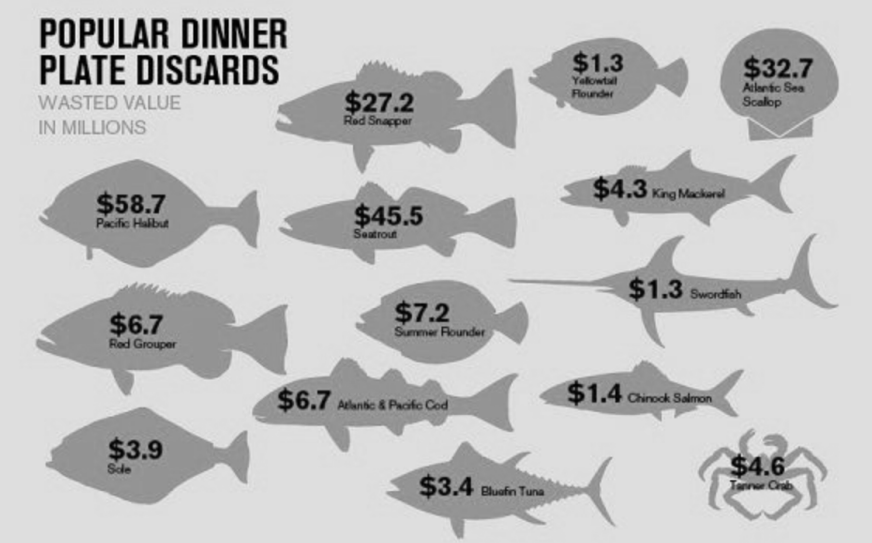
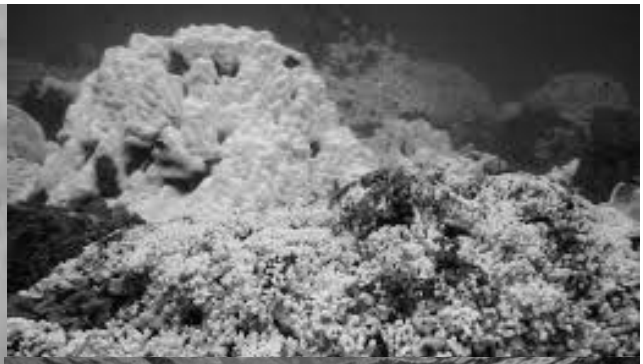
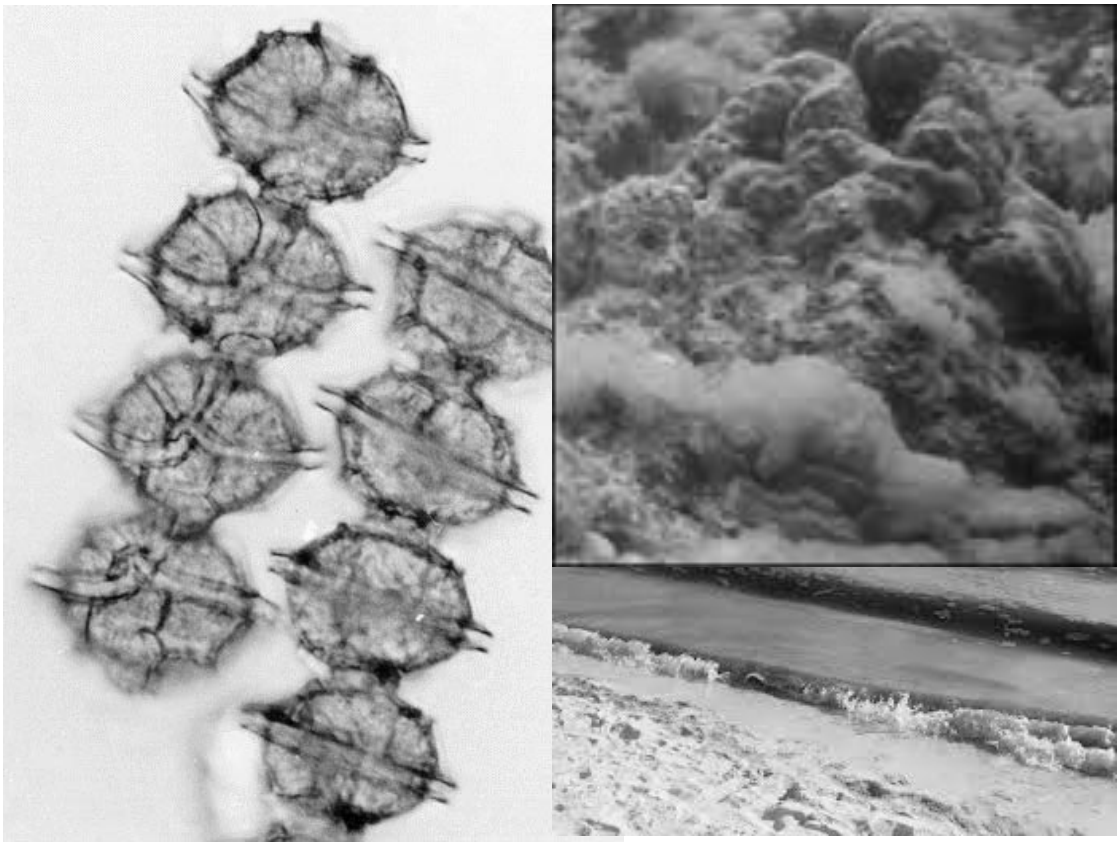


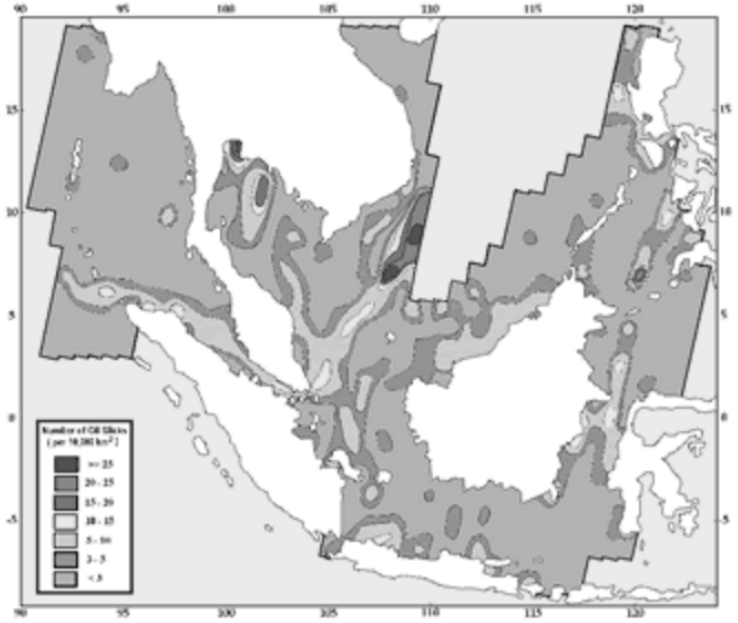
Issue 2: Effects of Pollution and habitat destruction





https://crisp.nus.edu.sg/~research/oilspills/oilspills.htm

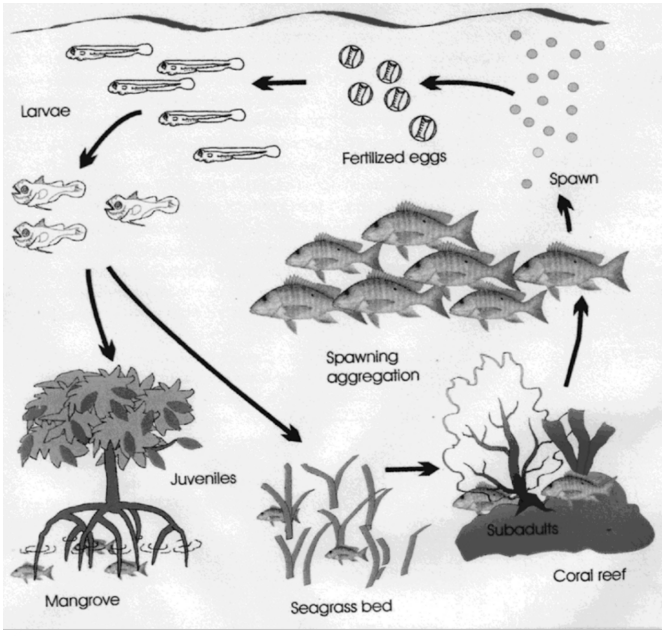
Oil spills in the SCS

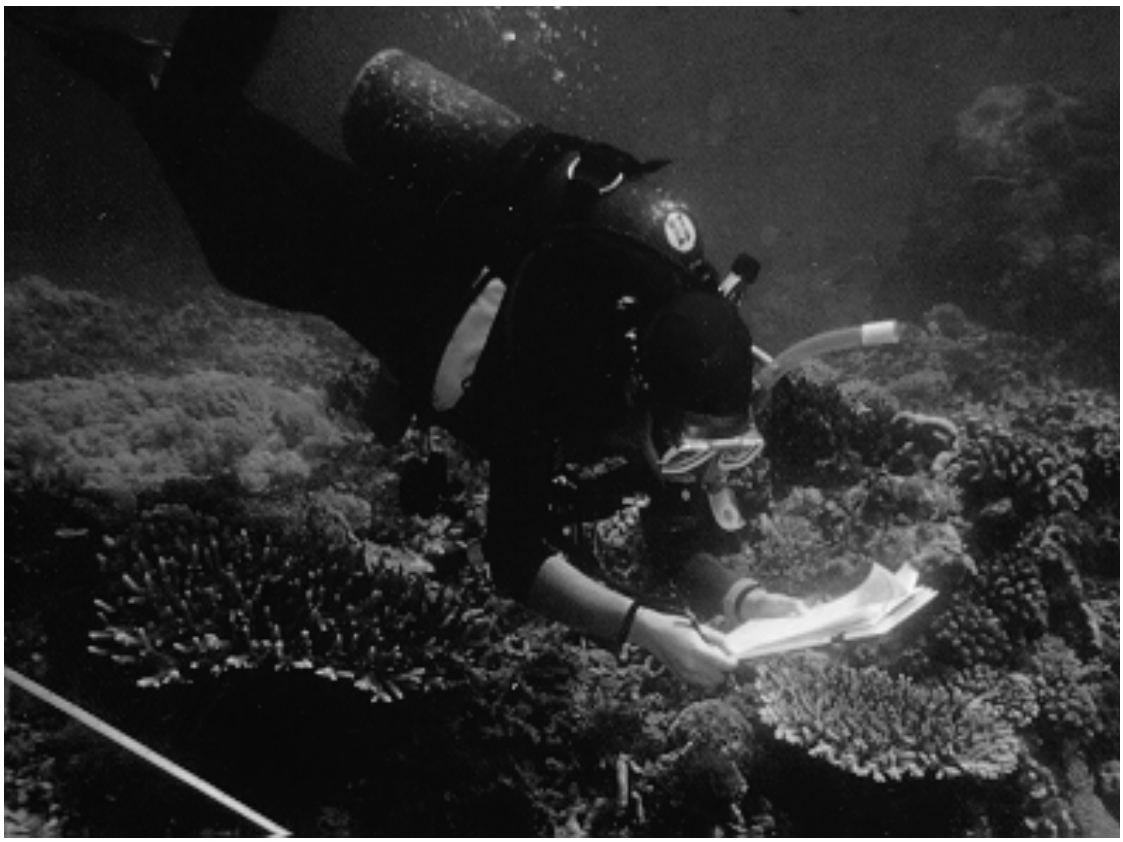


http://projects.inweh.unu.edu/inweh/inweh/content/StrategicActionProgrammes/pemseds_2003s.htmla_s

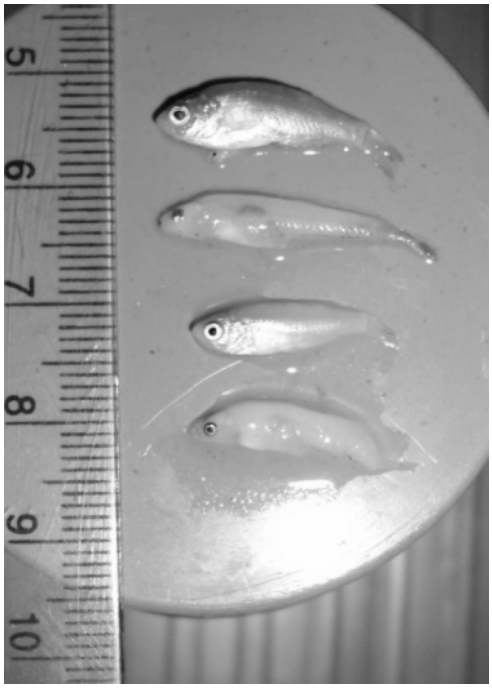
Oil spills

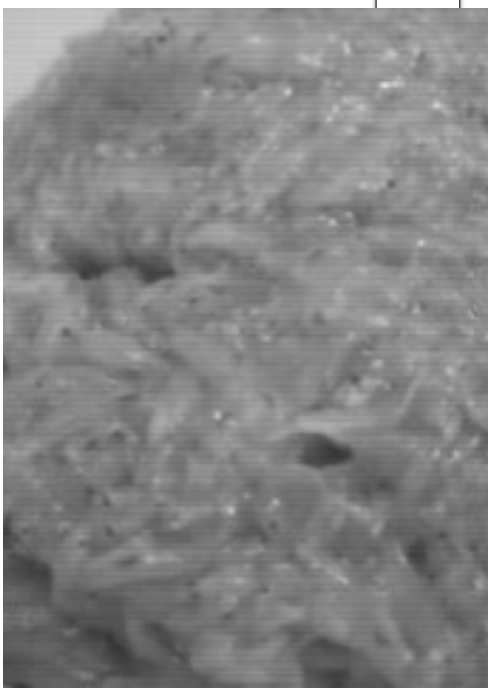
Issue 3: Interdependencies of the resource





Case of the "Dalagang bukid"





Issue 4: Limited resources for enforcement

- Establishment of marine protected areas or no-take zones
- Designating closed seasons and open season
- Integrated Coastal Zone Management and Ecosystem-based Fisheries Management
- Developing alternative livelihoods

- Controls over destructive fishing practices
- Regulations against habitat destruction

Solution 1: International Agreements

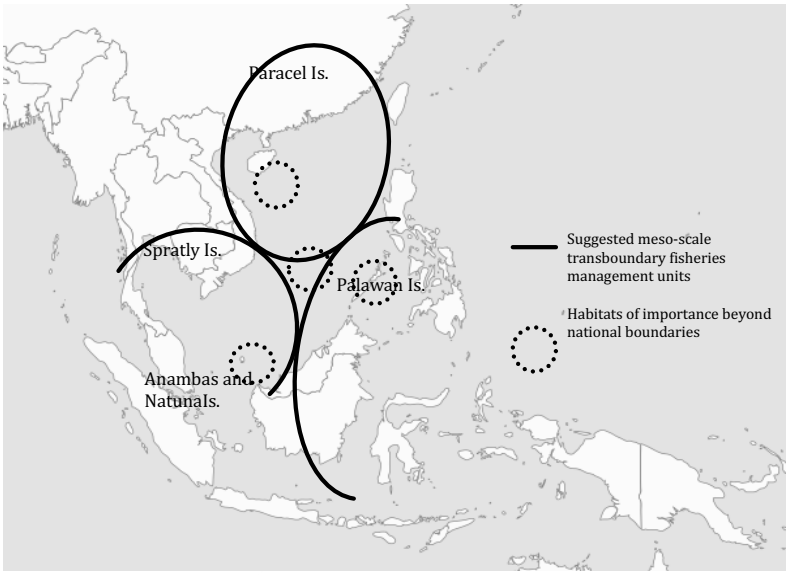
FAO Reykjavik Declaration 2001

FAO Code of Conduct for Responsible Fisheries 1995

Agenda 21 1992 and updates

Agreement Relating to the Conservation an Management of Straddling Stocks 1995

SOLUTION 2: Transboundary mgt units



Chapter 9

Exclusive Economic Zones and the Management of Fisheries in the South China Sea

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1. INTRODUCTION

The 1982 United Nations Convention on the Law of the Sea (LOSC), with the provisions for defining an Exclusive Economic Zone (EEZ), is the international agreement that has had the greatest influence on the structure of fisheries policies in national and international arenas. It had the profound effect of increasing the contribution of fisheries to the national gross domestic product or GDP. It brought about a redistribution of benefits from fishing from distant water fishing fleets to the coastal states. Investments flowed in to the fisheries sector. Countries that had fisheries resources but limited capacity to exploit them established joint ventures with states that owned fishing fleets (ADB, 1997). The end result was a substantial increase in the contribution of fisheries to the national GDP especially in developing countries and the overall shift in total capture fisheries production from the developed to the developing world (Delgado et al., 2003).

The LOSC and the EEZ are strongly associated with ownership and the implication that fisheries will be better managed within some property rights regime. These concepts were modified by coastal states to apply to fisheries management policies at the scale of local governments and even communities. Shortly after the Third United Nation's Conference on the Law of the Sea ended in 1982, community-based initiatives to define fishing rights and effectively manage fisheries proliferated. There was a stronger effort to move national policy toward devolution of fisheries management to local government units and encourage co-management and stakeholder participation in the management of coastal resources. There were several efforts to develop Integrated Coastal Zone Management (ICZM) Plans and establish Community Based Coastal Resource Management (CBCRM) strategies in the Philippines first, and later in Indonesia, Thailand, Malaysia and Vietnam.

In this paper, we present case studies where there is a poor institutional fit between the EEZs of coastal states and the natural structure of fisheries resources. This has led to the formulation of inadequate fisheries policies, difficulties in monitoring and controlling the overexploitation of fish stocks, and a massive degradation of fish habi-

S.A. Ebbin et al. (eds.), A Sea Change:
The Exclusive Economic Zone and Governance Institutions for Living Marine Resources, 136–149.

Meso-scale Transboundary Units for the Management of Coral Reefs in the South China Sea Area

M.C.A. Ablan, J.W. McManus, C.A. Chen, K.T. Shao, J. Bell, A.S. Cabanban, V.S. Tuan and I.W. Arthana

Abstract

Local communities and local government units are recognized as the primary stakeholders and participants in the management of coral reef resources and the primary beneficiaries of small-scale fishing activities in the nearshore areas of the coastal zone. The issues relating to the management of the coastal zone are multi-faceted and some issues are largely intertwined with national policy and development goals. Thus, national governments have jurisdiction over these nearshore coastal resources to harmonize policies, monitor resource use and provide incentives for sustainable use. However, the natural boundaries of these reef resources, the processes that support reef ecosystems, and the local or national affiliation of the people who benefit from them may transcend the boundaries of the local and national management units. Therefore, efforts to arrest the decline in fish catch and loss of biodiversity for reefs require management interventions and assessment activities to be carried out at varying scales. In Southeast Asia, some aspects of reef and reef resources management — particularly in deciding the allocation of catch among competing fisheries, development of sustainable harvest strategies, use of broodstock for restocking or stock enhancement programs, protection of nursery and spawning areas, designation of systems of marine protected areas, and the identification of representative, adequate and comprehensive areas for biodiversity conservation in the region — may require the definition of larger management units. At the regional level, multi-country initiatives will need to define units for the transboundary management of resources. The use of large marine ecosystems (LMEs) to identify and manage fisheries resources may be a starting point; however, given the relatively sedentary nature of coral reef-dwelling and reef-associated organisms compared with other pelagic and demersal species, meso-scale transboundary units within the LMEs have to be defined. This paper provides suggestions for transboundary management units for coral reef and reef-associated resources in Southeast Asia based on information from genetic structures of model organisms in the region. In addition, specific reef areas are identified, which may be important beyond their national boundaries, as potential sources of recruits.

Introduction

Much of the biodiversity and reef fisheries resources in Southeast Asia are unlikely to survive without active management. Coral reefs of the region are the most threatened with more than 80% at risk primarily from coastal development and fishing-related pressures (Bryant et al. 1998). Millions of coastal dwellers rely on reef resources for food and livelihood. As economies continue to grow and demands on the environment multiply, degradation and unsustainable use of this resource also increase.

Coastal communities in Southeast Asia are heavily dependent on fisheries. Catch from the reef fishery is estimated to comprise up to 20-25% of the total production from marine fisheries in countries like the Philippines and Indonesia (McManus 1997). Longhurst and Pauly (1987) have documented the occurrence of overfishing in east Malaysia, the Philippines, Vietnam and southern China. Reports show that the maximum sustainable yield (MSY), the limit reference point beyond which immediate and substantial action should be taken to protect harvested stock (Caddy and Csirke 1983), has already been exceeded for demersal (Silvestre et al. 1987), pelagic (Dalzell and Ganaden 1987; Trinidad et al. 1993) and reef fisheries (McManus and Meñez 1997) in the Philippines. Similar cases occur elsewhere in the region but are less well documented. The situation is apparently the same in Vietnam (Long in press) and eastern Malaysia (Abu Talib et al. in press) as growing populations turn to fishing as a source of livelihood.

Aside from being unsustainable, overfishing in the region has implications for species diversity and abundance for both pelagic (Christensen 1998) and reef fisheries (McManus 1992). Biodiversity loss due to harvest is apparent in the local-scale extinctions of reef-associated species such as the sea urchin *Tripneustes gratilla* (Talaue-McManus and Kesner 1995) and the giant clams *Tridacna derasa* and *Tridacna gigas* (Meñez et al. 1997).

Reef Connectivity and Implications for Management

Conceptually, rehabilitation and sustainability of a reef subject to intense fishing pressure hinge on the availability of new recruits and their

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Genetics and the study of fisheries connectivity in Asian developing countries

MA. Carmen A. Ablan
Show more

http://dx.doi.org/10.1016/j.fishres.2006.02.006

Abstract

Management interventions to halt the decline and restore productivity of coastal fisheries in developing countries are increasingly becoming spatially explicit and focused on local scales. As policies in these countries gravitate towards local management, knowledge of the extent to which the local management units are dependent or independent of others becomes essential to the success of any intervention. Defining resource boundaries and measuring connectivity in the marine environment, however, has not been easy. Asian developing countries, where the capability to use molecular genetic tools in fisheries and aquaculture has escalated in the last few years, are exploring the use of genetic markers as a means to obtain the elusive answers. The challenge is to test the potential of molecular methods and their usefulness to provide some indication of resource boundaries and connectivity among management units in the context of developing countries. The paper presents a brief summary of the available methods to determine connectivity using genetic markers and two examples where they have been applied in Southeast Asia. Recommendations for the more efficient conduct of the research based on the experiences from these projects are presented.

Keywords

Genetics; Connectivity; Marine fish; MPAs; Microsatellites; Asia

Mar. Biotechnol. 6, 312–326, 2004
DOI: 10.1007/s10126-003-0028-2

MARINE BIOTECHNOLOGY

Original Submissions

Population Structure and Genetic Variability of Six Bar Wrasse (*Thallasoma hardwicki*) in Northern South China Sea Revealed by Mitochondrial Control Region Sequences

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Abstract: The genetic relationships among northern South China Sea populations of the six bar wrasse (*Thallasoma hardwicki*) were investigated. Fish collected from the Solomon Islands were used for geographic comparison. In 1998 and 1999, a total of 100 fish were sampled from 6 localities of the northern South China Sea and 3 localities of the Solomon Islands. Genetic variations in DNA sequences were examined from the first hypervariable region (HVR-1) of the mitochondrial control region, as amplified by polymerase chain reaction. High levels of haplotypic diversity ($h = 0.944 \pm 0.0016$, $\pi = 0.0224 \pm 0.01171$) in the HVR-1 region of the mitochondrial control region of *T. hardwicki* were detected. This yielded 94 haplotypes that exhibited a minimum spanning tree with a starburst structure, suggestive of a very recent origin for most haplotypes. Neutrality tests indicated that the pattern of genetic variability in *T. hardwicki* is consistent either with genetic hitchhiking by an advantageous mutation or with population expansion. Partitioning populations into coherent geographic groups divided the northern South China Sea samples ($\Phi_{CT} = 0.0313$, $P < 0.001$) into 3 major groups: a north–central group composed of northwestern Taiwan and northern Vietnam; a southwestern group containing southern Vietnam; and a southern group including the central Philippines. These results are in concordance with mesoscale boundaries proposed by allozyme markers, thus highlighting the importance of identifying transboundary units for the conservation and management of fisheries in the South China Sea.

Key words: mitochondrial control region, *Thallasoma hardwicki*, demographic history, population structure, South China Sea.

Introduction

The literature is replete with examples of marine fish species with high levels of gene flow that exhibit no genetic

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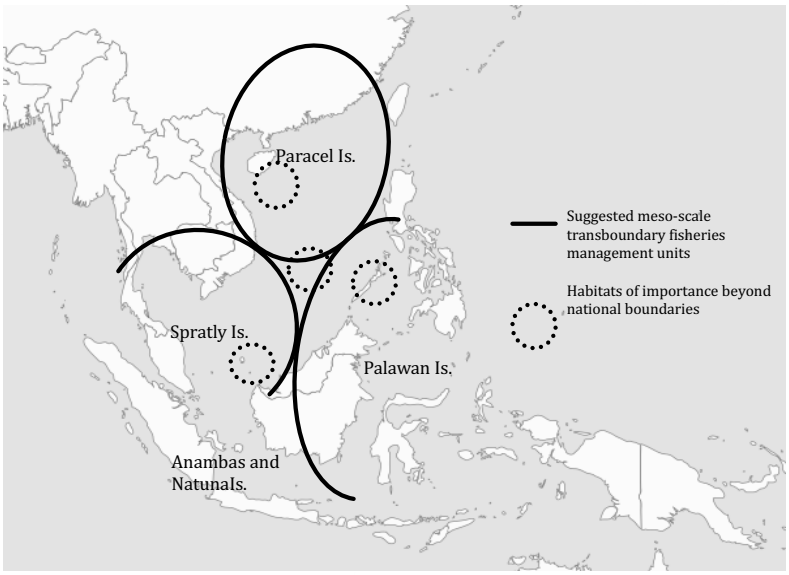


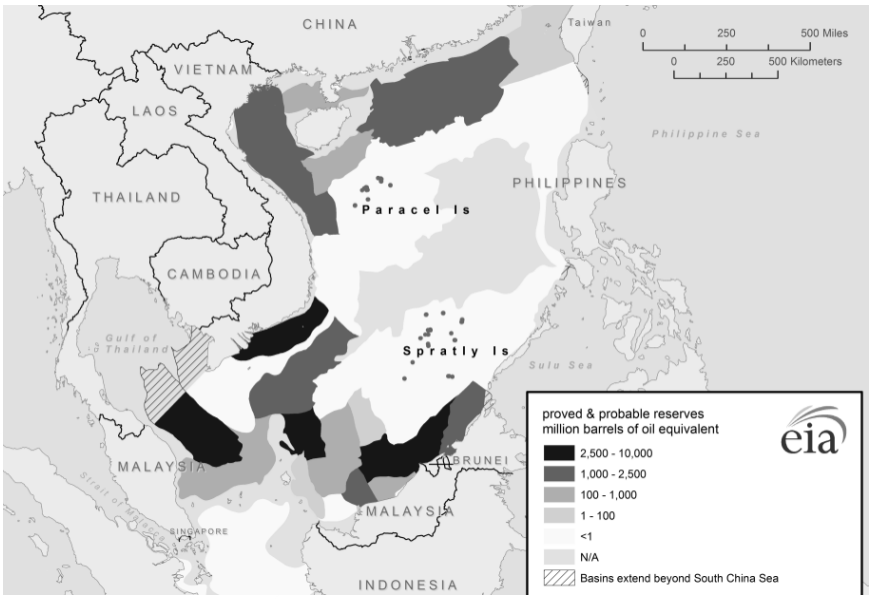
For consideration….

a. Regardless of sovereignty, declare no fishing within 1 nautical mile of the prominent features

b. Considering traditional fishing rights authorized to fish under national quotas carrying satellite-based vessel identification systems for self-policing

c. Other fishing regulations applied in an adaptive manner via research and decision-making under the management of an agreed organization

SOLUTION 3: Discussion on trade-offs



Ambio
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REVIEW

What is at stake? Status and threats to South China Sea marine fisheries

Louise S. L. Teh, Allison Witter, William W. L. Cheung, U. Rashid Sumaila, Xueying Yin

What is at stake?

Table 1 Landed value of catch from SCS countries (2012), and the economic activity and household income (000 USD) supported by reported levels of landed value Source of economic and income multipliers: Dyck and Sumaila (2010)

Country	Landed value (000 USD)	Economic multiplier	Income multiplier	Economic effect (000 USD)	Income effect (000 USD)
Brunei	18.42[a]	2.16	0.62	39.75	11.39
Cambodia	110.73[a]	1.73	0.54	191.94	59.60
China	9807.03[b]	3.34	0.79	32 727.94	7752.11
Hong Kong	296.77[c]	2.59	0.46	769.16	135.27
Indonesia	1084.99[b]	1.66	0.52	1806.05	568.66
Malaysia	1219.13[b]	2.58	0.70	3140.01	856.69
Philippines	817.34[b]	1.19	0.34	972.91	275.36
Singapore	12.30[a]	4.01	0.70	49.31	8.66
Taiwan	2731.29[b]	3.28	0.97	8957.90	2645.49
Thailand	1286.63[b]	2.12	0.24	2725.64	308.84
Vietnam	4384.18[a]	3.47	0.77	15 201.03	3363.13
Total[d]	21 768 810			66 581 628	15 985 210

[a] *Source* SEAFDEC (2012)

[b] *Source* National fisheries statistics of respective countries

[c] *Source* Agriculture, Fisheries, and Conservation Department Hong Kong (http://www.gov.hk/en/about/abouthk/factsheets/docs/agriculture.pdf)

[d] *Note* Total does not include Macau, for which no data was available, but is likely to be minimal

Table 2 Summary of vessel and employment numbers in selected SCS fisheries. *Source* Funge-Smith et al. (2012), unless otherwise indicated

Fishery location	No. vessels	Data year	No. people employed	Data year
Brunei	2627[a]	2012	3840[b]	2006
Cambodia	6236[c]	2006	74 572[c]	2006
China (northern SCS)	92 312	2004–2008	648 799	2009
Hong Kong	4500[d]	2014	9400[a]	2014
Indonesia (FMA 711)	76 763	2010	320 017	2010
Macau	n/a		n/a	
Malaysia (Peninsular east coast, Sabah, Sarawak)	31 660[a]	2012	56 113	2008
Philippines (Regions NCR, CAR, I, III, IV)	116 959[e]	2012	627 000[f]	2013
Singapore	4[a]	2012	n/a	
Taiwan	23 159 [g]	2012	271 592 [g]	2012
Thailand (east coast)	58 119	2000	168 680	2000
Vietnam	129 519	2010	540 000 [h]	2000
Total	541 858		2 720 013	

[a] *Source* SEAFDEC (2014)

[b] *Source* Abdul Rahim (2007)

[c] *Source* Puthy (2007)

[d] *Source* Agriculture, Fisheries and Conservation Department (AFCD) of Hong Kong. Retrieved 12 February, 2016, from www.hk-fish.net/eng/fisheries_info/fishing_fleeting/index.htm

[e] This consists of 115 303 municipal boats and 1656 commercial vessels. Municipal boat count is based on 2000 data; commercial vessel numbers are based on 2007 data. *Source* BFAR (2012)

[f] This is the total number of fishers in fishery subzone A and B. Note that Zone B consists of one region (Region V) that does not fall within the SCS. *Source* Palomares and Pauly (2014)