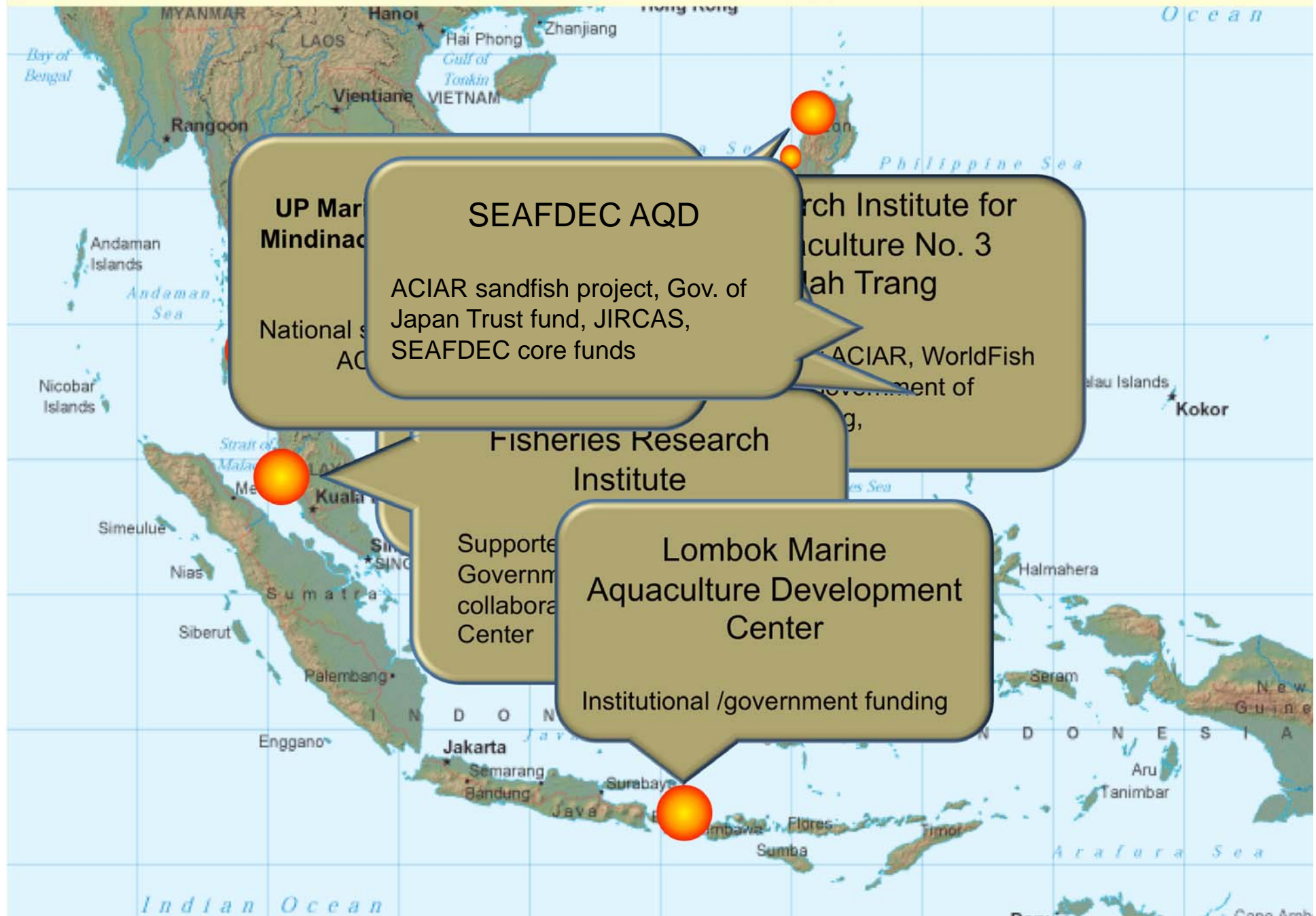


# OVERVIEW OF SEA CUCUMBER AQUACULTURE AND STOCKING RESEARCH IN THE SOUTH-EAST ASIAN REGION

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# Research sites





# This talk

- Outline ongoing research activities into sea cucumber culture in Southeast Asia
  - Briefly highlight some results that will not be presented by others during this meeting
  - Highlight new and ongoing research focus amongst some of these teams
  - Outline bottlenecks and ongoing issues
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# Hatchery/nursery development

- Until recently focused squarely on *H. scabra*
  - Early work conducted outside the region (James, Battaglione/Ramofafia and team) enthusiastically **adopted** in Asia (aided in particular by Rayner Pitt and Natacha Aguado's hatchery manual) and **adapted** to suit local needs
  - Simplification and diversification are key to uptake of developed technology in coastal communities
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# Simplification



Use of a single algal species throughout vastly simplifies hatchery production

(RIA3/Duy)





# Simplification (Hapa nets in ponds at RIA3)





# Adaptability



Floating hapa systems developed at UP-MSI provide options where marine ponds are not available

Photo: C. Hair

## **SEA CUCUMBER HATCHERY** (constructed: April 2010) (ACIAR & JIRCAS funds, RIA 3 collaboration)

- Larval Rearing Tanks, 10 units, 3-ton capacity
- Nursery Tanks, 4 units, 8-ton capacity
- Algal Tanks, 2 units, 3-ton capacity
- Space for experimental set-up (outdoor)







## Sandfish seed production data (Apr-Nov 2010)

	Total Count ('000)			Stage 1	Surv (%) (D0→S1)
	Day 0	Day 2	Day 8		
21-Apr-10	816	630	200	17,275	2.12
22-Apr-10	96	78	40	1,551	1.62
28-Apr-10	1,435	1,443	700	1,306	0.09
28-Jul-10	2,069	1,980	1,590	3,944	0.19
10-Aug-10	4,800	3,720	1,335	20,939	0.44
17-Sep-10	616	570	278	11,005	1.79
17-Sep-10	1,630	1,530	270	6,719	0.41
4-Oct-10	858	600	435	2,774	0.32
13-Oct-10	3,600	1,200	870	20,227	0.56
10-Nov-10	3,600	1,935	1,380	2,178	0.06
<b>TOTAL</b>	<b>19,520</b>	<b>13,686</b>	<b>7,098</b>	<b>87,918</b>	
<b>MEAN</b>	<b>1,952</b>	<b>1,369</b>	<b>710</b>	<b>8,792</b>	<b>0.76</b>



2010 (Oct) Training course on  
seed production and nursery of  
sandfish *Holothuria scabra*







# Bottlenecks

- Results do not always appear transferable, with modifications to local conditions necessary
    - Broodstock conditioning
    - Local water conditions and pathogens
  - In many instances, survival remains extremely variable
  - Use of live feed restricts uptake
  - Broodstock availability is an issue in many places
  - Space requirements for nursery/conditioning
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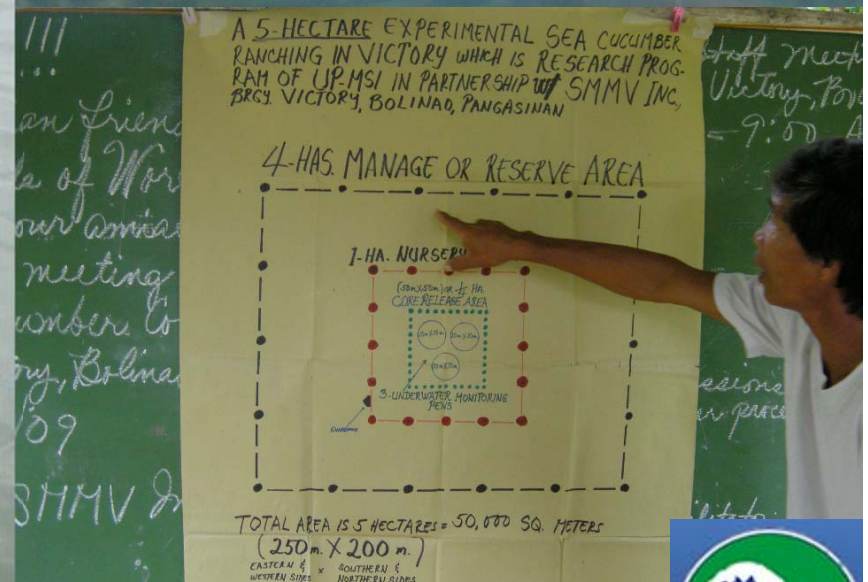
# Growout – a range of models

- Sea ranching
    - Community-based sea ranching in Philippines (UP-MSI, UP-Mindanao through ACIAR and National programs, SEAFDEC through GOJ-TF)
    - Mangrove-friendly systems (SEAFDEC /JIRCAS)
    - Cage system trials in Indonesia
  - Pond culture
    - Monoculture systems (RIA3, SEAFDEC )
    - Rotational systems (RIA3/WorldFish/ACIAR)
    - Co-culture systems (RIA3, SEAFDEC, SGIC)
  - Not restocking/enhancement at this stage
    - Positive signs from UP-MSI (synchronous spawning), but a difficult research topic
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Photo: C. Hair



## Community-based sea-ranching - Philippines





# Pond farming in Vietnam



- Around a dozen farmers
- Producing 2-3 t/ha/annum
- Seed from RIA 3 hatchery at 2 sizes
- Farmers sell to local dealers gutted only



# Cage and pen trials

Lombok Marine Aquaculture Development Centre



**After 12 month :**

- **Survival Rate : 15.2 %**
- **Slow growth rate**
- **high mortality caused of disease and injuries**
- **Trials discontinued**



# Co-culture trials

- Attractive concept due to:
  - Bioremediation capacity
  - Niche availability
  - Benign nature of sea cucumbers
- Some success with Babylon snail and seabass in Vietnam
- Successes reported outside of SE Asia (e.g. Slater and Carton, *A. mollis* with green mussel in NZ; Various authors, *A. japonicas* with scallops, abalone, shrimp )
- Shrimp an obvious choice due to pond usage
  - Past research not positive (e.g. Bell et al, *stylirostris*)
  - Current research disastrous (*vannamei* in Vietnam)
- Rotation remains an option



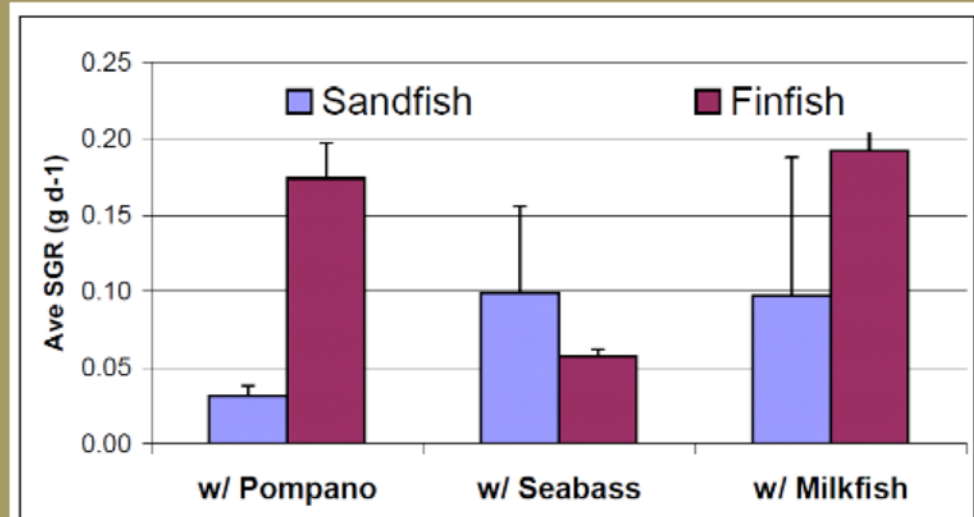
# Co-culture trials - finfish



**6 species tested:** Milkfish, Seabass, Rabbitfish, Grouper, Pompano, Snapper

**Rabbitfish, Grouper** not compatible with sandfish

- Growth compromised with Pompano
- Seabass may have suffered
- Milkfish OK
- Snapper ongoing





# Bottlenecks & constraints

- Growth rates of around 1 year to (small) market size in ponds, and substantially longer in natural habitat
  - Density dependence = space intensive
  - Sediment and salinity requirements for ponds are restrictive (although not in central Vietnam)
  - Mechanics of large-scale releases
  - Low returns in some areas (Indonesia, Philippines) exacerbated by low yield (as low as 3%) after drying
  - Sandfish appear quite susceptible to physical trauma and co-culture options may need to look at physical or temporal separation
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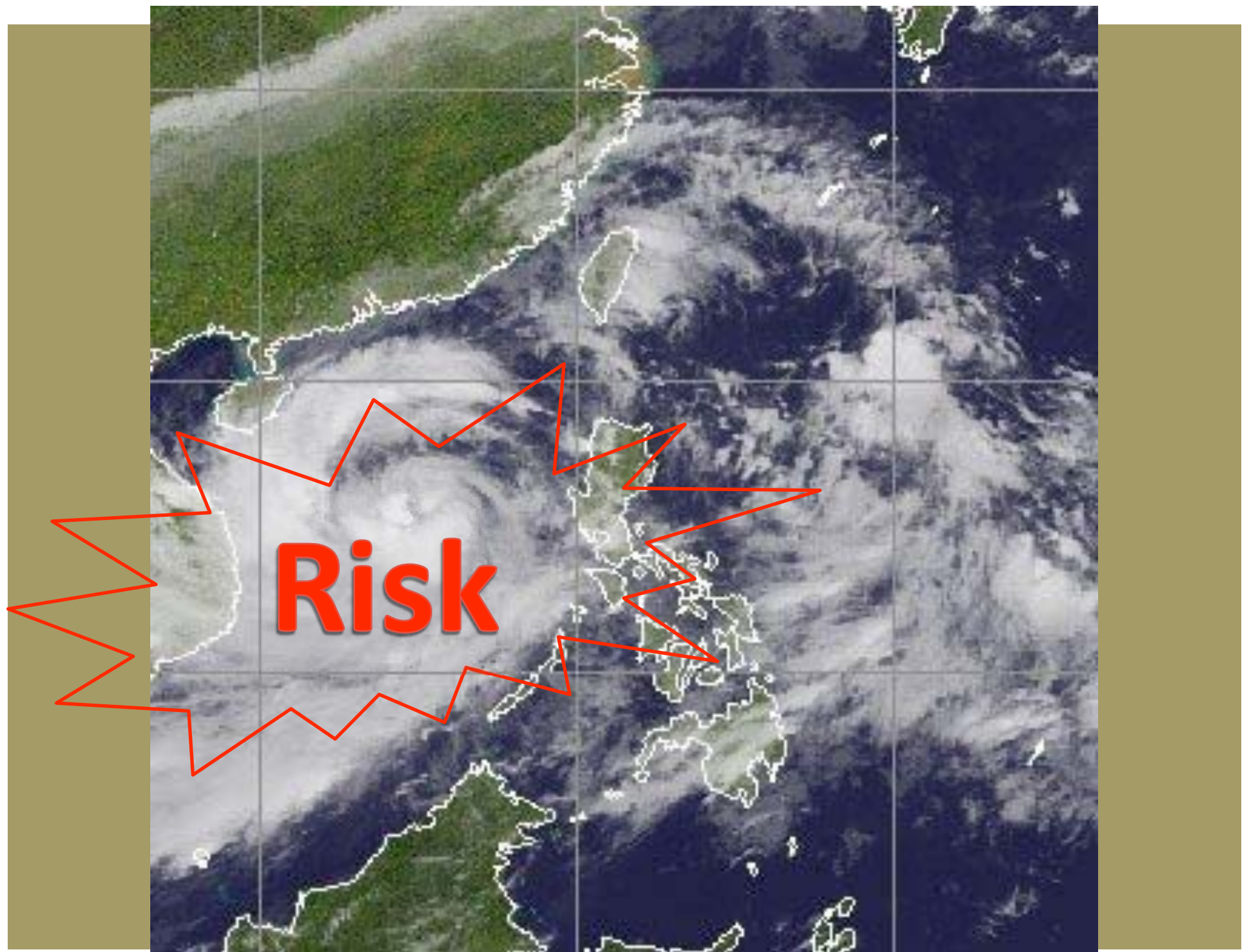






Photo by Gil Macinto





# Post-harvest issues

- Optimal processing methods
    - Some research by NFRDI (Philippines) but without productive outcomes to-date
  - Value-chain optimisation
  - Ongoing work WorldFish Centre and Philippines partners
  - Covering Philippines and Vietnam to-date
  - Inconsistent pricing between countries and regions shows that there is still major work to be done here
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# Future research areas

- Improving accessibility of technology:
    - Diversified systems (all players!)
    - Alternative nursery systems (MSI, JCU, UP-Min)
  - Stabilising production
    - broodstock conditioning (DAC/TSF. SGIC)
    - Detailed dietary/condition analysis (JCU/DAC/RIA3 – ACIAR, SEAFDEC/JIRCAS)
  - Species diversification: interest in *S. horrens* in particular FRI (Malaysia) and UP-MSI (Philippines)
    - Integration with fisheries governance (MSI, Philippines national program/ACIAR)
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## Future research directions cont'd

- Integrated production systems and enterprise structure (RIA 3/ACIAR – Cam Ranh Bay)
  - Technology scale-out:
    - Adaptation of shrimp hatcheries (RIA3, SEAFDEC)
    - Dispersed learning sites (MSI/ACIAR/SEAFDEC with institutional and NGO partners)
  - Continued work on feasibility, institutional, regulative and economic aspects of community based ranching (MSI, UP-MIN, ACIAR, WorldFish/JCU and partners, SEAFDEC/GOJ-TF, SGIC)
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Thanks