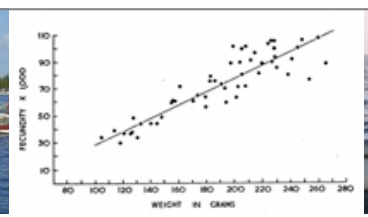
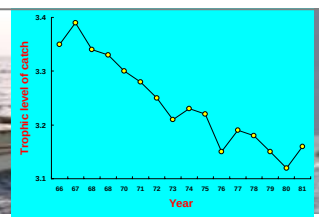
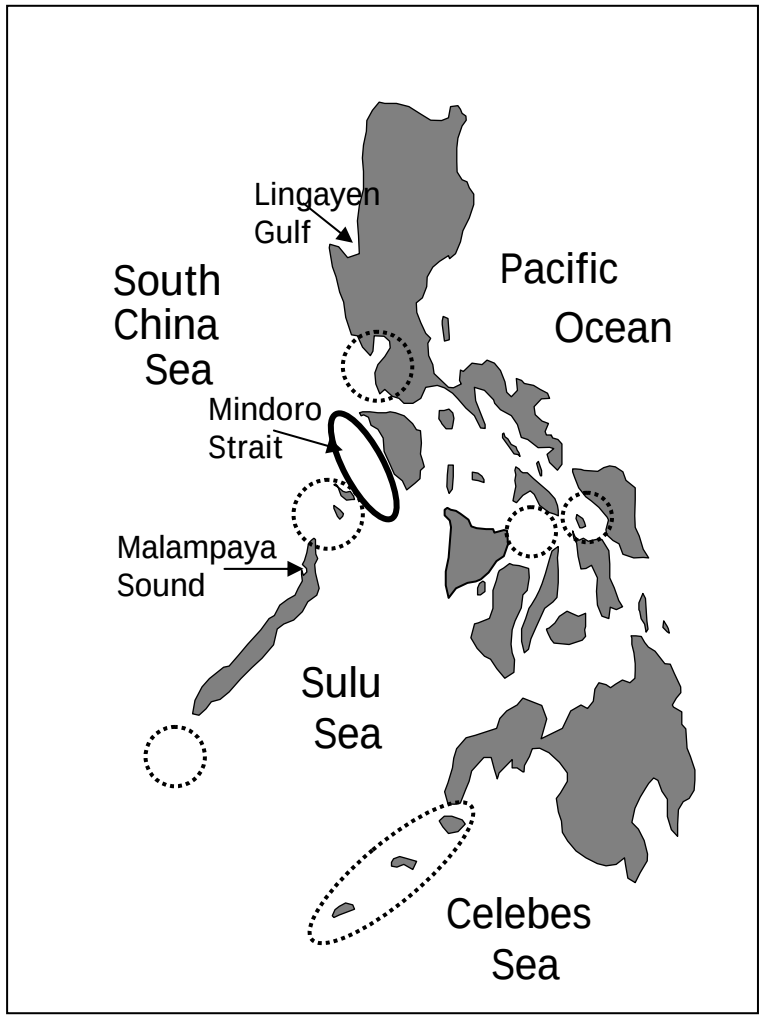
Some Good Practices in the Establishment of *Refugia*, Sanctuaries, and Fisheries Management Systems in the Philippines

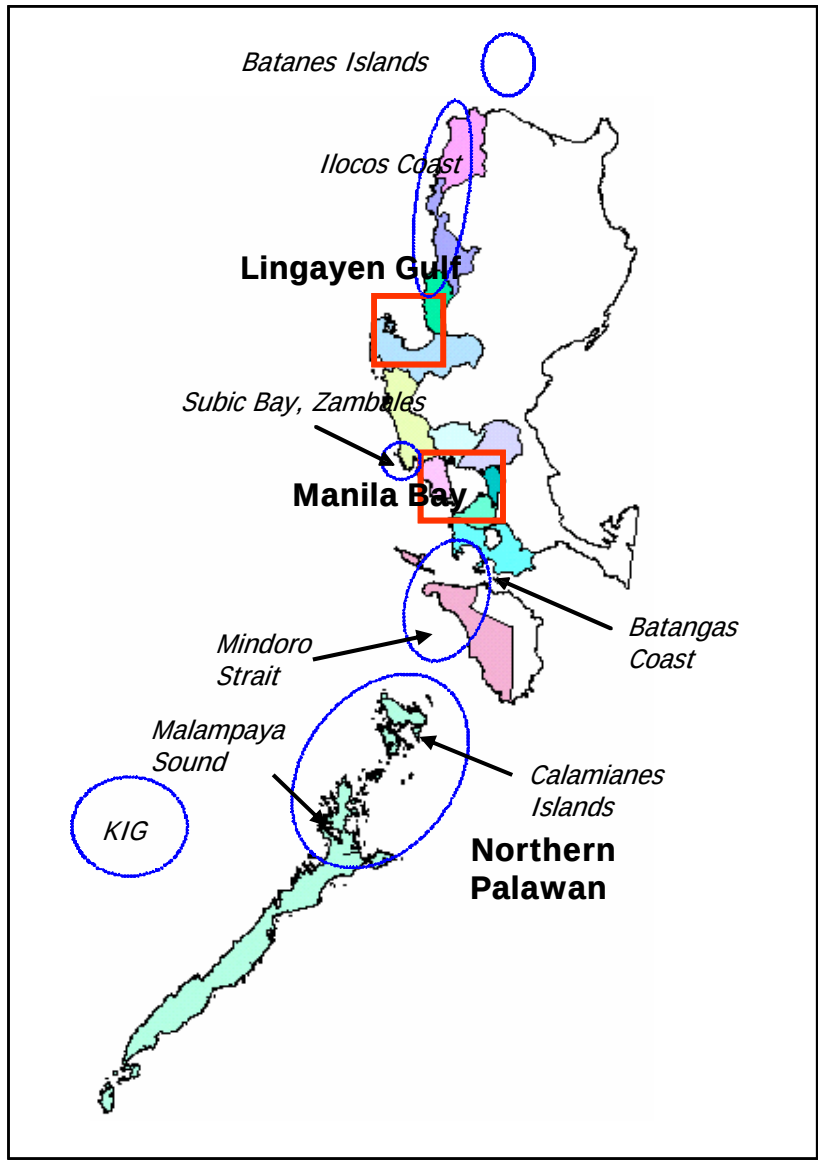



Presentation Outline

- Establishing network of *refugia* and sanctuaries
- Species specific management interventions
- Some initiatives towards ecosystem approach



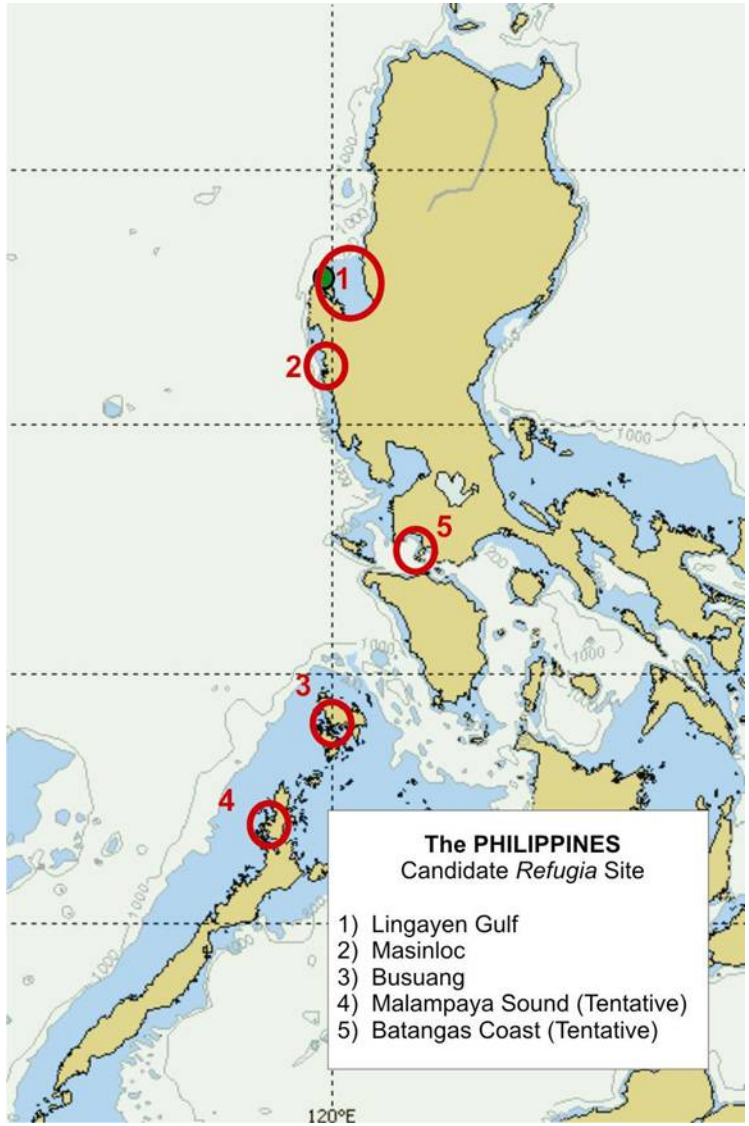
Major areas of high larval count and presumed to have intense spawning (based on Magnusson, 1970 and Tan, 1970).



Map of western Philippines showing locations of main embayments (red squares) and other coastal areas of transboundary significance in the South China Sea.

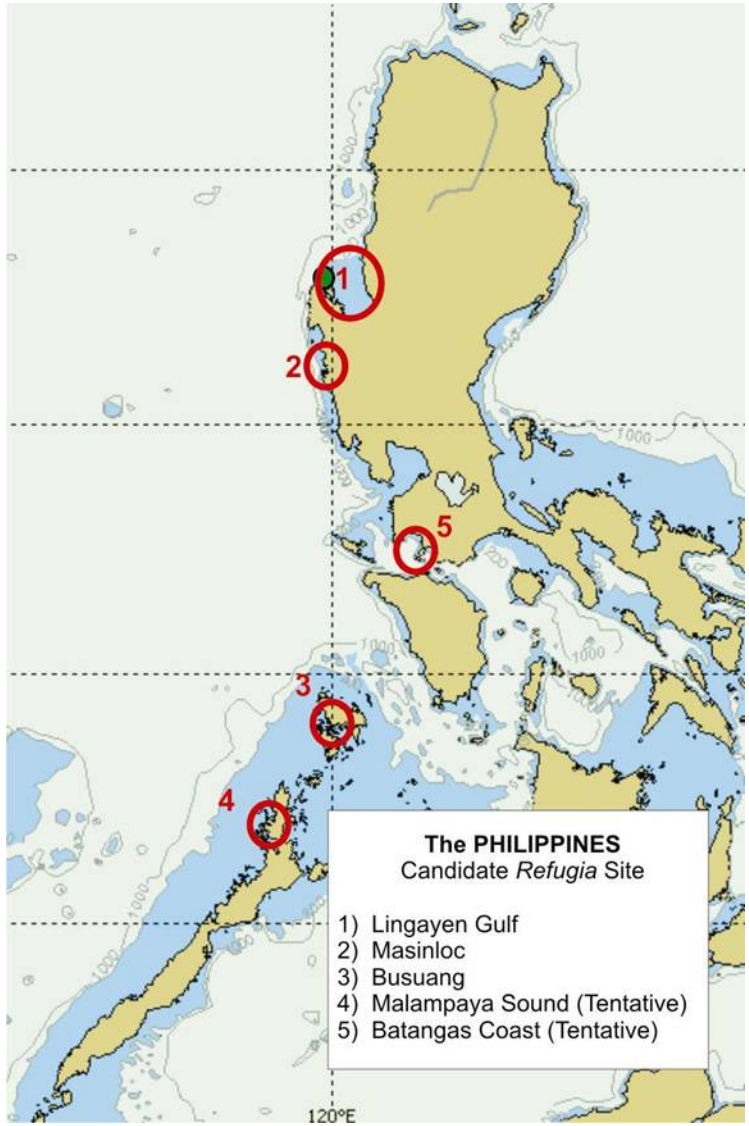
Candidate refugia sites in western Philippines

1. Bolinao, Lingayen Gulf
2. Masinloc, Zambales
3. Busuanga, Calamianes



Participants in the various consultations

- Local Government Units
- Academe
- Regional Government Agencies
- Law Enforcers (Police, Coast Guard, Navy, Bantay Dagat)
- Fisherfolk Organizations
- Non-Governmental Organizations
- People's Organizations
- National Committee Members



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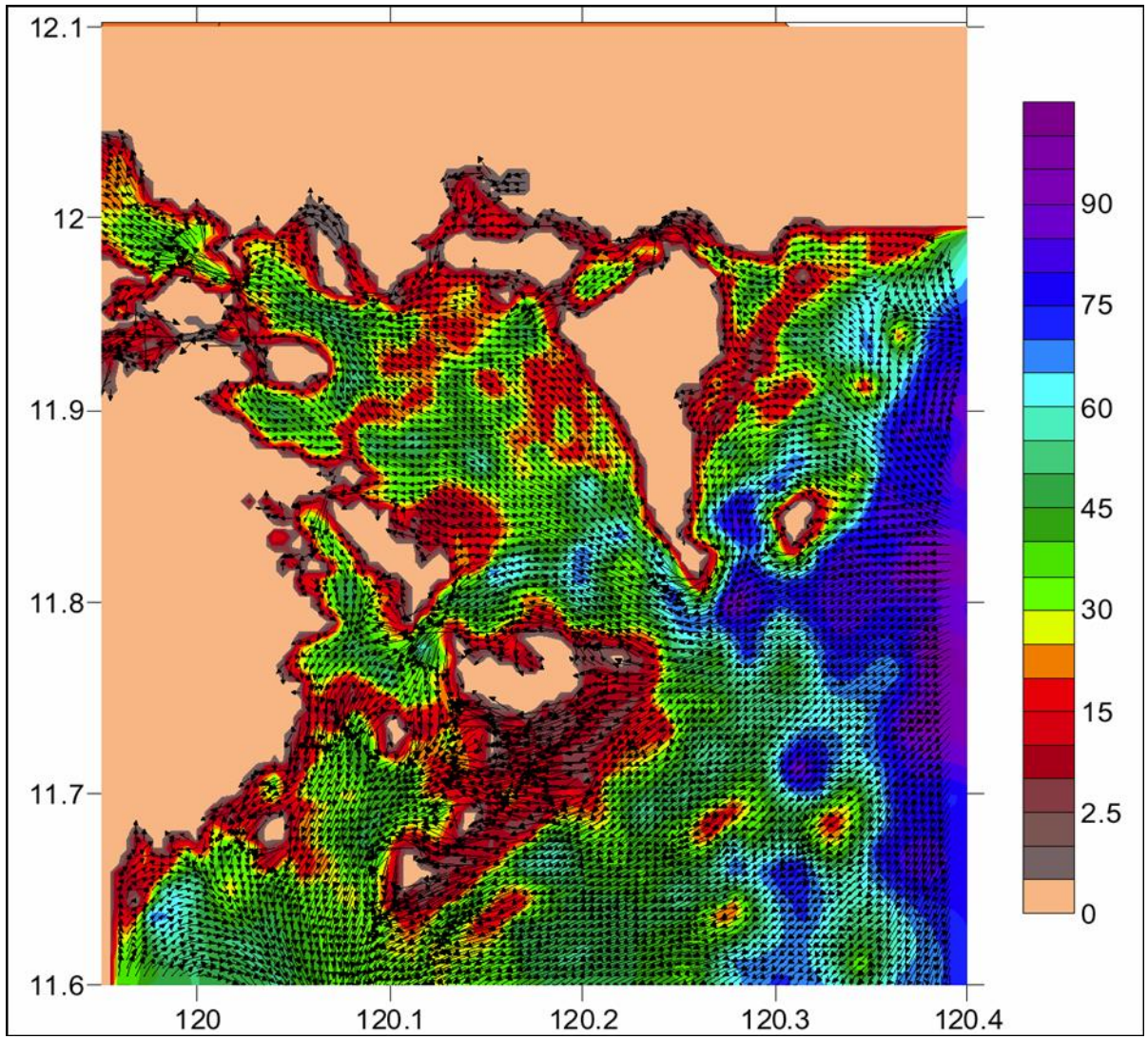
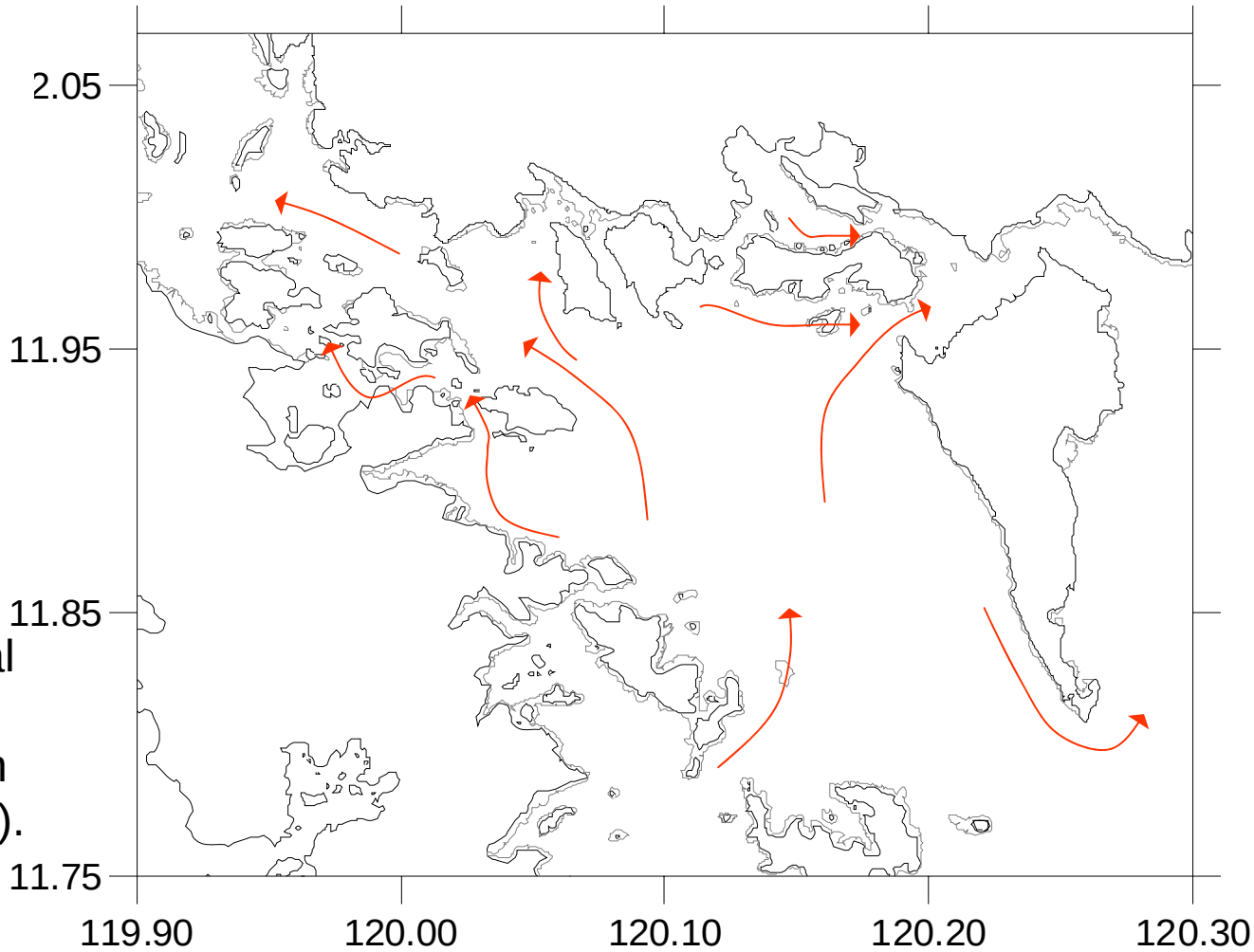
Circulation pattern



General tidal circulation in Coron Bay (Villanoy 2006).

Simulated dispersal

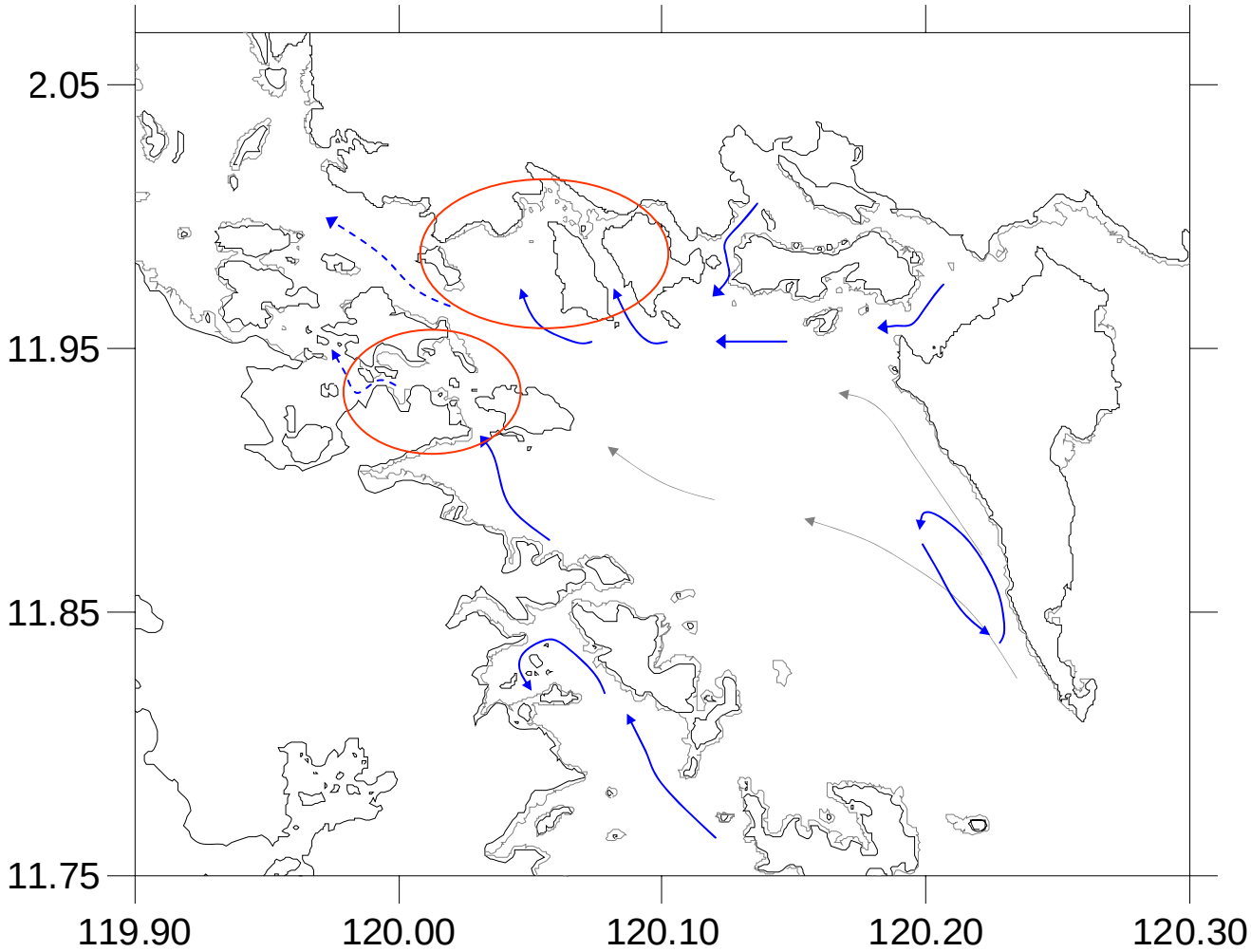


Simulated dispersal resulting from tidal circulation in Coron Bay (Villanoy 2006).

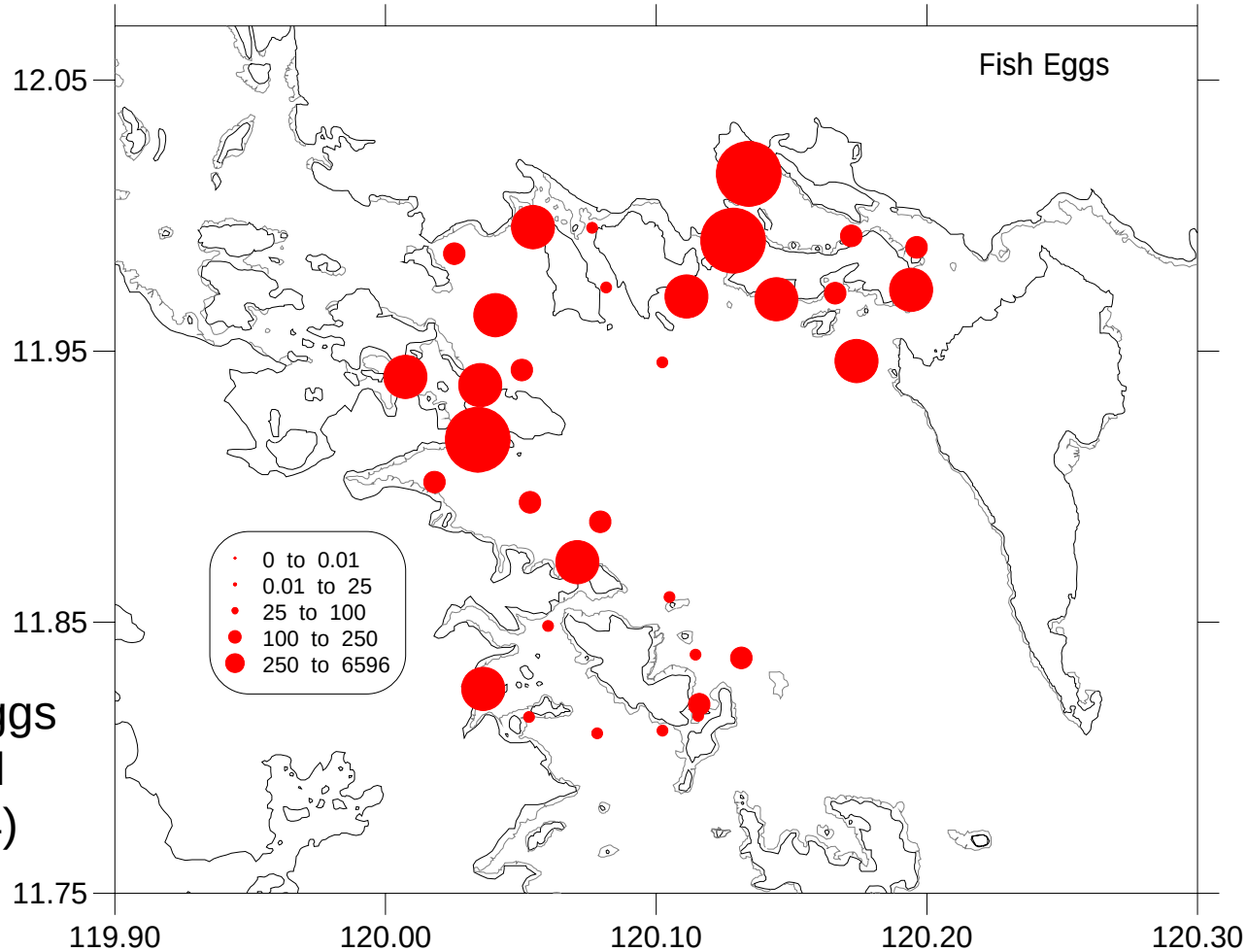
Simulated dispersal

Simulated dispersal with wind effects typical of April (Villanoy 2006).

Red ellipses indicate areas where settled particles originate from several sources. Grey lines indicate possible but weak dispersal, apparent only after 30 days.

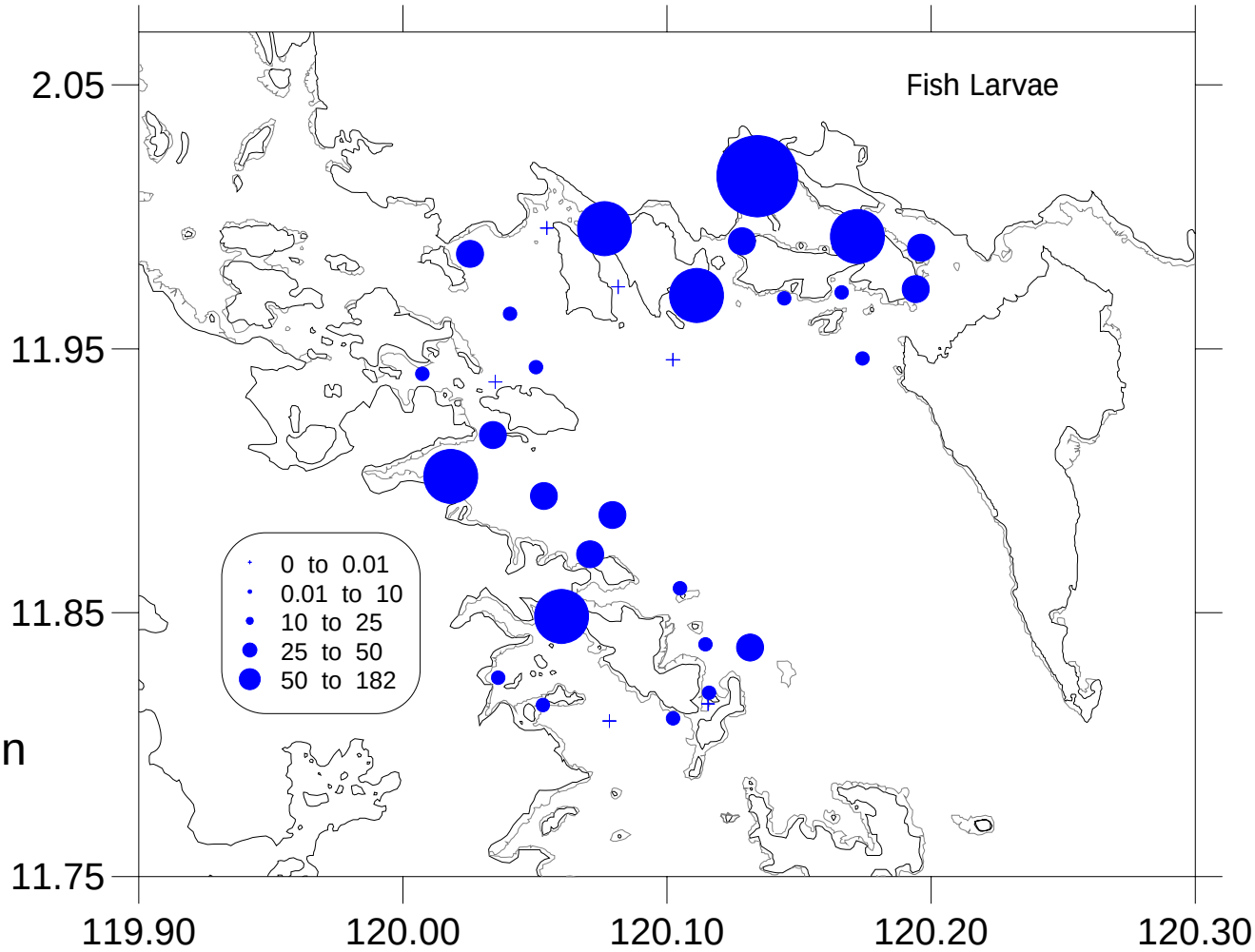


Fish eggs distribution



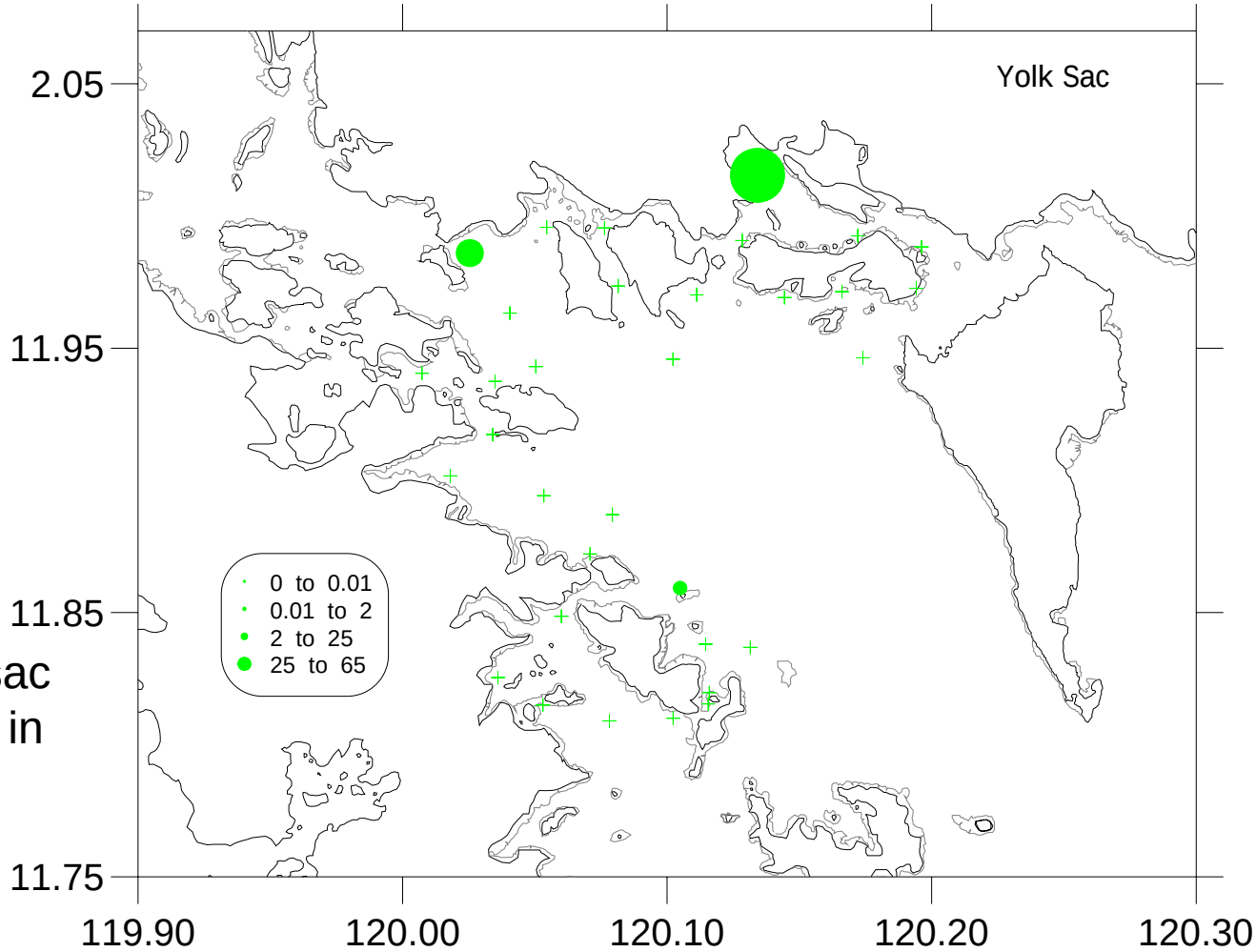
Density (no./100m^3) distribution of fish eggs in Coron Bay in April 2004 (Campos 2004)

Fish larvae distribution

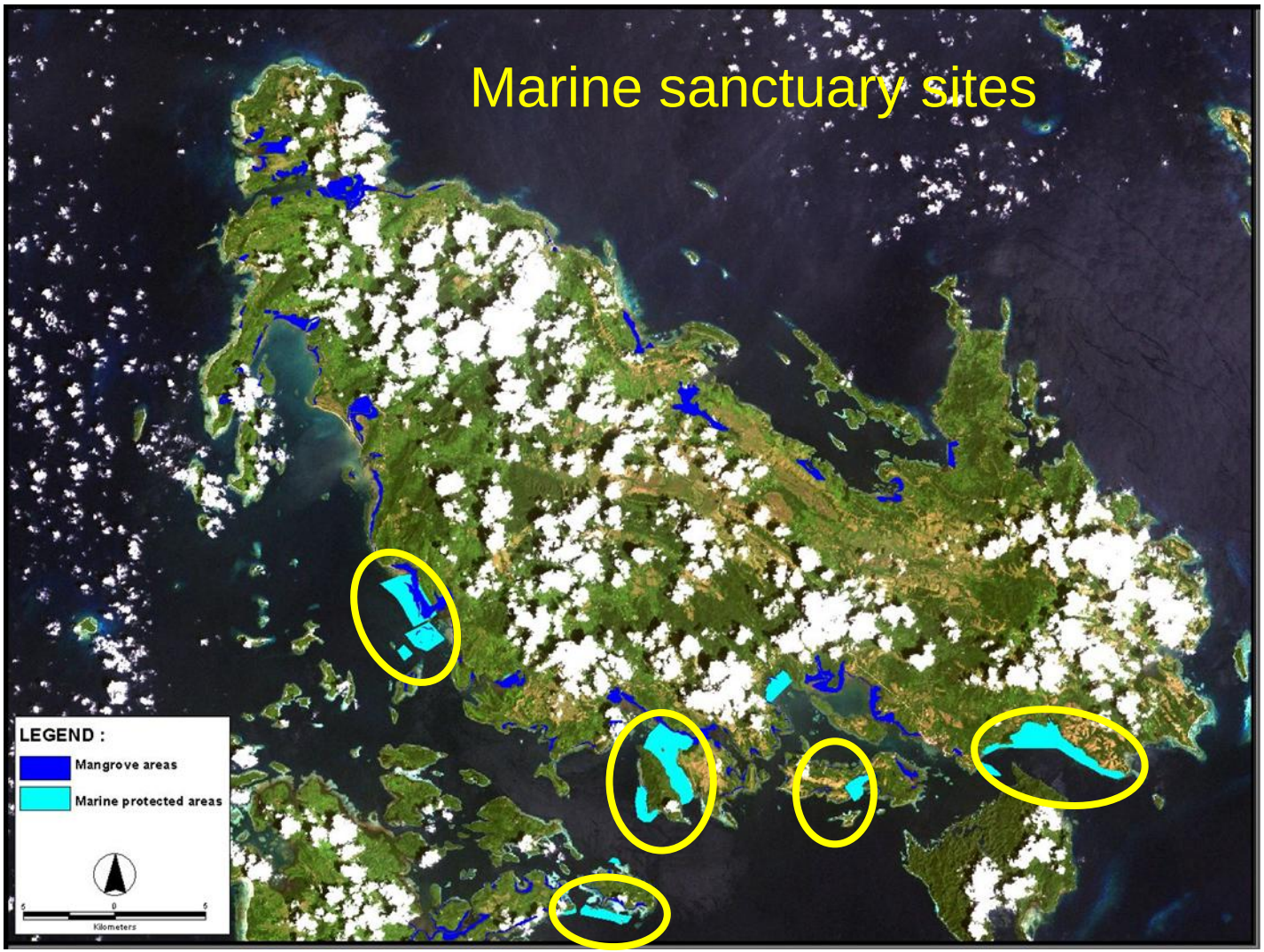


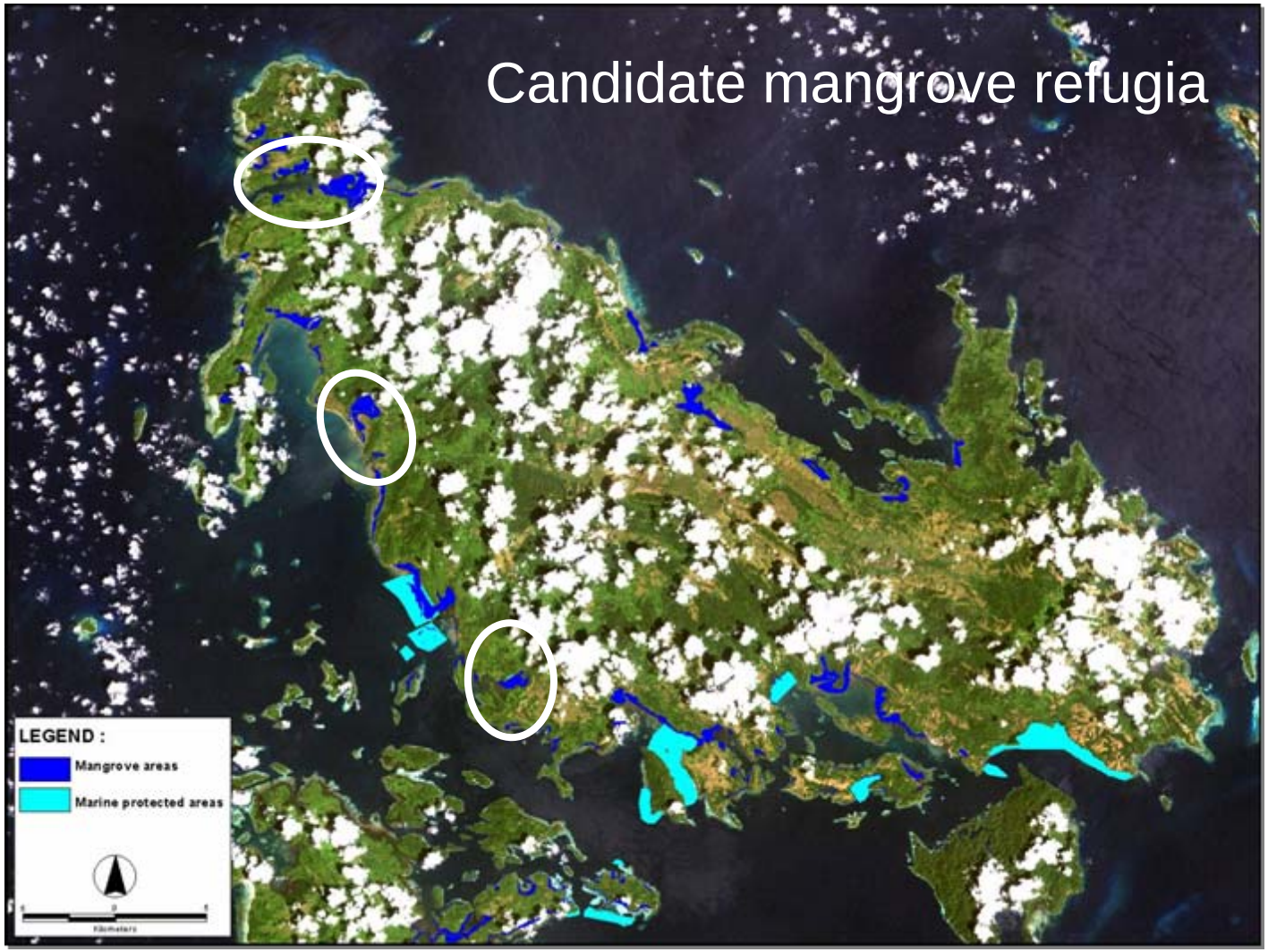
Density (ind./100m³) distribution of fish larvae in Coron Bay in April 2004. (Campos 2004)

Yolk sac larvae distribution

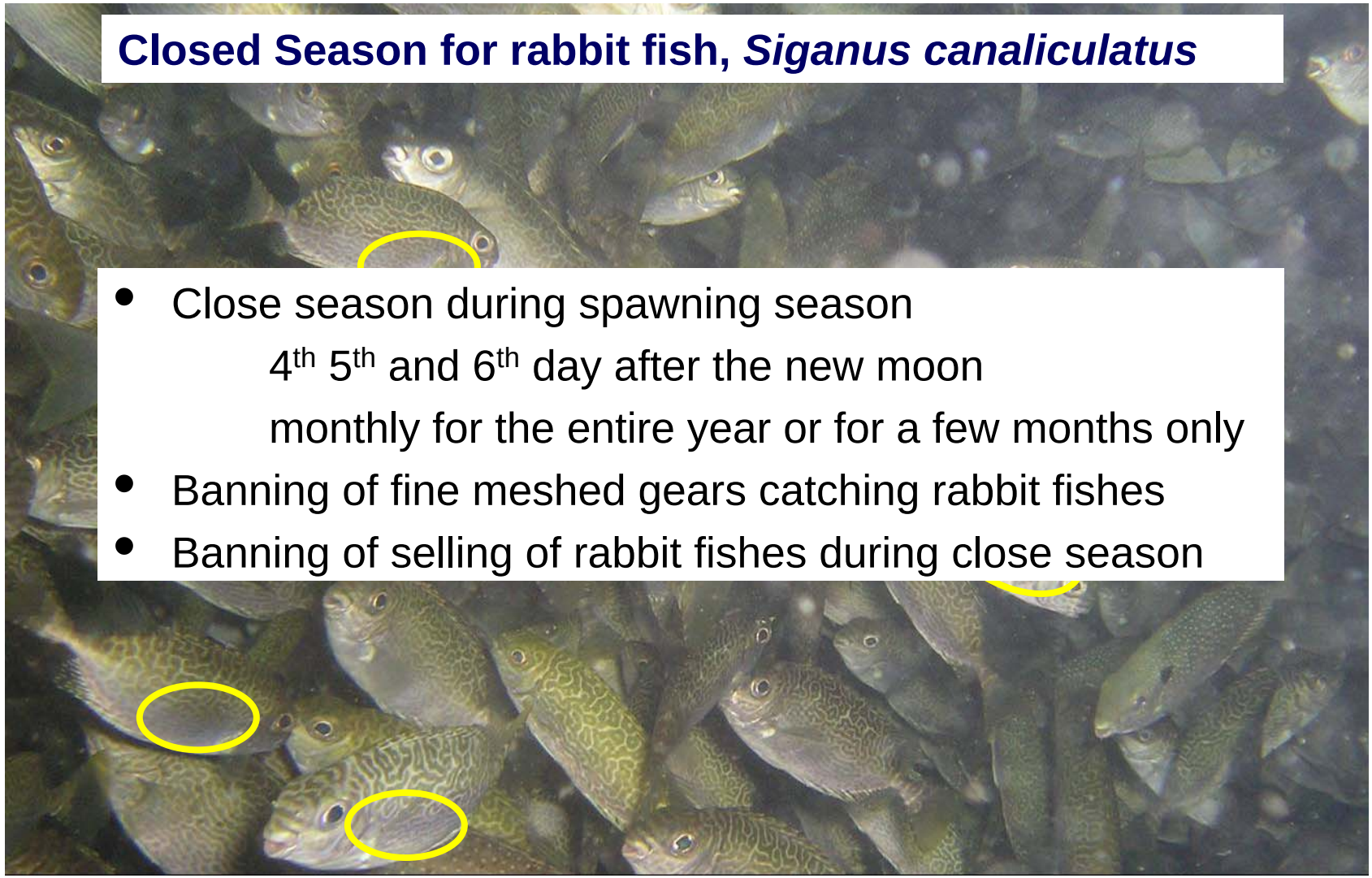


Distribution of yolk sac larvae in Coron Bay in April 2004 (Campos 2004)


Marine sanctuary sites
LEGEND :
Mangrove areas
Marine protected areas
Kilometers

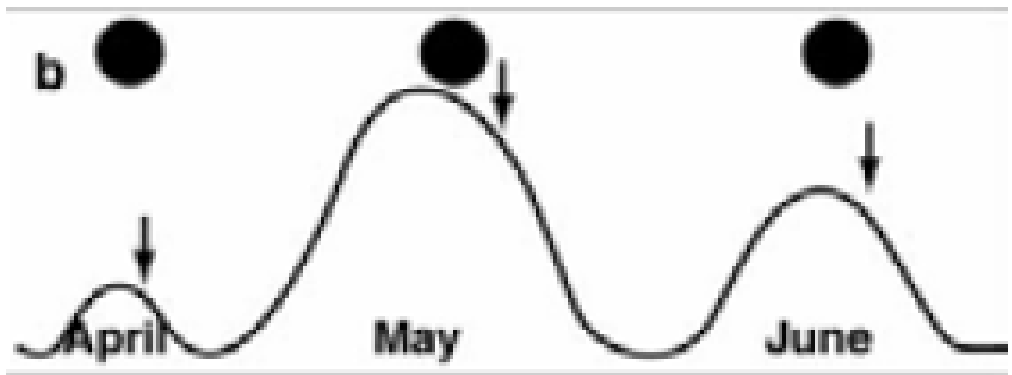

Candidate mangrove refugia
LEGEND :
Mangrove areas
Marine protected areas

Closed Season for rabbit fish, *Siganus canaliculatus*

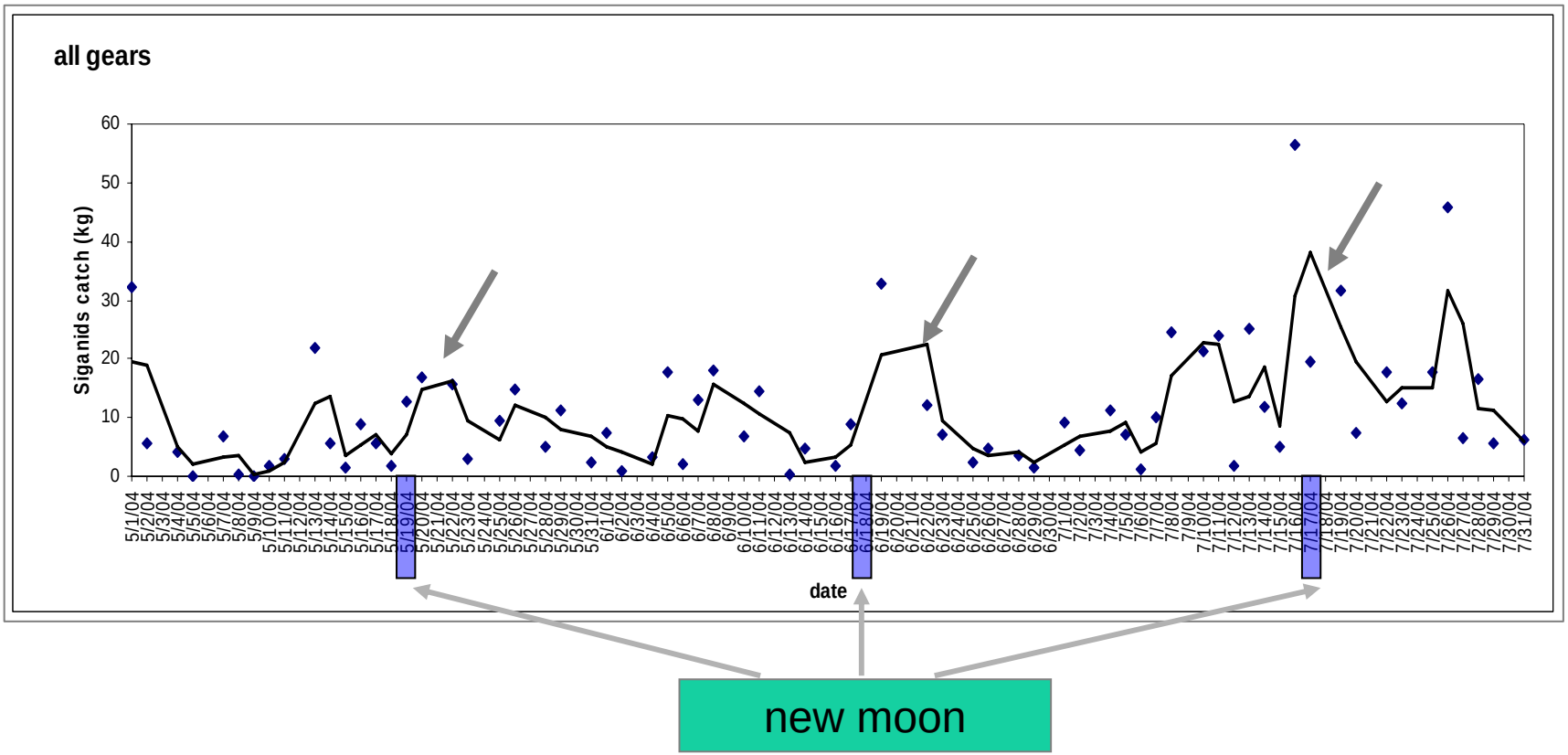


- Close season during spawning season
  - 4th 5th and 6th day after the new moon
  - monthly for the entire year or for a few months only
- Banning of fine meshed gears catching rabbit fishes
- Banning of selling of rabbit fishes during close season

Closed Season for rabbit fish, *Siganus canaliculatus*

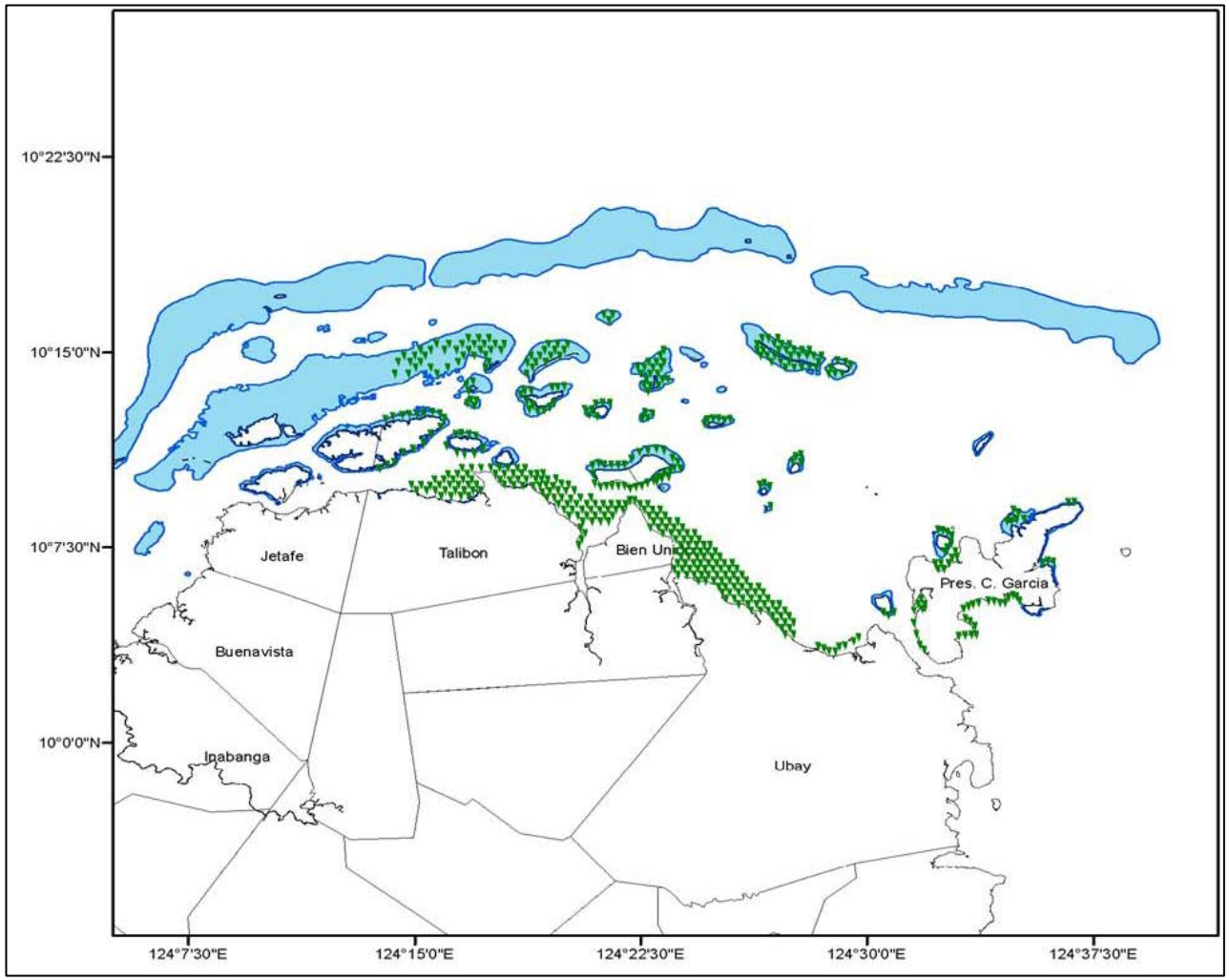


Closed Season for rabbit fish, *Siganus canaliculatus*

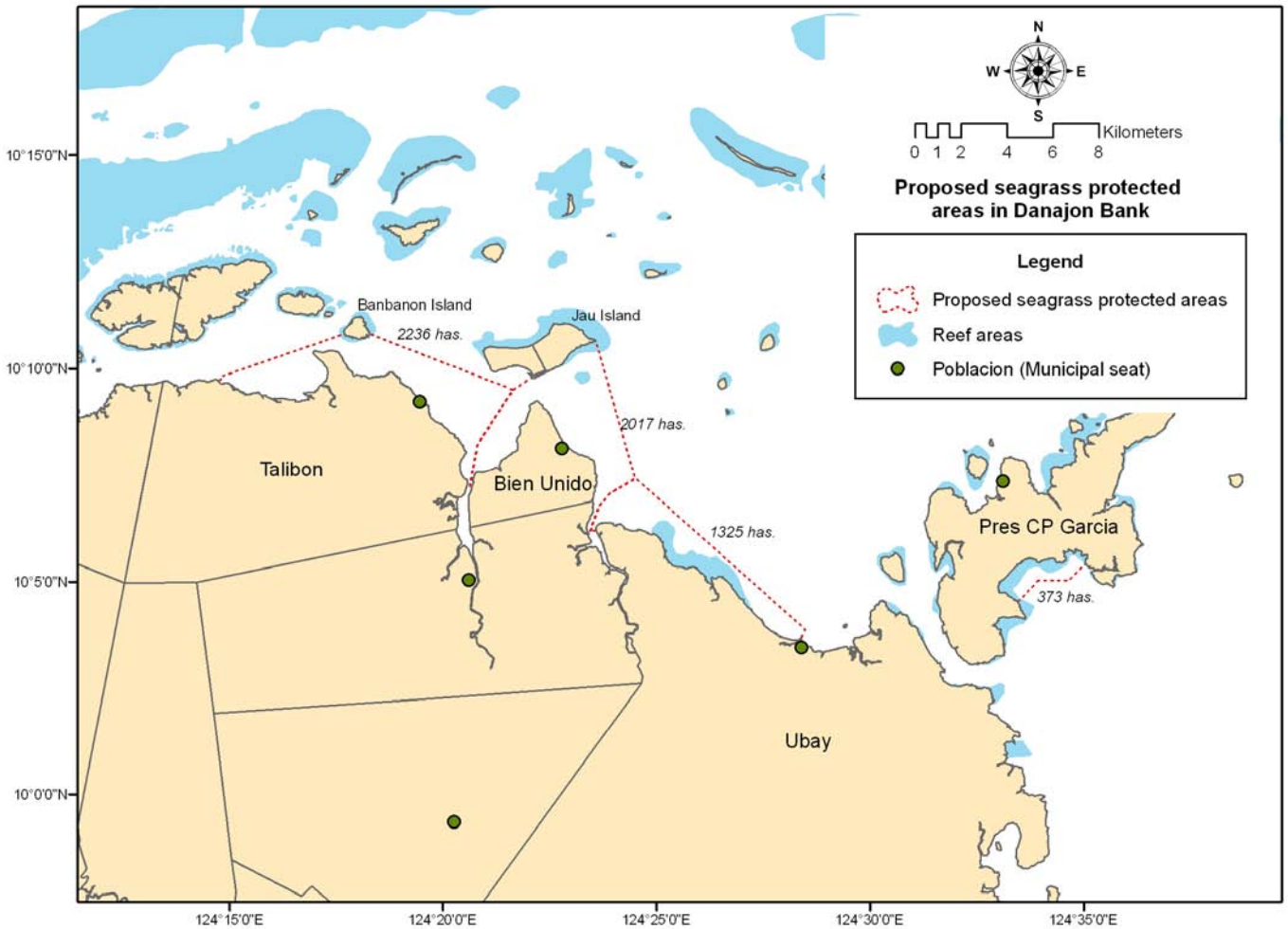


Catch monitoring data from various gears catching rabbit fish in Danajon Bank from May to July 2004

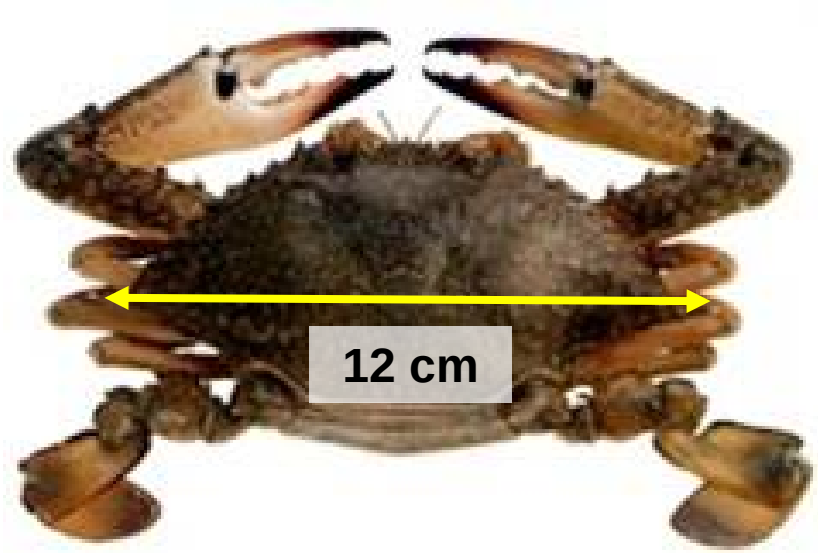
Major seagrass areas



Proposed temporal seagrass closed areas



Size limit on blue crab, *Portunus pelagicus*, and ban on harvesting of berried individuals



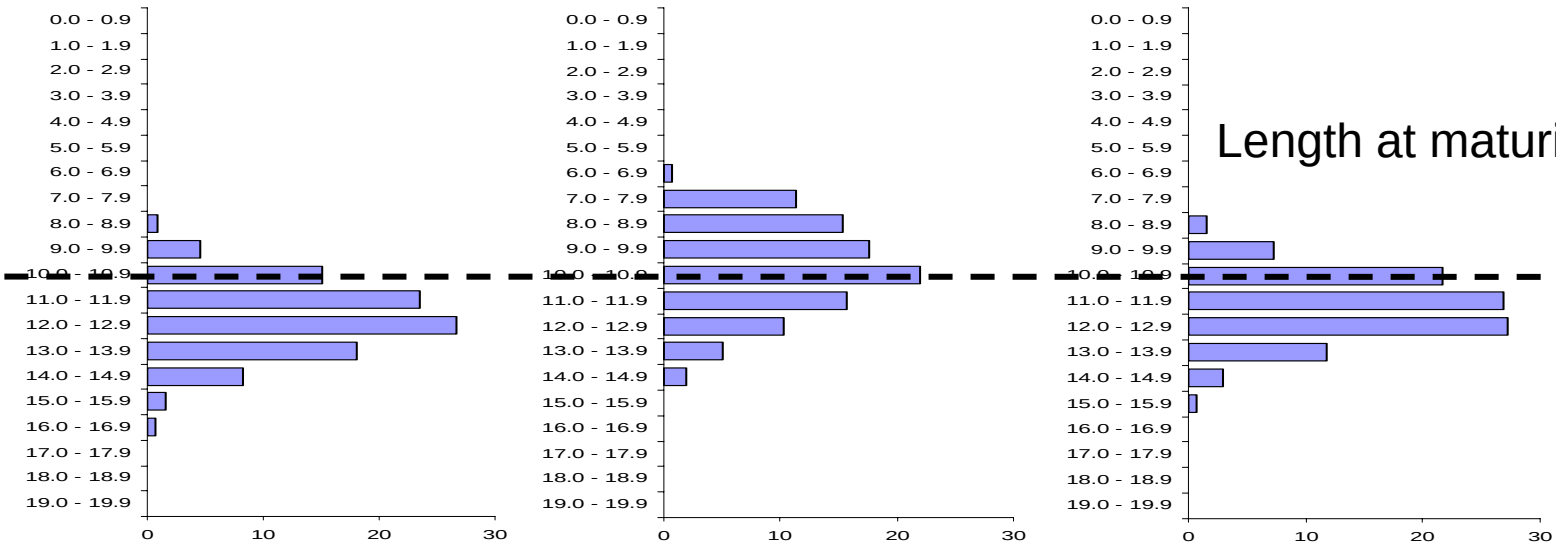
- Size limits (12 cm carapace width?)
- Minimum crab gillnet mesh size of 10 cm (4 inches)
- Prohibit selling and buying of berried females
- Impounding berried females (7 days?)
- Zoning of crab fishing gears

Size limit on blue crab, *Portunus pelagicus*, and ban on harvesting of berried individuals

Crab gillnet

Crab liftnet

Crab pot



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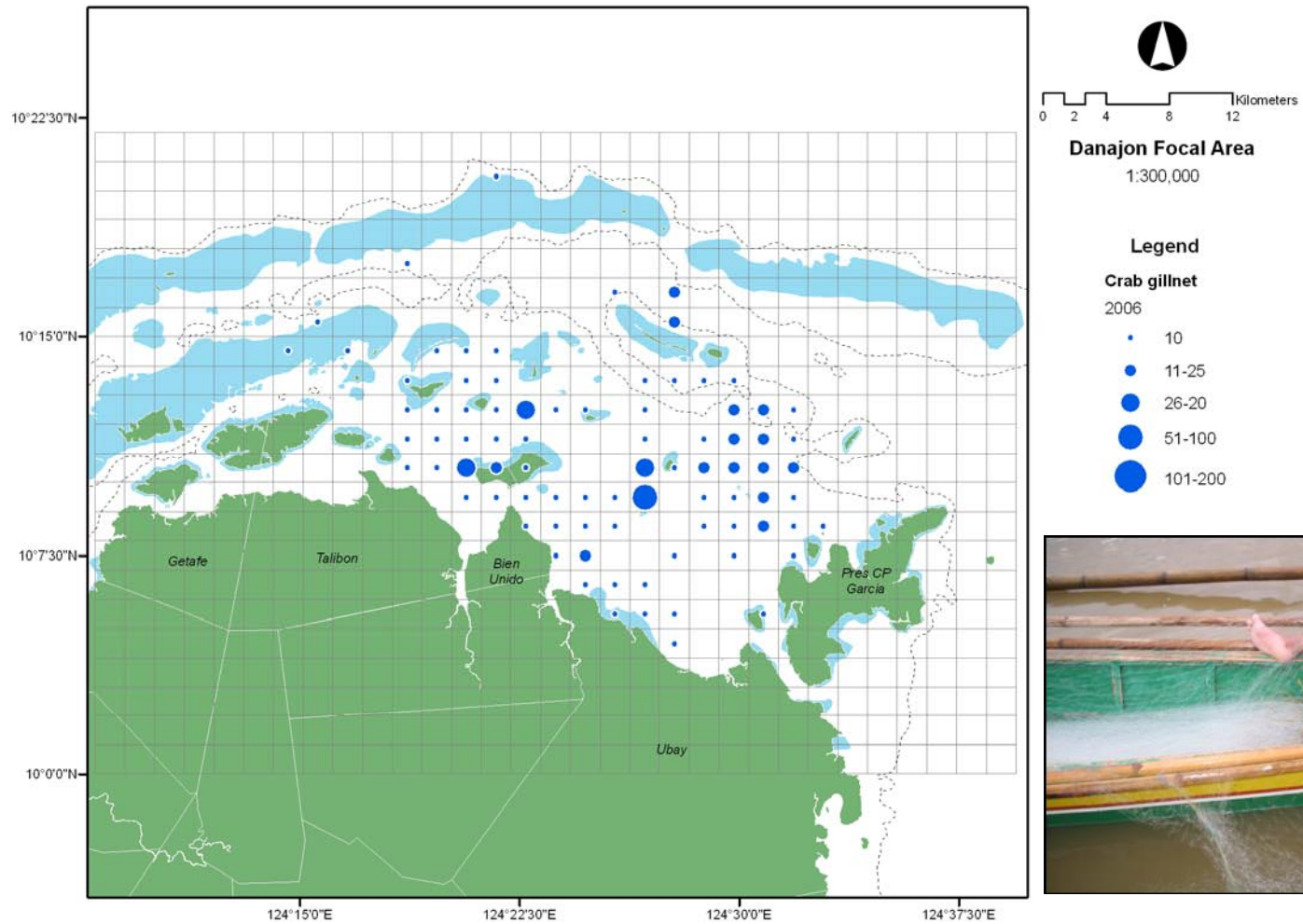

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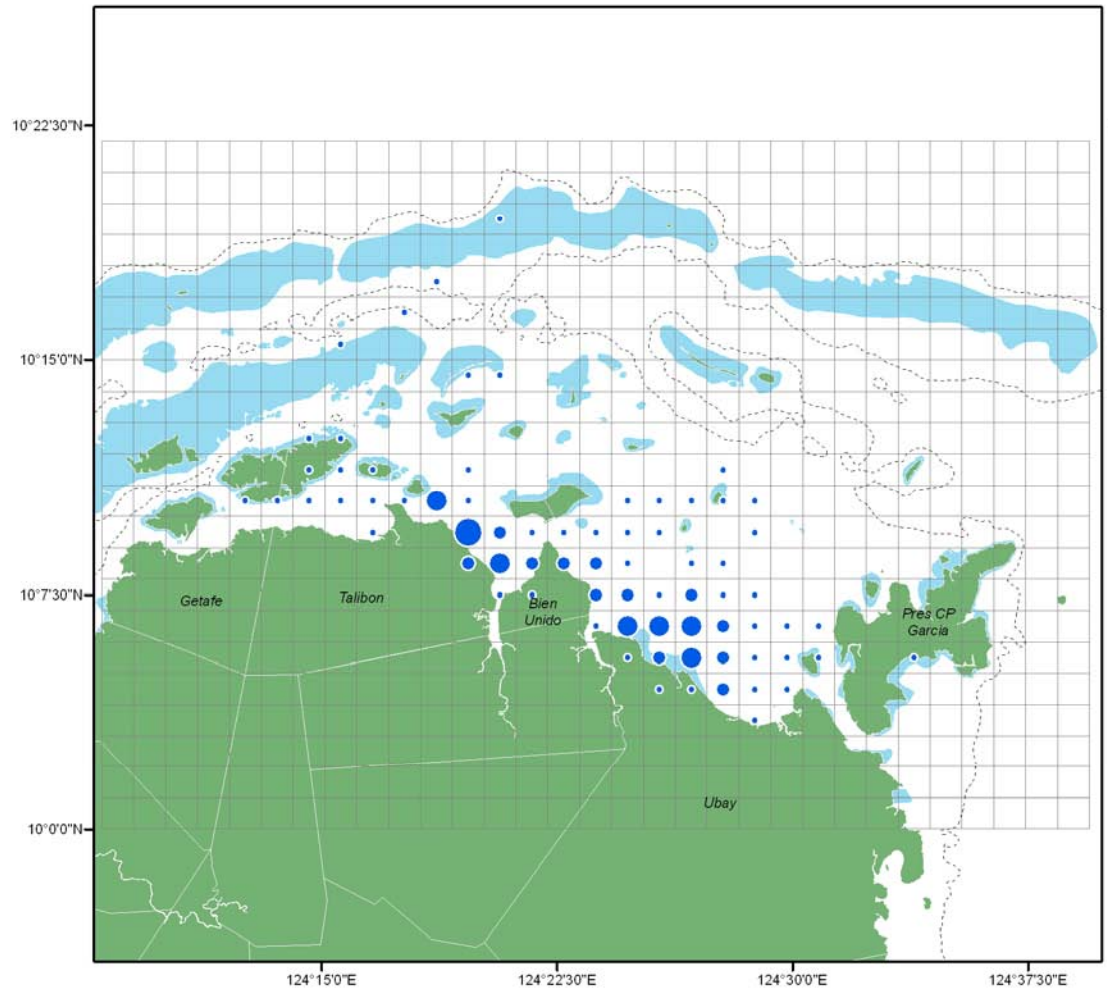
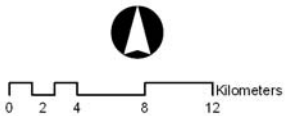




Danajon Focal Area

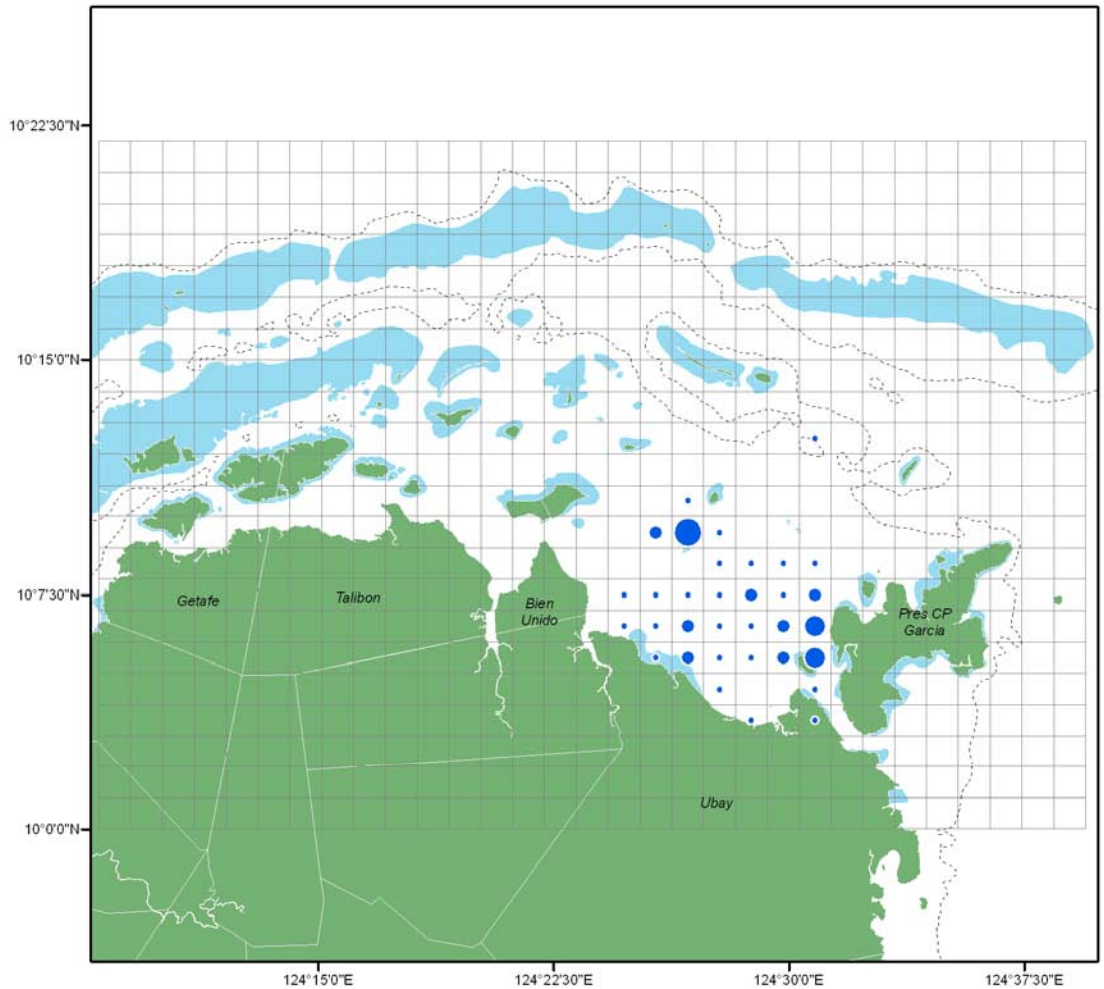
1:300,000

Legend

Crab liftnet

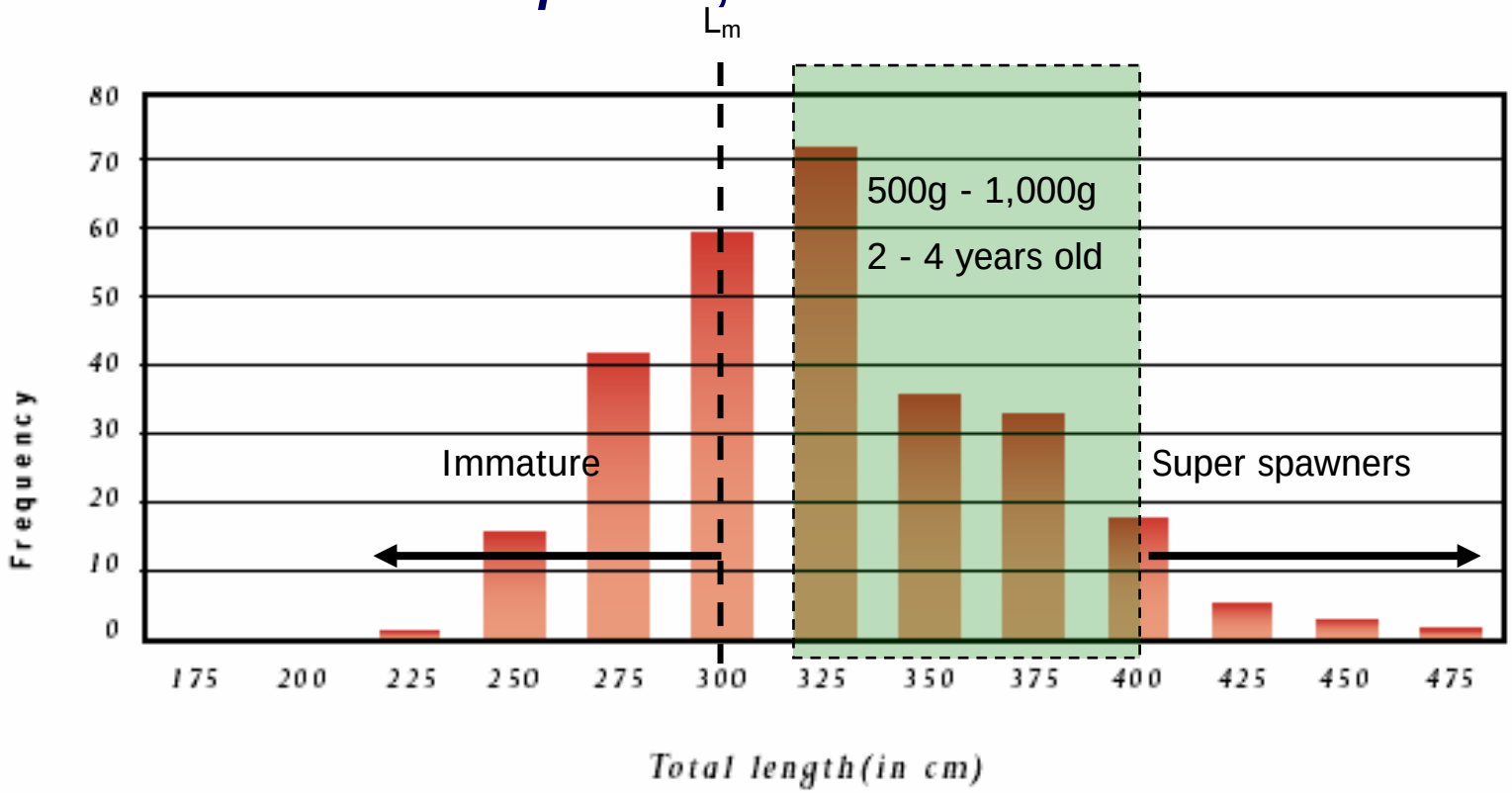
2006

- 10
- 11-25
- 26-50
- 51-100
- 101-200


10°22'30"N
10°15'0"N
10°7'30"N
10°0'0"N
124°15'0"E
124°22'30"E
124°30'0"E
124°37'30"E
Getafe
Talibon
Bien Unido
Pres CP Garcia
Ubay


Kilometers
0 2 4 8 12
Danajon Focal Area
1:300,000
Legend
Crab pot
2006
10
11-25
26-50
51-100
101-300

Minimum and maximum size limit for red grouper, *Plectropomus leopardus*, in Calamianes

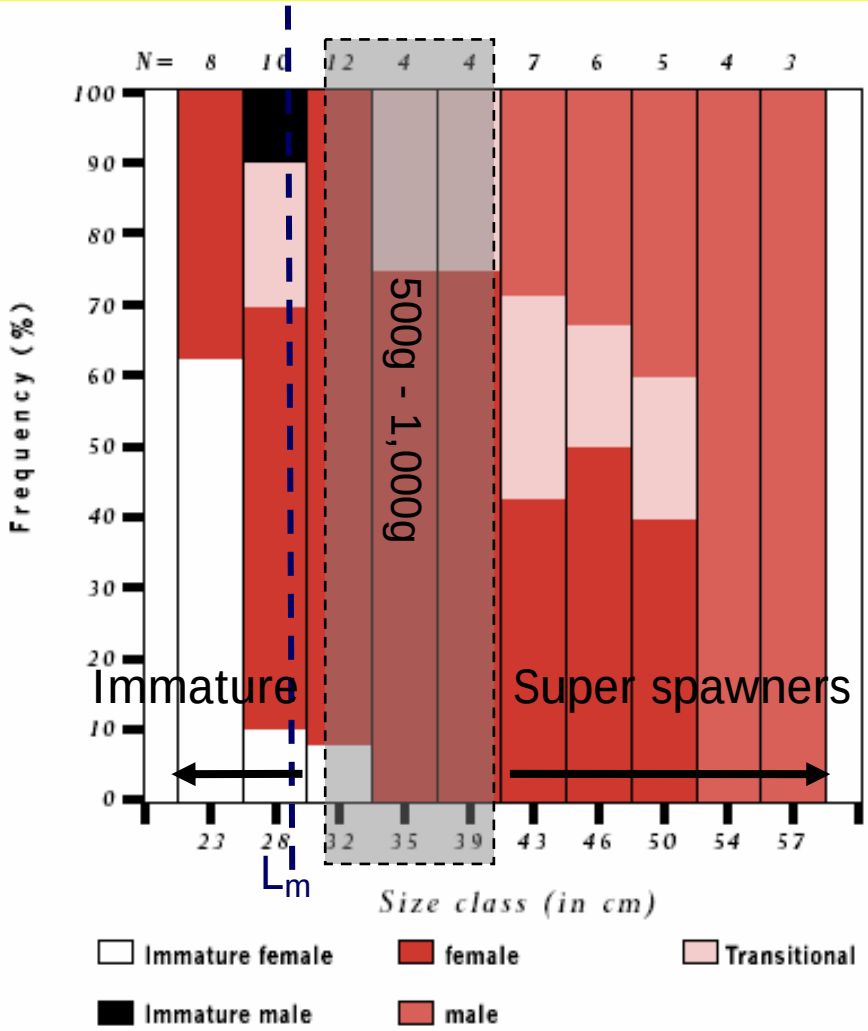


Length frequency distribution of *Plectropomus leopardus* in Calamianes in 1998 (Mamauag *et al*. 2002)

Minimum and maximum size limit for red grouper, *Plectropomus leopardus*, in Calamianes

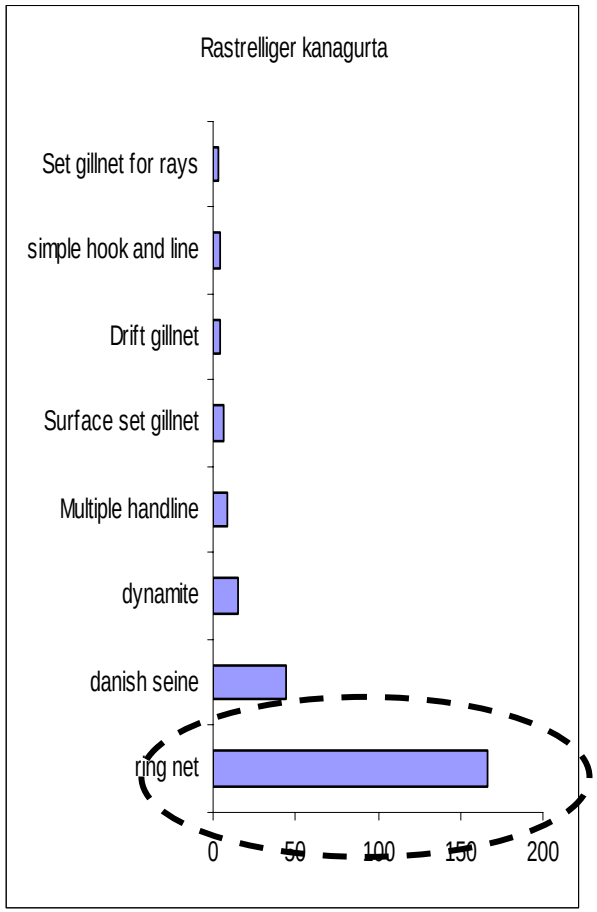
Sex Selectivity?

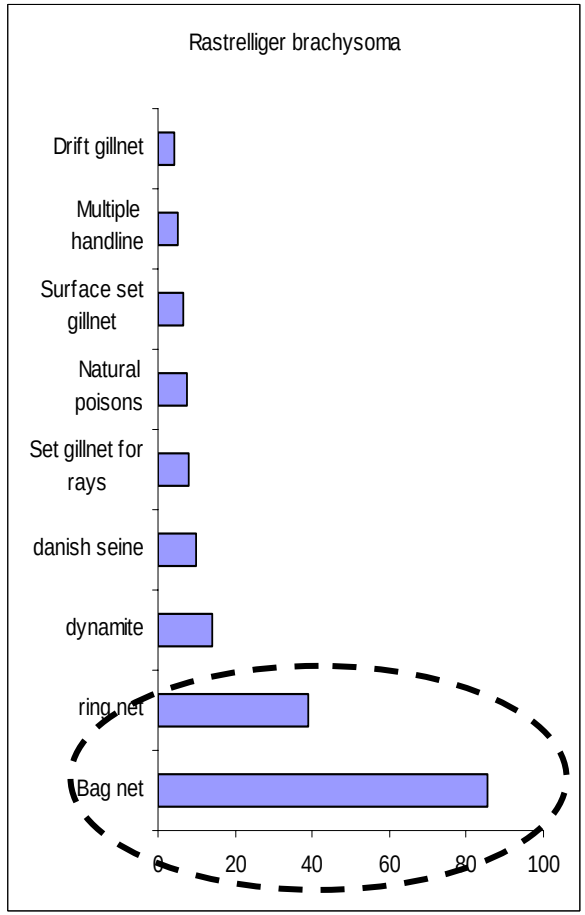
Length frequency distribution of sexual development stages of *Plectropomus leopardus* in Calamianes (Mamauag 1997)



Ban on harvest of berried lobster

Ban on fine meshed fishing gears catching juveniles





Trophic level: the concept

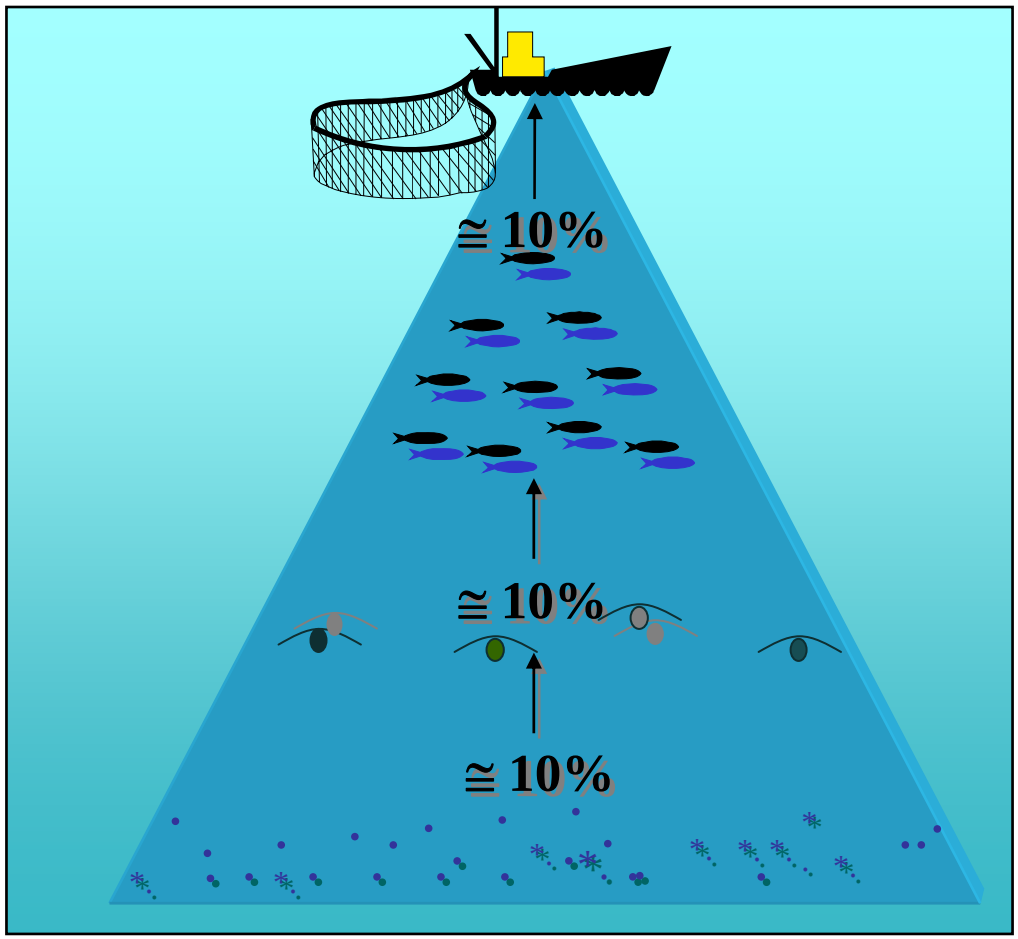
Trophic level

4 – Top predators

3 – Prey fish

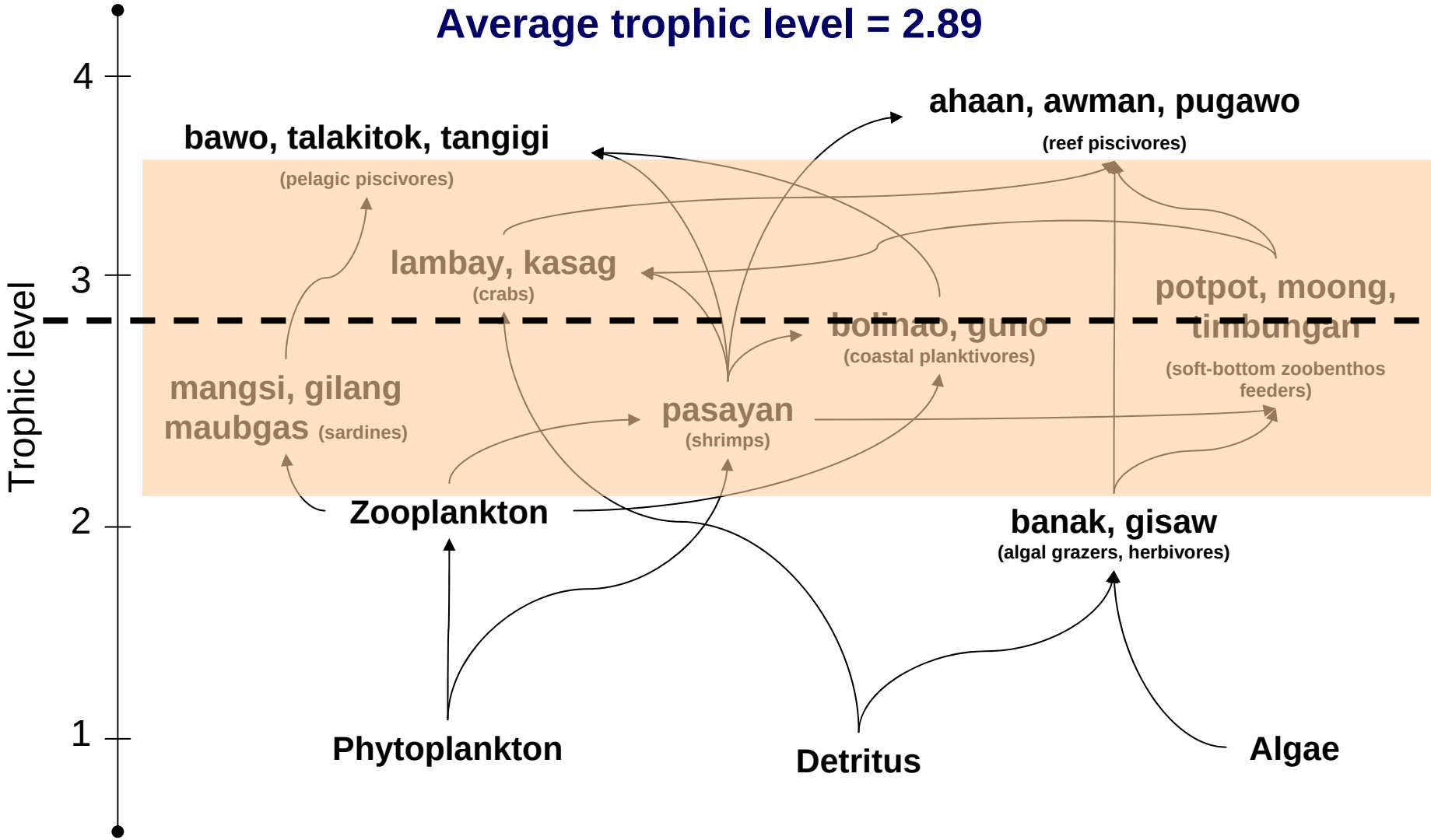
2 – Zooplankton

1 – Phytoplankton



Trophic groups

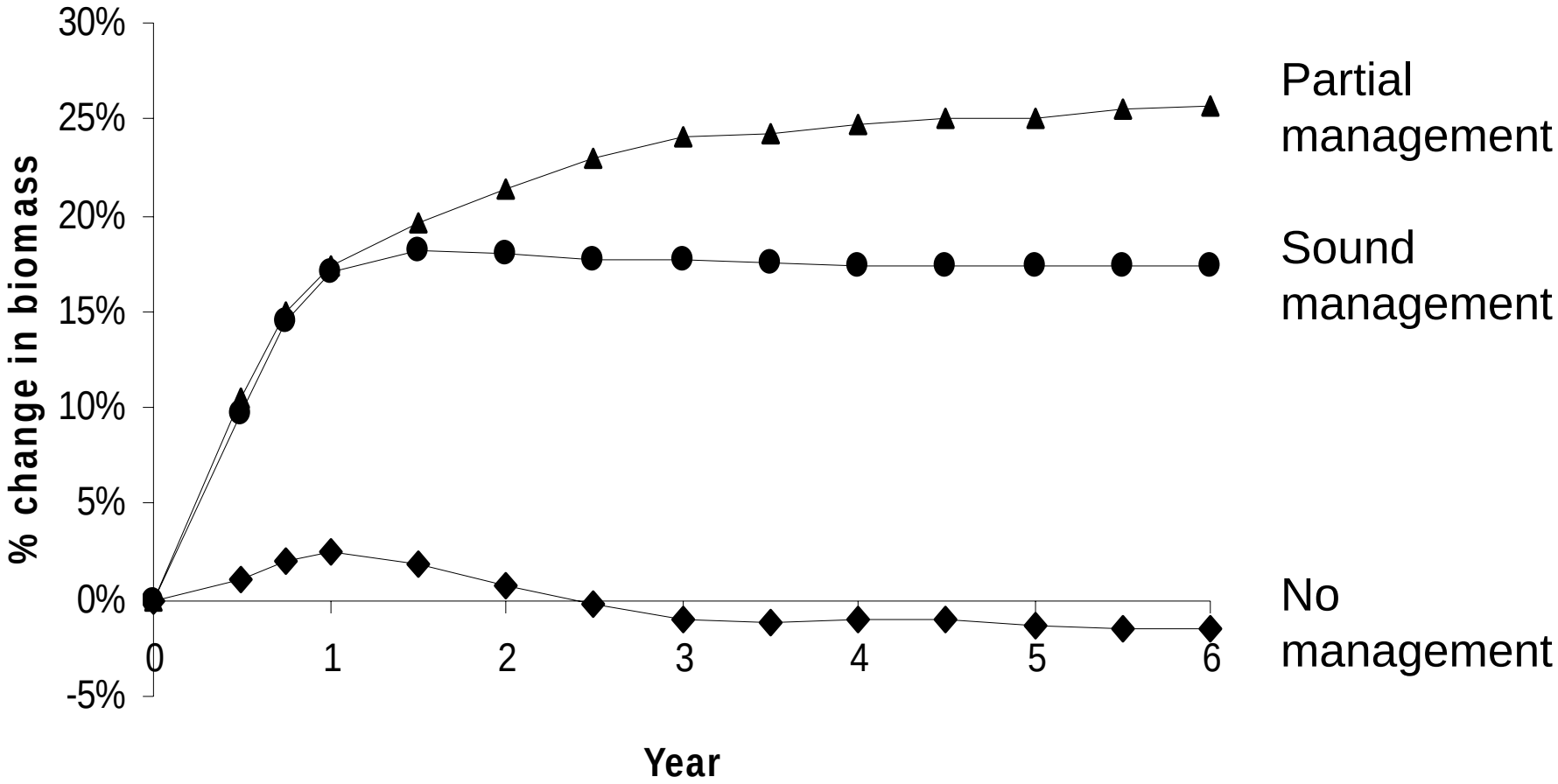
1	Pelagic piscivores	*bawo, talakitok, kubal-kubal, balila, bat-og, lapis, tangigi, diwit*
2	Soft-bottom piscivores	*ubod, tiki-tiki, sunugan, banghutin*
3	Reef-associated piscivores	*ahaan, islawan, awman, panangitan, gawot, pugapo*
4	Squids	*nokos taroroton, bisaya, kubotan, buko-buko*
5	Soft-bottom zoobenthos feeders	*moong, sapsap, caraballas, samook, bogo, timbungan, asoos, bugaong*
6	Reef-associated zoobenthos feeders	*pakol, ngisi-ngisi, kyampaw, lipti, labayan, lupit, katambak, tad, lagaw, tuwas, silay*
7	Blue crabs	*lambay, kasag*
8	Shrimps	*pasayan, locon, lunhan, bulit*
9	Pelagic planktivores	*tamarong, tikab, anduhaw*
10	Sardines	*hilos-hilos, mangsi, gilang, maubgas*
11	Coastal planktivores	*guno, bolinao, libgao, solid*
12	Demersal herbivores	*banak, gisaw, molmol*
13	Rabbitfish	*danggit, kitong, samaral*
14	Sergestids	*uyap*


Average trophic level = 2.89
Trophic level
4
3
2
1
ahaan, awman, pugawo
(reef piscivores)
bawo, talakitok, tangigi
(pelagic piscivores)
lambay, kasag
(crabs)
potpot, moong,
timbungan
(soft-bottom zoobenthos
feeders)
bolinao, guno
(coastal planktivores)
mangsi, gilang
maubgas (sardines)
pasayan
(shrimps)
Zooplankton
banak, gisaw
(algal grazers, herbivores)
Phytoplankton
Detritus
Algae

Simulation

A	Collapse of management regime	Increase of trawls, Danish seines, and blast fishing activities
B	Partial/haphazard management interventions	Removal of all illegal and destructive gears and effort redistributed indiscriminately
C	Appropriate management options in place	Removal of all illegal and destructive gears and effort redistributed appropriately

Trend in harvestable biomass in years following intervention



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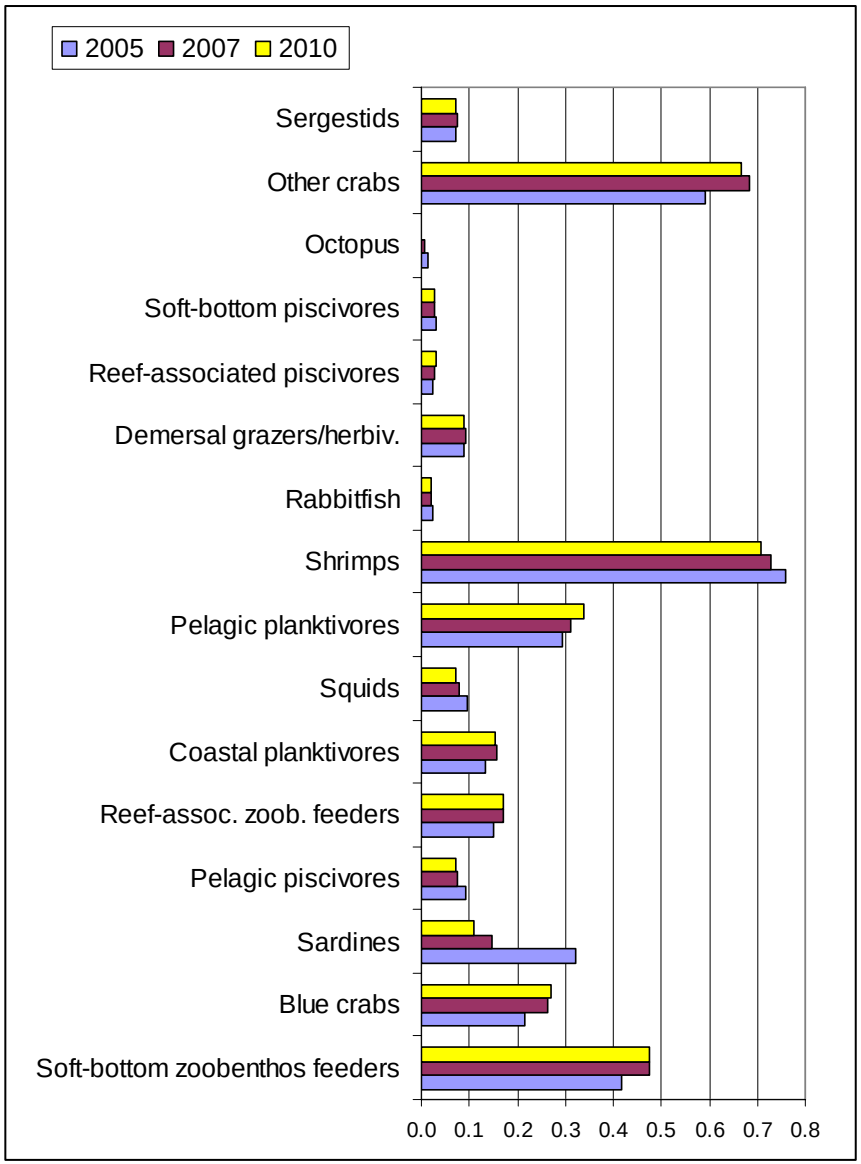
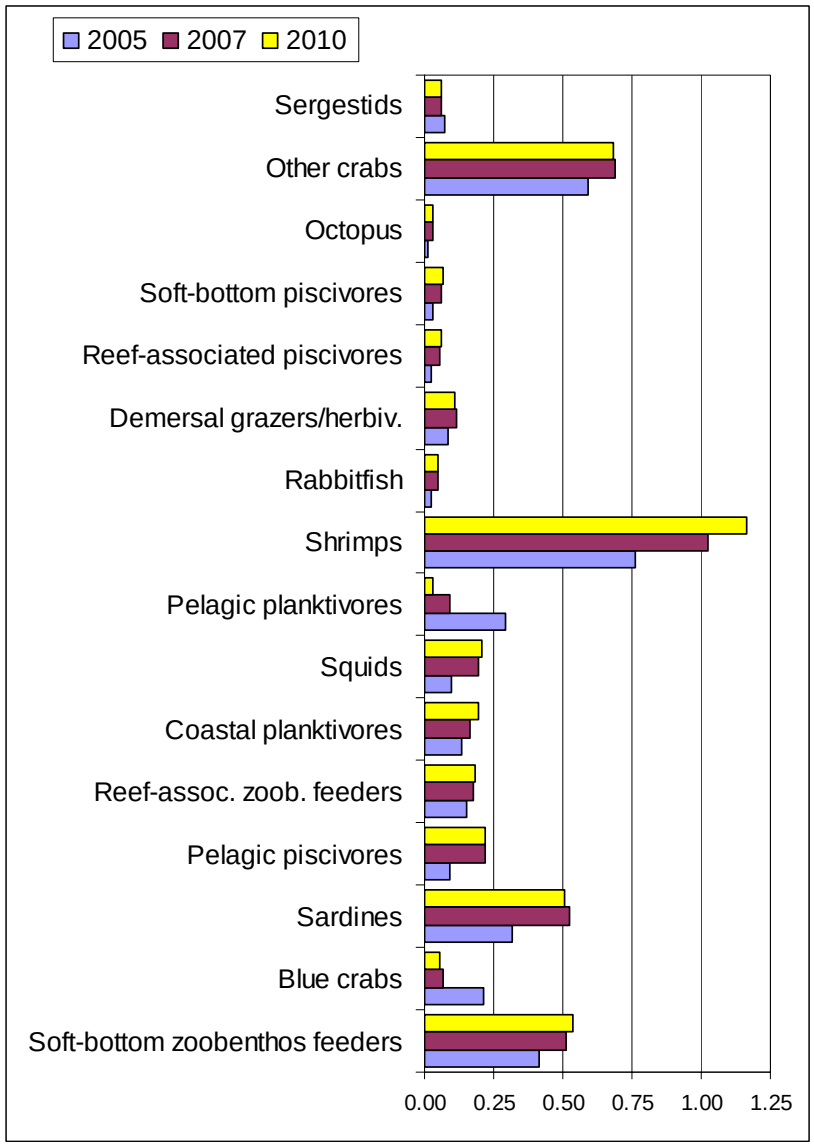


No management

	2007	2010
Overall harvestable biomass	3.35 t/km^2	3.28 t/km^2
% change	+ 0.8%	- 1.4%

Group	2007	2010
Sardines	- 54%	- 66%
Octopus	- 40%	- 65%
Pel. piscivores	- 19%	- 23%
Rabbitfish	- 18%	- 25%
Shrimps	- 4%	- 7%

Group	2007	2010
Blue crabs	+ 23%	+ 25%
Coast.planktivores	+ 17%	+ 16%
Other crabs	+ 16%	+ 13%
Soft-bottom zoob. feeders	+ 14%	+14 %



Partial management

Group	2007	2010
Overall harvestable biomass	4.03 t/km^2	4.16 t/km^2
% change	+ 21.3%	+ 25.1%

Group	2007	2010
Blue crabs	- 69%	- 75%
Pel. Ppanktivores	- 69%	- 90%
Sergestids	- 15%	- 19%

Group	2007	2010
Pel. piscivores	+ 134%	+ 136%
Reef piscivores	+ 124%	+ 135%
Octopus	+ 120%	+ 133%
Soft-bottom pisci.	+ 105%	+ 120%
Squids	+ 102%	+ 117%
Rabbitfish	+ 97%	+ 97%
Shrimps	+ 35%	+ 53%

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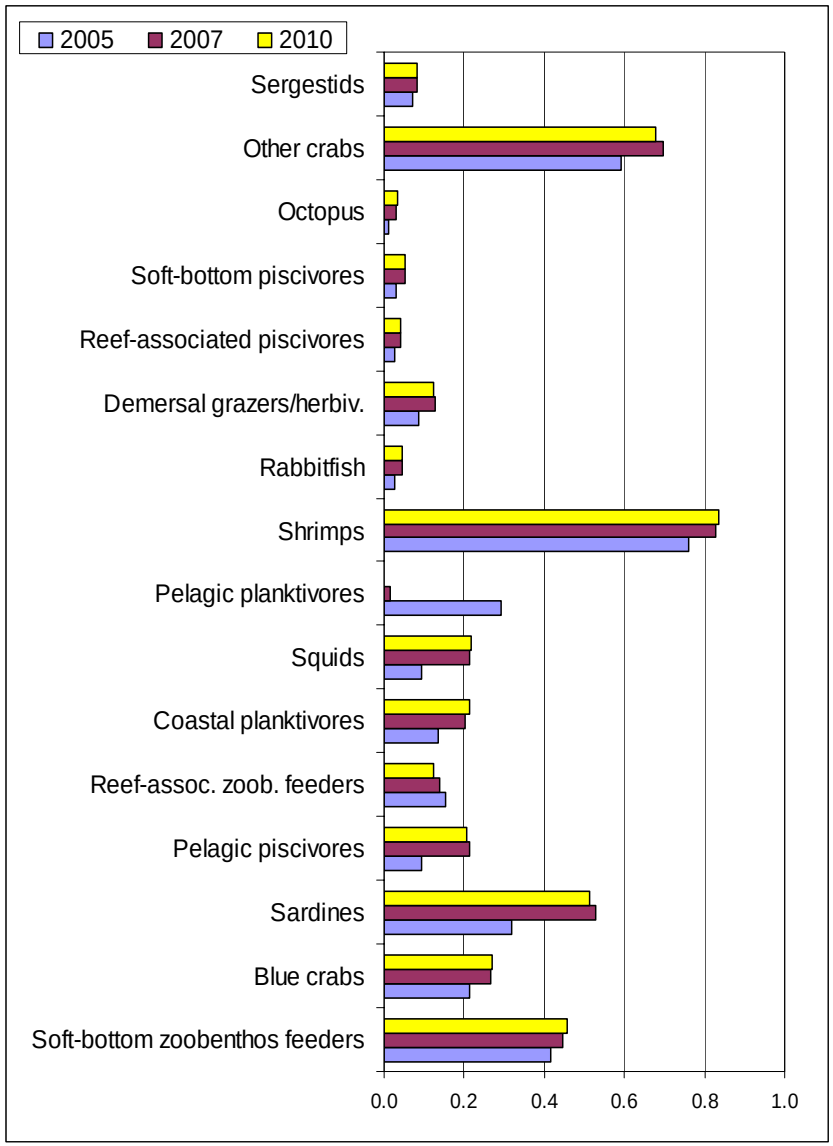

Sound management

	2007	2010
Overall harvestable biomass	3.92 t/km²	3.90 t/km²
% change	+ 18.0%	+ 17.3%

Group	2007	2010
Pelagic plank.	- 95%	- 100%
Reef-assoc. zoob. Feeders	- 10%	- 18%

Group	2007	2010
Octopus	+ 143%	+ 162%
Pel. Pisci.	+ 127%	+ 121%
Squids	+ 124%	+ 129%
Rabbitfish	+ 80%	+ 80%
Soft-bottom pisci.	+ 77%	+ 78%
Sardines	+ 65%	+ 60%
Reef-assoc. pisci.	+ 54%	+ 59%
Crabs	+ 23%	+ 26%

Summary of results of simulation

- Collapse of management regime will lead to overall decline of the harvestable biomass
- Partial management will lead to the biggest overall increase in the harvestable biomass but drastic decline of important commodity like the “blue crab”
- Sound management will lead to a moderate increase in the harvestable biomass but increase in the desirable species especially the carnivores