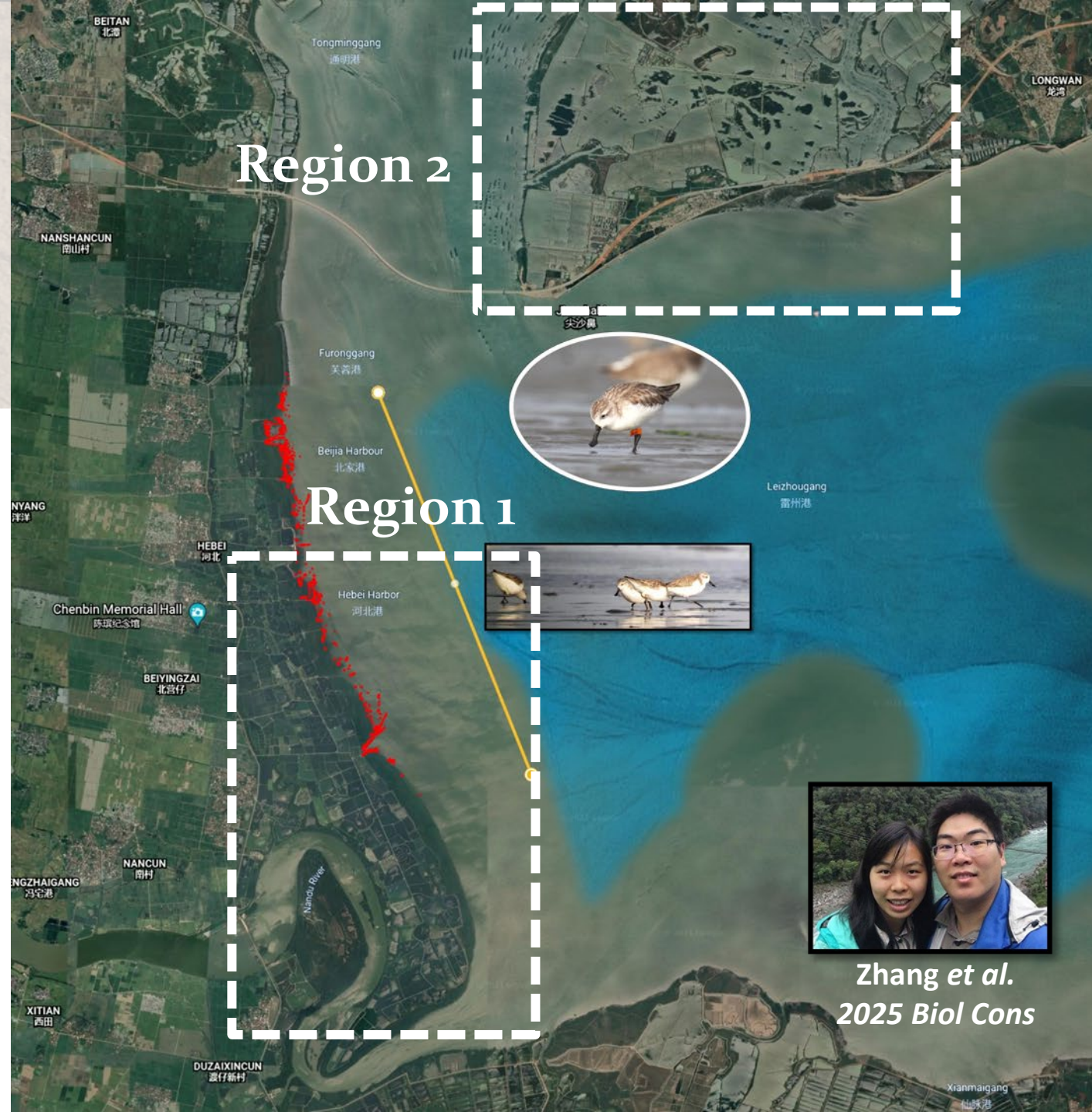
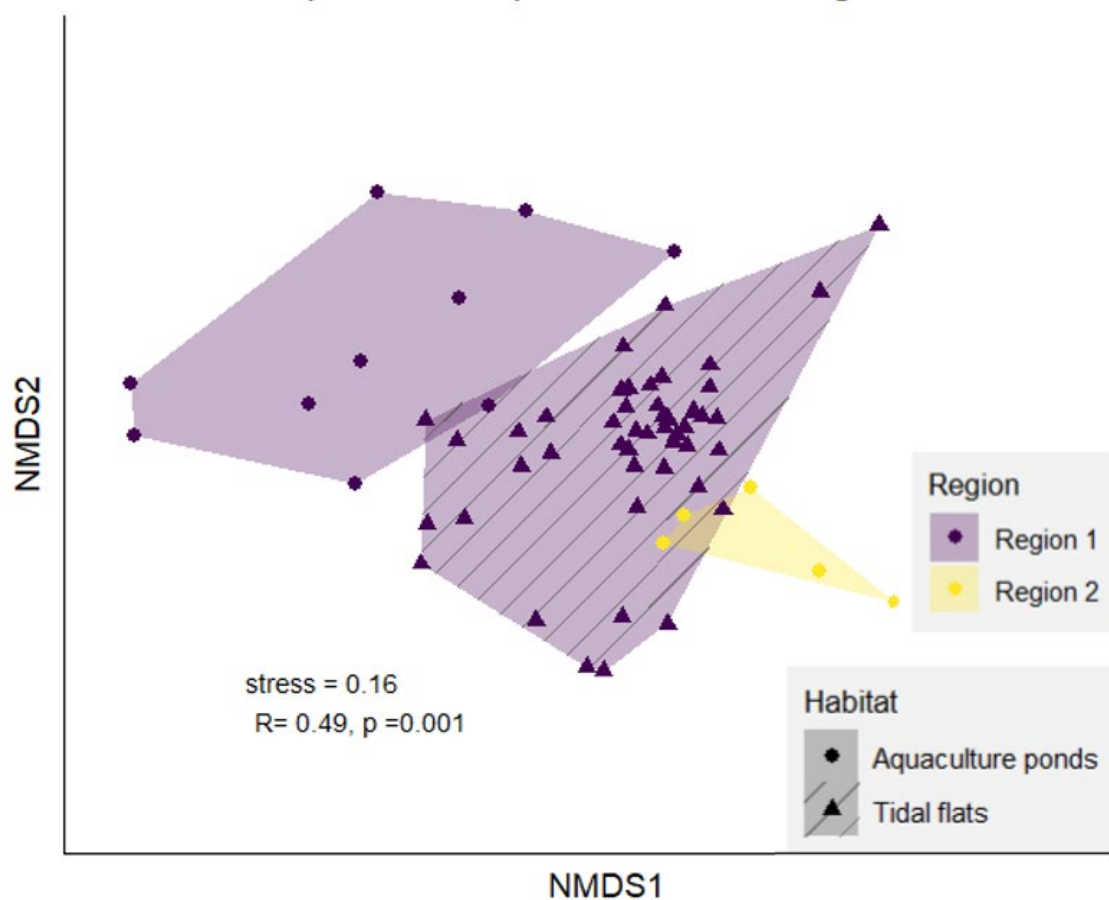
Time-lapse camera and satellite tracking data to quantify and compare the **occurrence frequency and habitat use of birds** in different habitats

- 1) Waterbirds avoided areas where *S. alterniflora* was present. Once *S. alterniflora* was eradicated, the species richness and species-level diversity of shorebirds and waterbirds did not differ significantly from those of the bare tidal flats
- 2) Combined with tracking data, *Spartina* eradication increased the habitat availability to waterbirds
- 3) The density and biomass of benthos in deeper sediments (5–20 cm below the surface) were significantly lower in *S. alterniflora* eradicated areas than in bare tidal flats



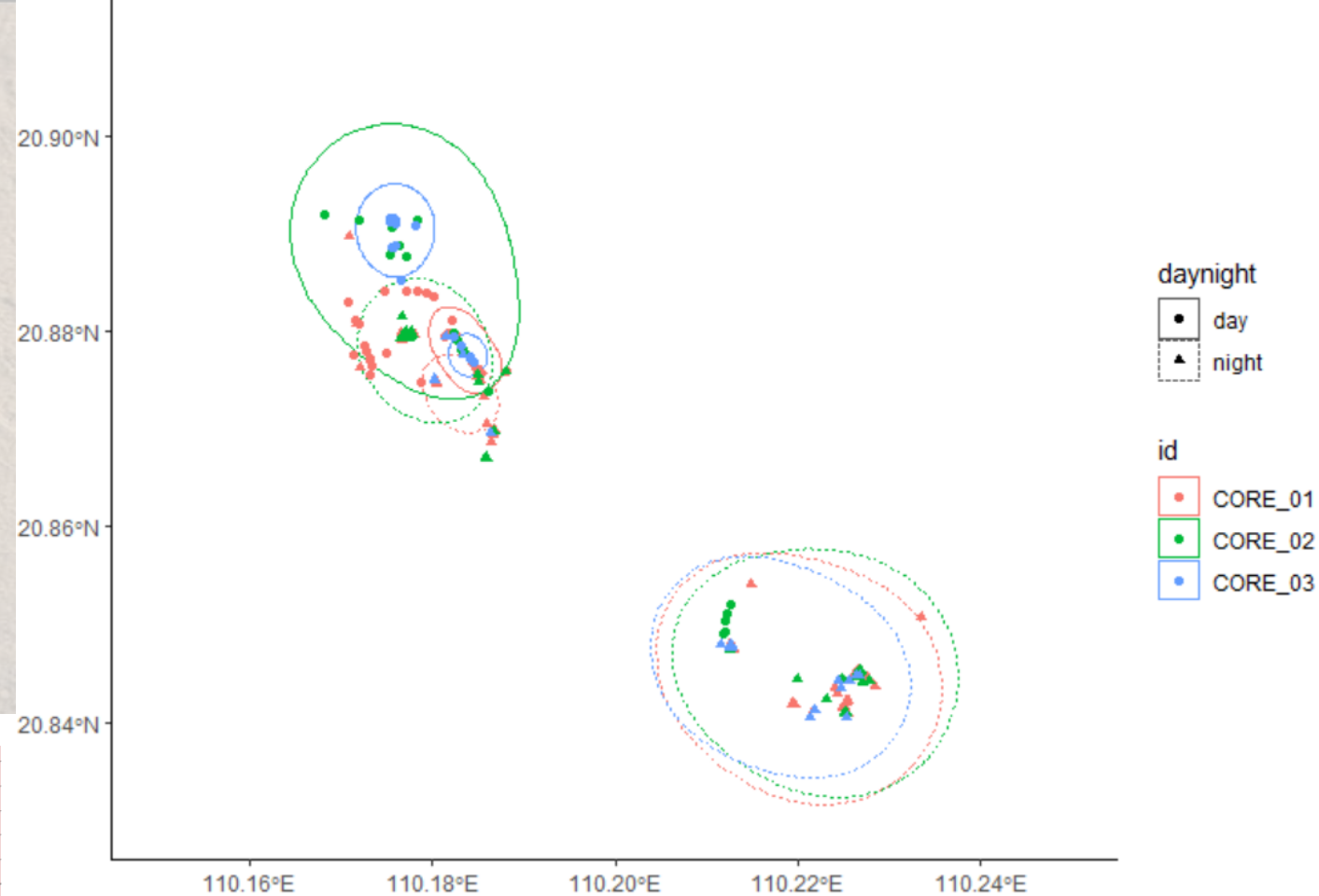
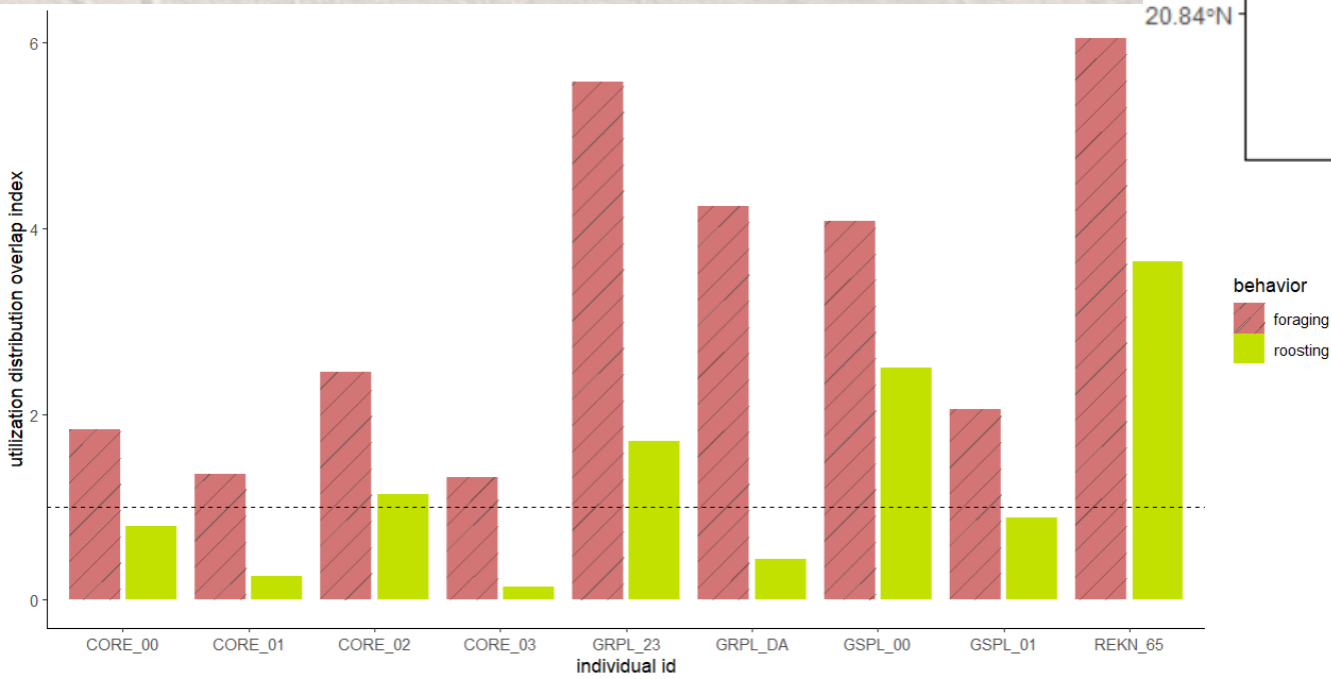
Habitat-use pattern

Different species compositions in adjacent areas

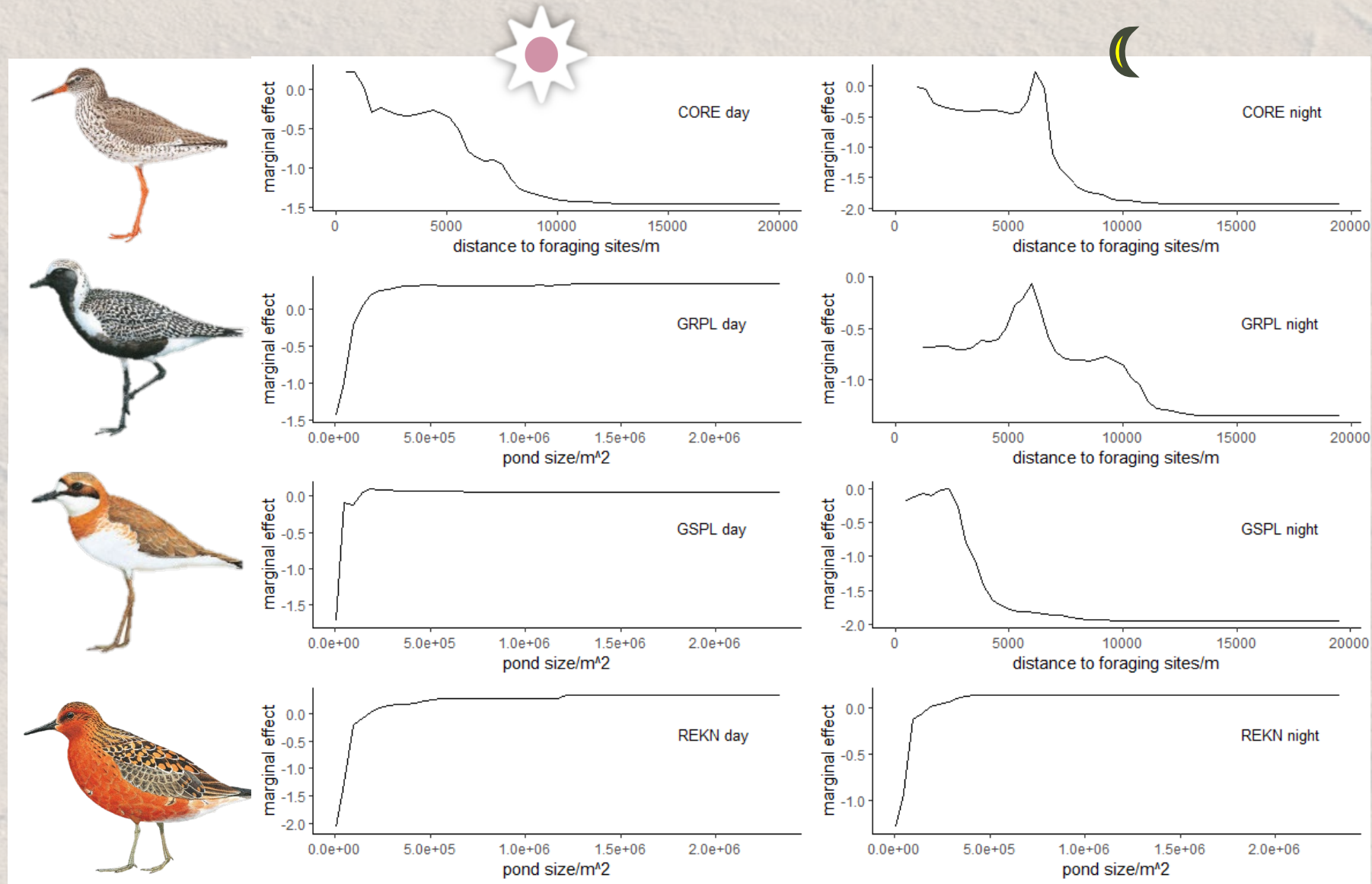


Habitat-use pattern

- **Circadian difference in roosting home ranges:** 5 in 9 tracked individuals (common redshank, grey plover, greater sand plover) showed clear separation of roosting home range between day and night ($UDOI < 1$)

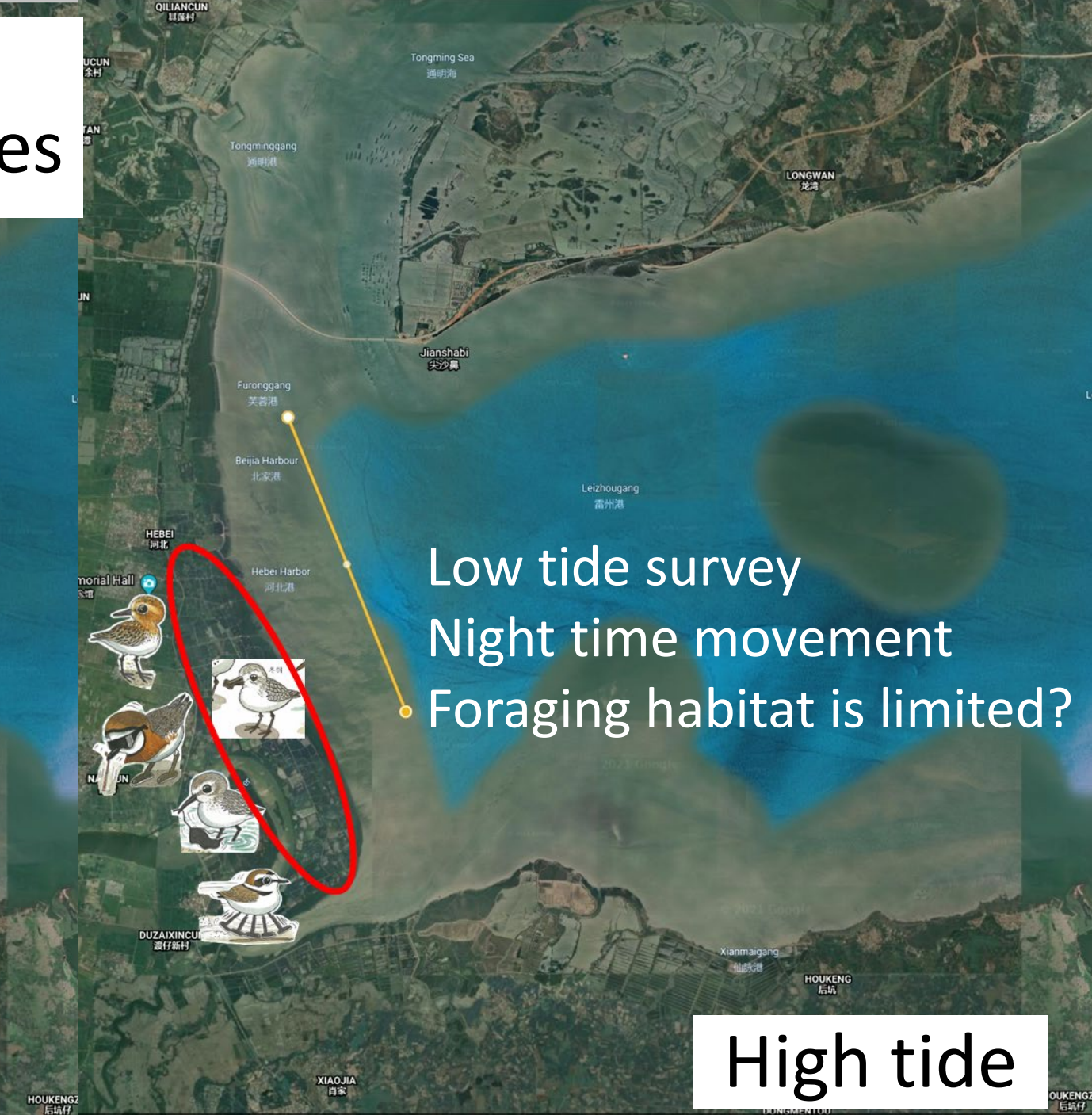
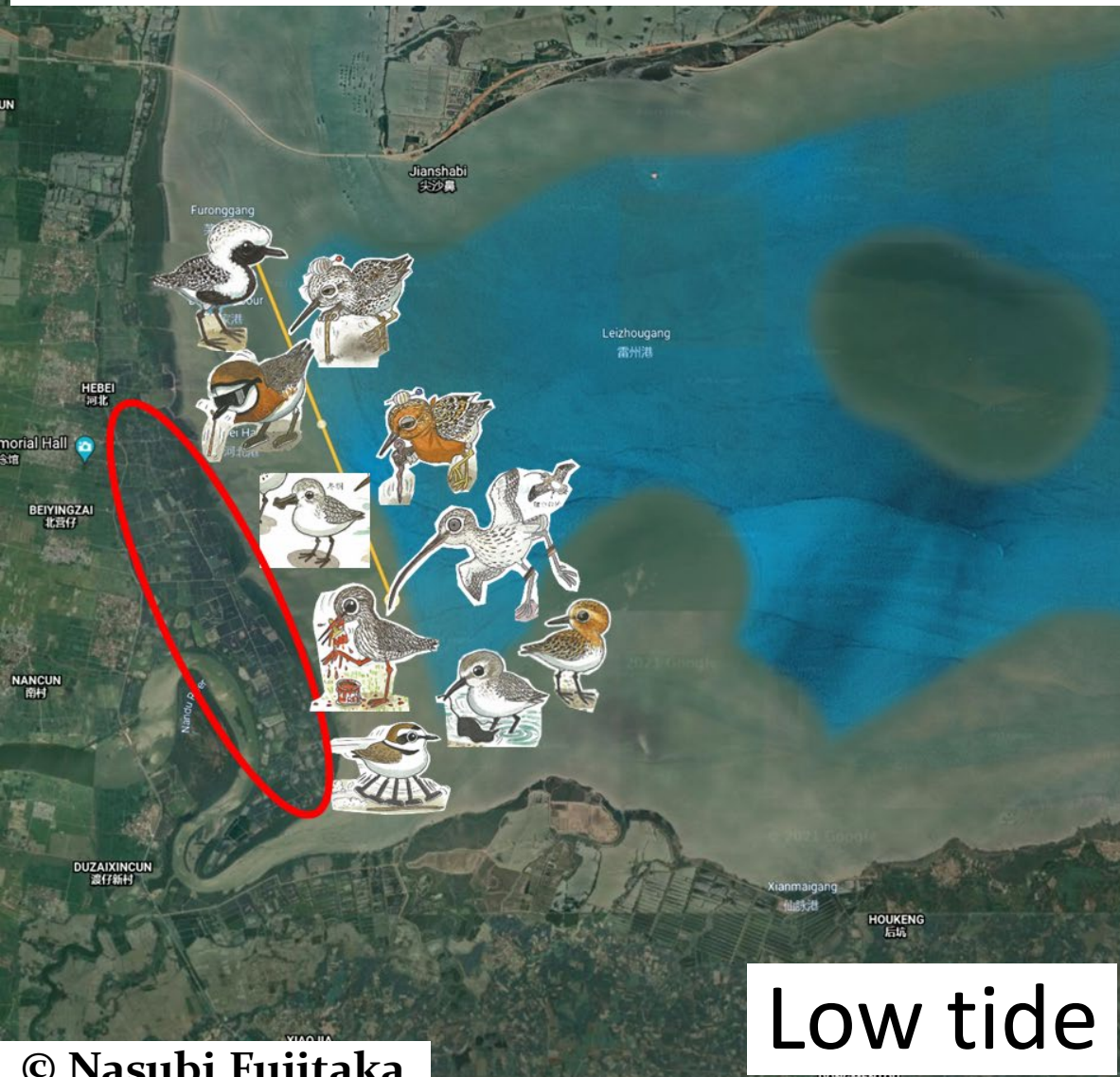


Factors affecting roost selection



Marginal effects of the most important explanatory variables

Different species have different roosting preferences



Low tide survey
Night time movement
Foraging habitat is limited?

Application of satellite tracking technology

↓ Impact of windfarm

M03 ♂

年龄：约2021年5月出生

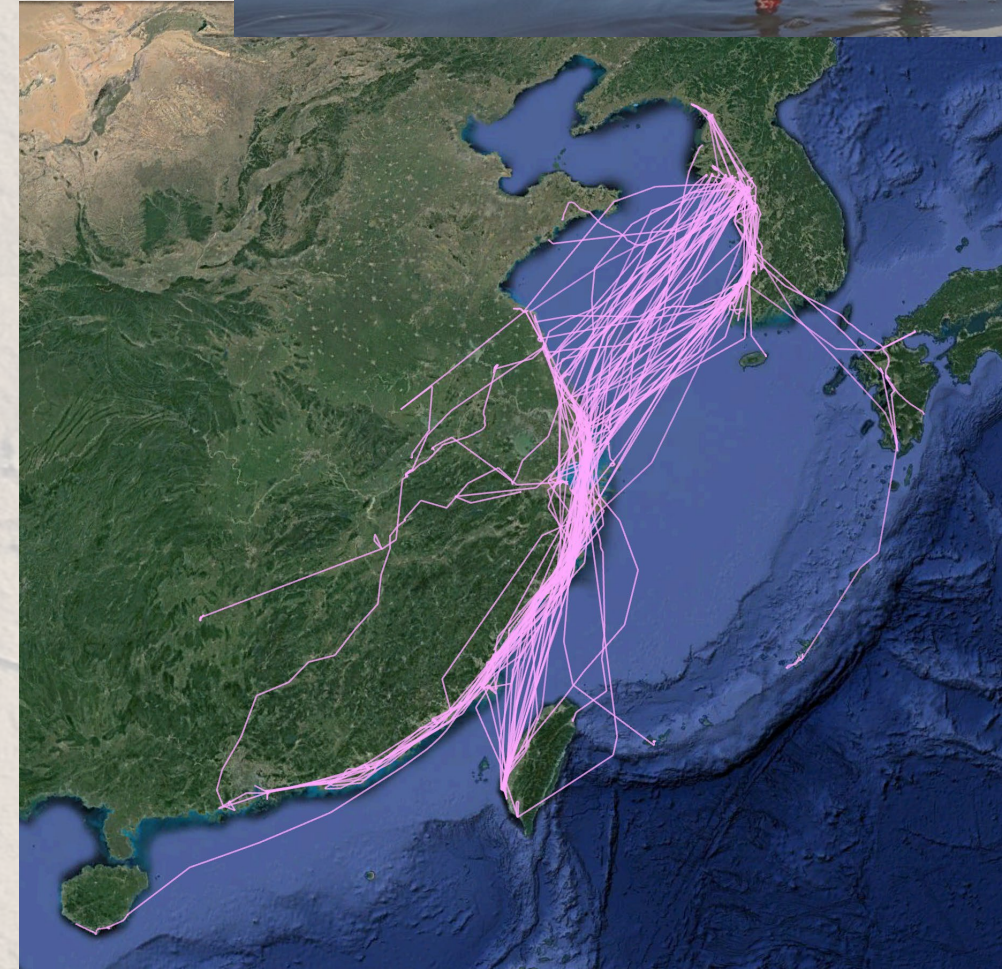
轨迹：2021夏季 – 韩国Okgwido

现在位置 – 韩国Hakgari

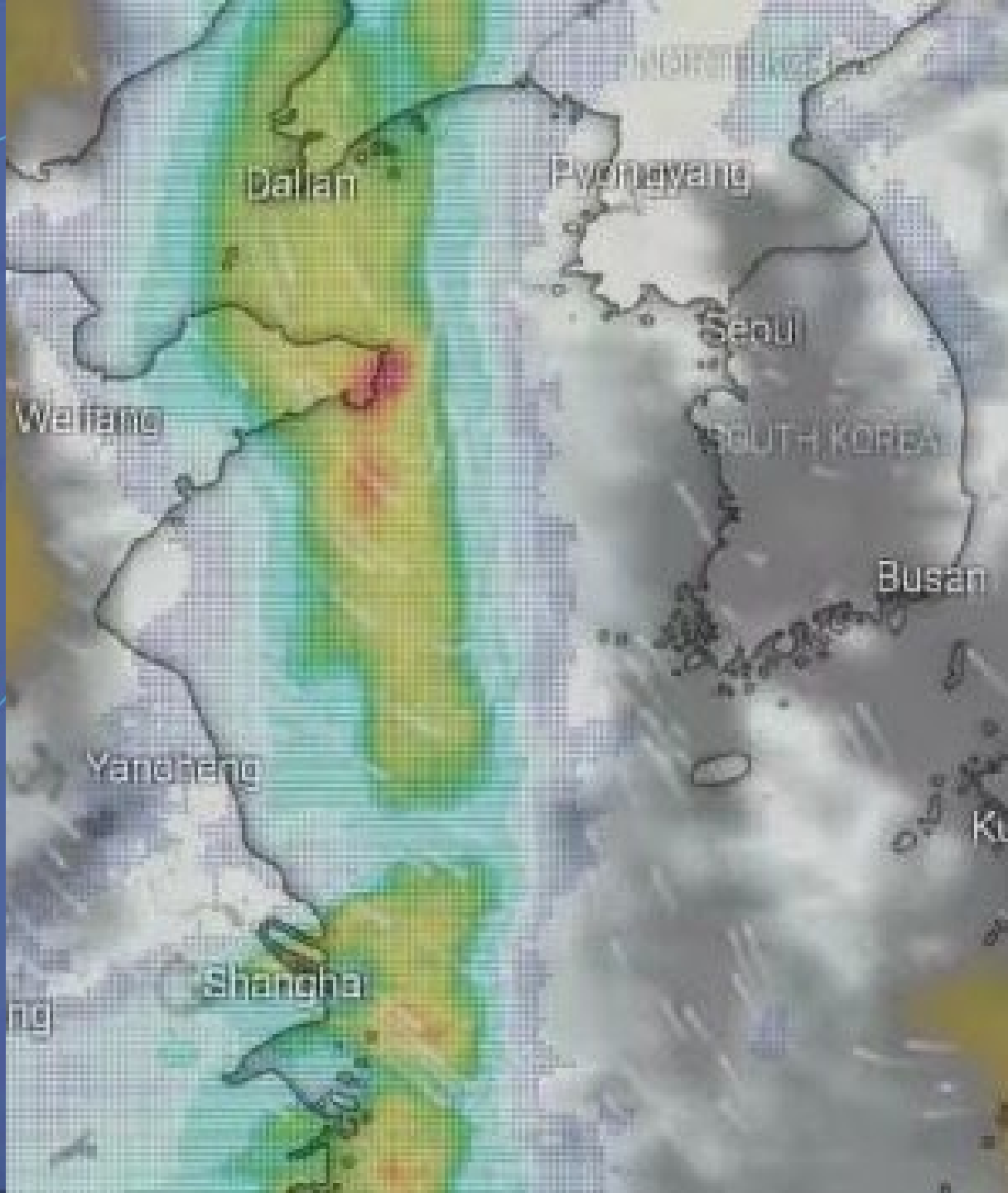
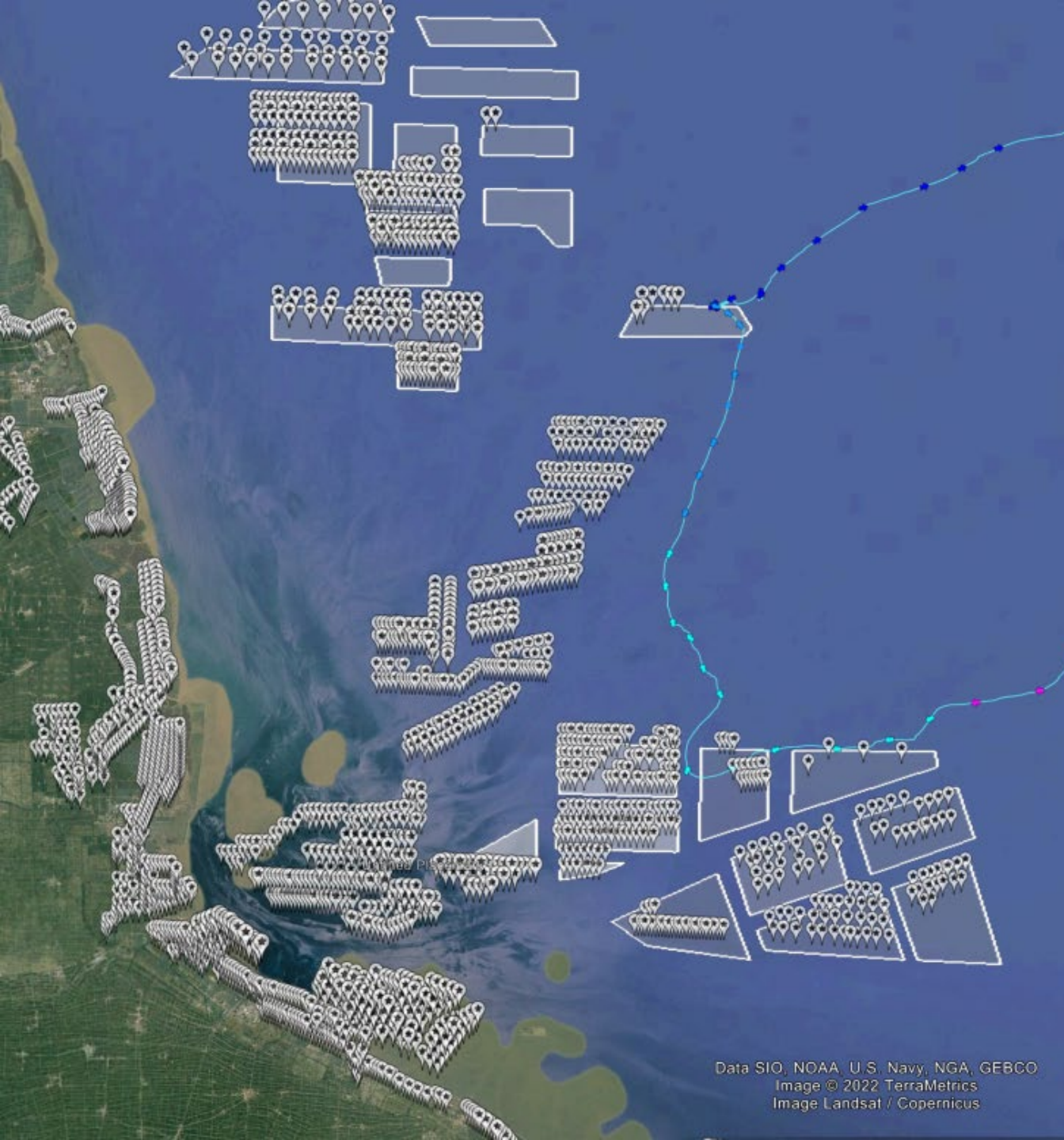
左



右

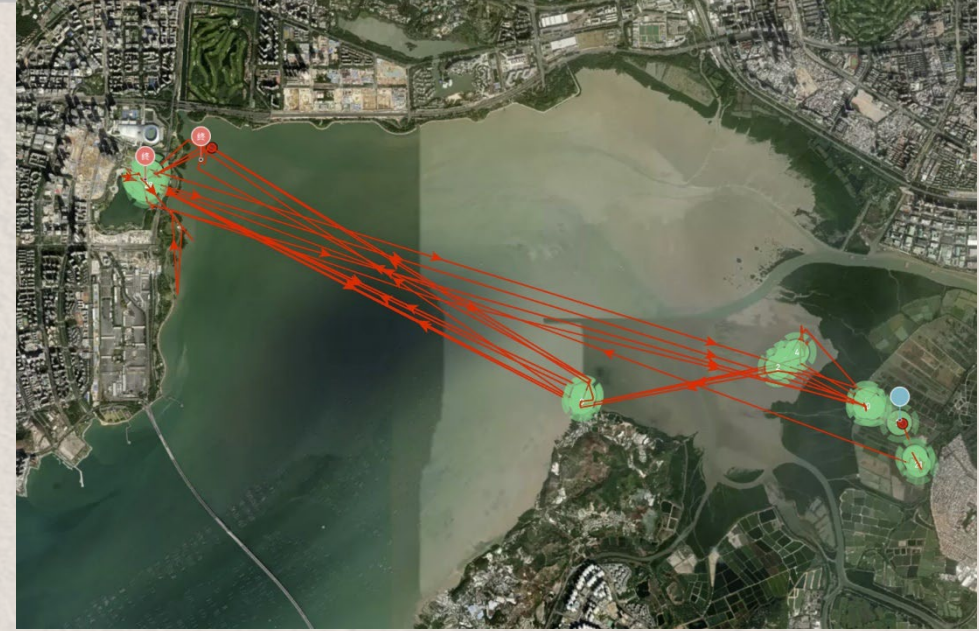






Take home messages

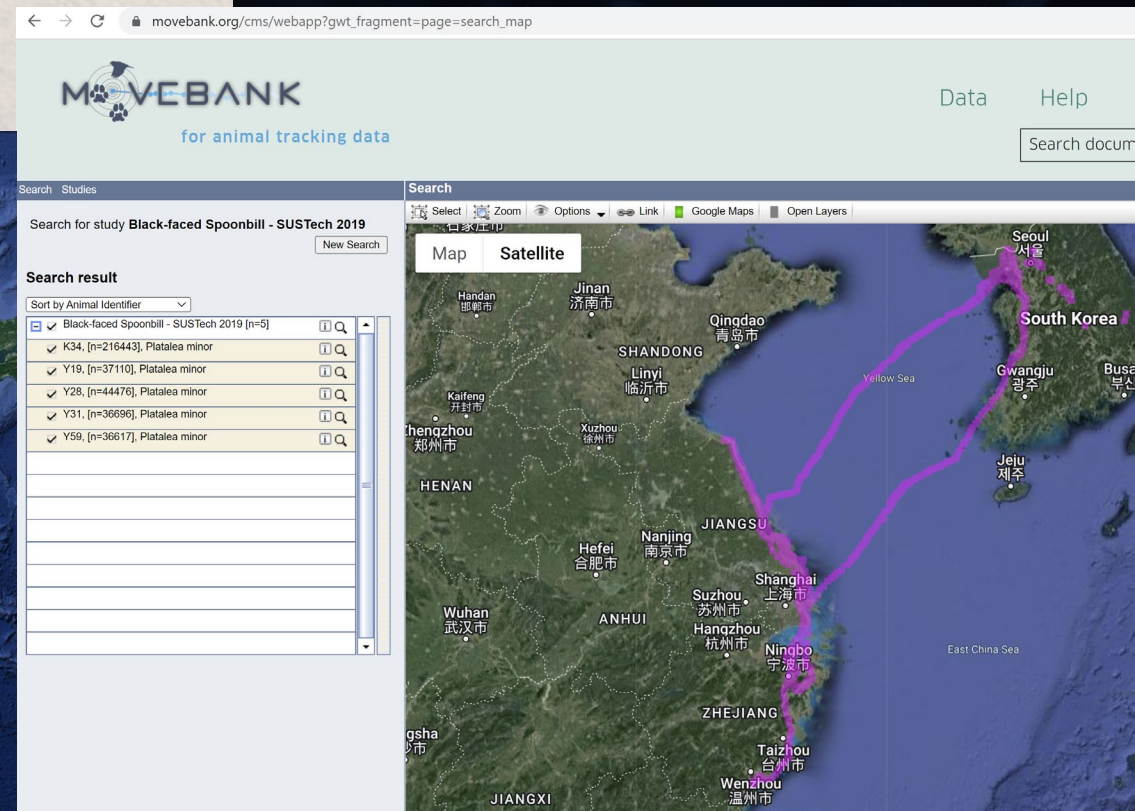
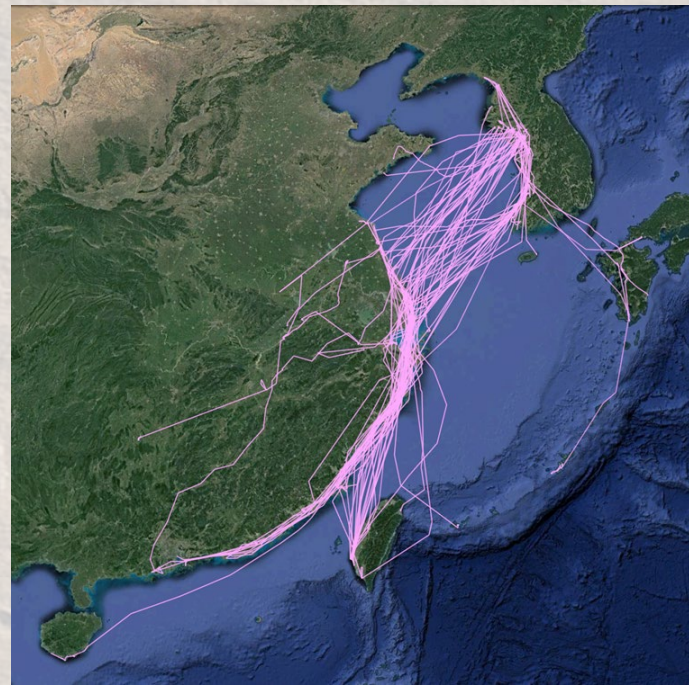
- ✚ Satellite tracking technology has a very strong potential applied values in the conservation of migratory birds and protected area management
- ✚ Habitat use, quantify management range, evaluate the effectiveness of management intervention, impact of development
- ✚ Relatively expensive, requires specialized skillsets for analysis, need a careful plan



Tracking data, future direction

<https://www.globalflywaynetwork.org/flyway/east-asian-australasian-flyway/map>

movebank.org





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choimo@yahoo.com