Integrated Study of Marine Mammals: An Update of The Regional Project in The Southeast Asia

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Why to Study MM?

• MMs are top predators/grazers
• MMs are icons of a healthy ecosystem
• MMs are friends to humans
• Conservation MMs is conservation of the whole ecosystem
What to Study of MM?

- Size of MM population (feeding pressure)
- Habitats and migration (where and when feed)
- Preys/food availability (what & how much being fed)
- Behaviors (swimming, reproduction)
- etc.
How to Study MM?

• Difficult to study
  – regulations, confines to natural environment hostile to terrestrially-limited humans
  – time/labor-limited/consuming and expensive

• NOT easy to get sample for prey analysis
How to Study MM?

• New technologies
  – Aerial survey:
    microplanes (expensive and dangerous) vs. UAVs
    (fors: economic, safe, convenient and sharp images;
    advanced - autotracking, IR, night observation, wide
    zoom range, etc.)
    pros: weather impacts, wind, rain
How to Study MM?

- New technologies
  - Satellite/radio telemetry (+/- data loggers):
    for: long period, continuous monitoring of the habitats, migration paths
    pro: relies on animal capture, the satellite(s) used matter accuracy

Nigel et al. 2015 《Science》

Global locations of published satellite telemetry studies over time
How to Study MM?

• New technologies
  – Unmanned auto-vessel, synoptic observation platform
    • environment: SST, SSS, pH, chla, etc
    • video monitor: MM and preys
    • Echosounding and hydrophone: preys and habitat
    • water sampling
How to Study MM?

- New technologies
  - Bioacoustics: passive, active

So how do you like me so far?
How to Study MM?

• New technologies
  – Bioacoustics: ultrasonic, sonic

Nigel et al. 2015 《Science》

Global locations of published acoustic telemetry studies over time
How to Study MM?

- New technologies
  - Bioacoustics: ultrasonic monitoring of dolphin hot spots and sighting in Songkhla Lake (Lagoon), Thailand
How to Study MM?

• New technologies
  – Bioacoustics: "sonic" observation in the Bay of Brunei

![Graphs showing normal, stressed, sudden motor startup, and chased conditions](image)
How to Study MM?

• New technologies
  – Bioacoustics: selective seagrass grazing by dugongs
How to Study MM?

• New technologies
  – Bioacoustics: selective feeding by dolphins?
How to Study MM?

• New technologies
  – Bioacoustics: habitat mapping

<table>
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<tr>
<th>putitive prey abundance</th>
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<tbody>
<tr>
<td>Date</td>
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<tr>
<td>Time (CST)</td>
</tr>
<tr>
<td>Depth (m)</td>
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<td>Speed (m/s)</td>
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<td>GPS Lat.</td>
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<td>GPS Long.</td>
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Seagrass bed distribution
10m both sides of track
How to Study MM?

- New technologies
  - Bioacoustics:
    - Better detection efficiency
    - Non-invasive
    - Day and Night observation
    - Continuous and long term monitoring
    - Collecting information of both MM and preys the same time
How to Study MM?

- New technologies
  - Molecular/isotope analysis with autopsy and biopsy samples
    - analysis of lipids or stable isotopes --> feeding habits / age
    - hormone levels --> reproductive status
    - genetic analysis --> subpopulations, relationships within/between population/species
Integrated Study of MM
Empowering our capacity

- Population dynamics
  - sighting, photo ID
  - UAVs
  - genetics
- Habitat and migration
  - sighting, photo ID
  - UAVs
  - bioacoustics
  - satellite/SMS telemetry
- Biology and behaviors
  - Molecular/isotope analysis
  - sighting
  - UAVs
  - bioacoustics
  - satellite/SMS telemetry
Acknowledgement

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- Local partners' co-financed projects
Thank you