Use of Ichthyoplankton Survey in Fisheries Resource Management

Nygiel Armada

Regional Technical Working Group

(Fisheries)

Presentation Outline
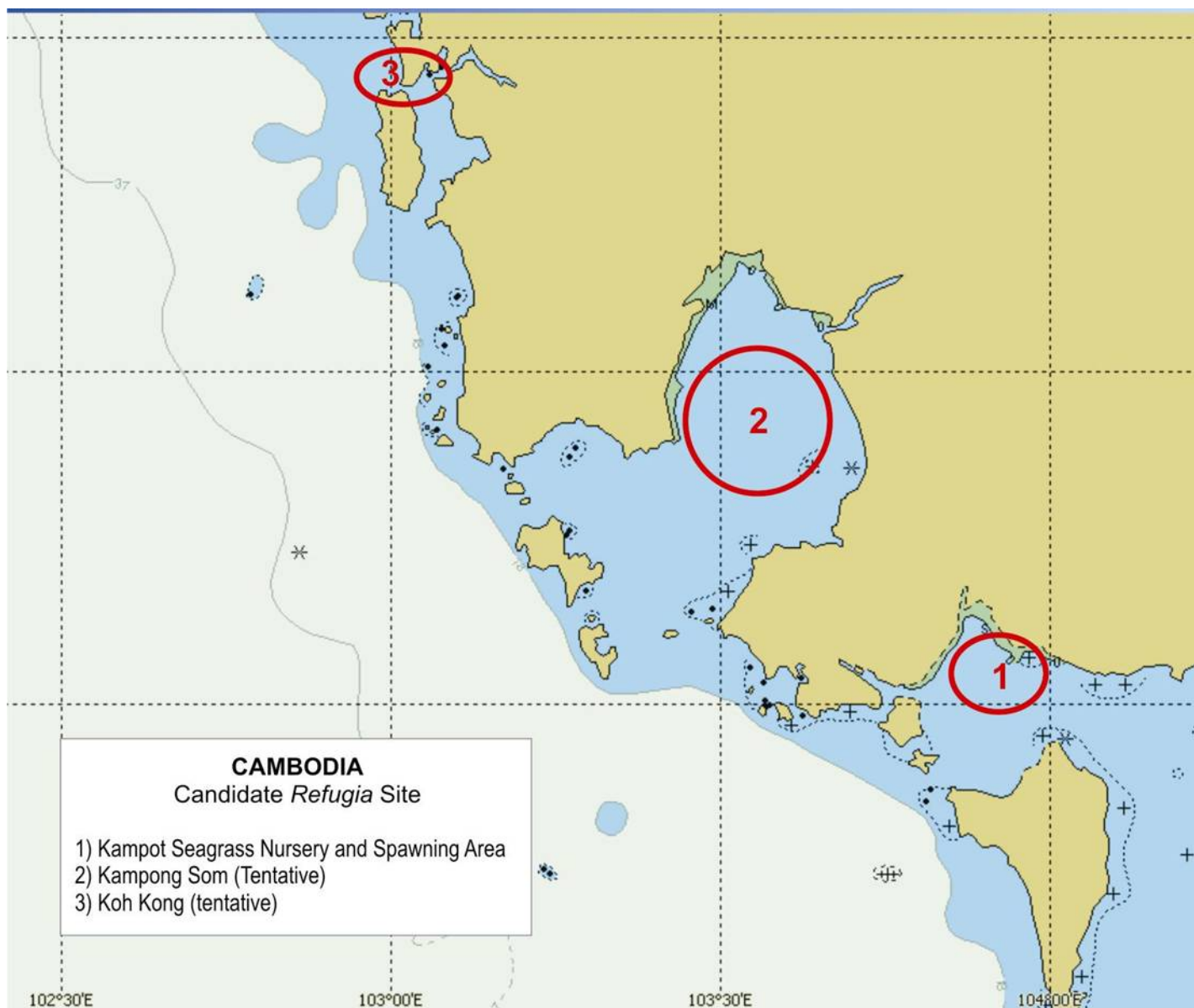
- **Establishment of fish *refugia***
- **Recruitment**
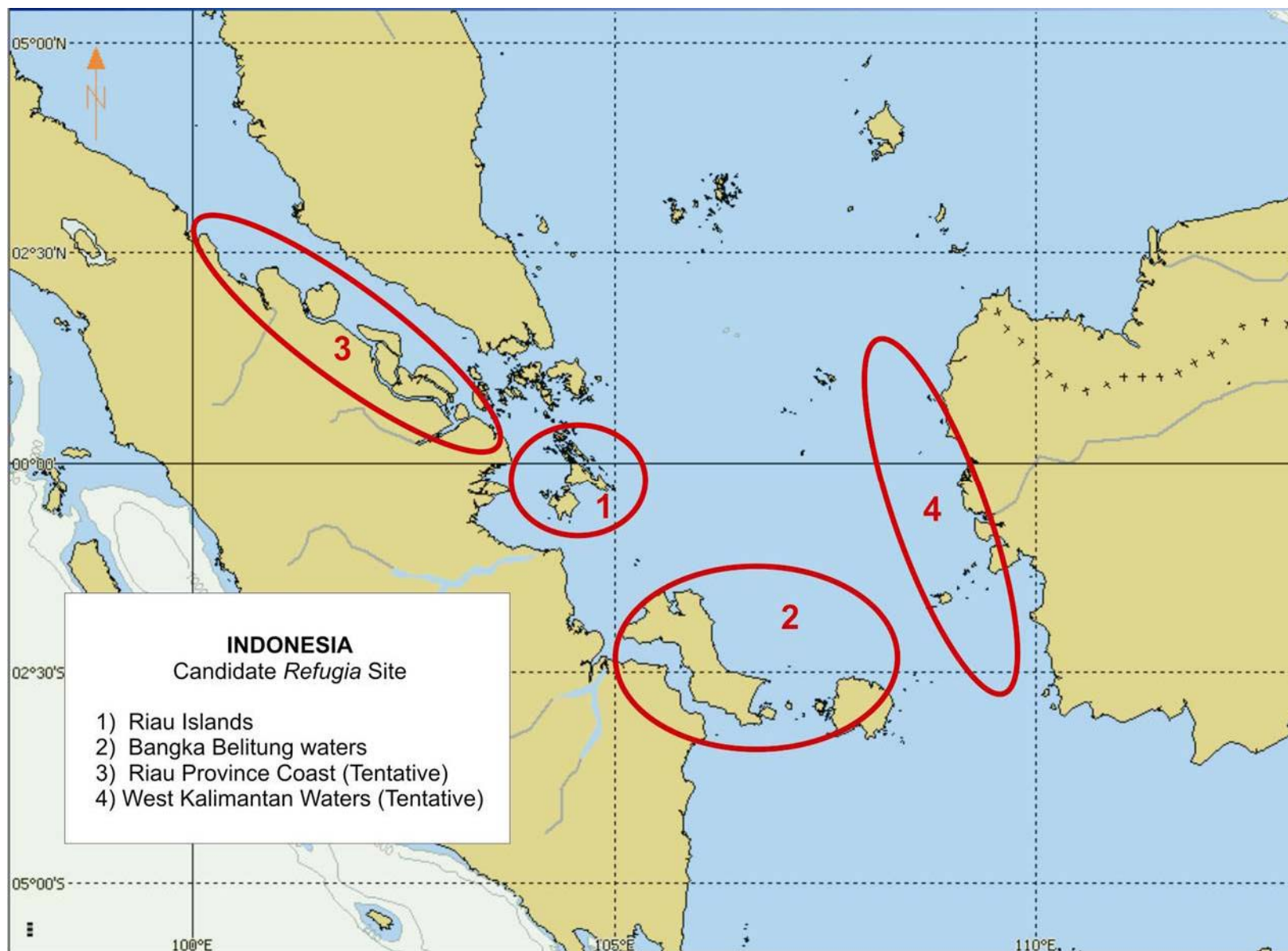- **Ichthyoplankton survey**
- **Some practical applications**

CAMBODIA
Candidate *Refugia* Site

1) Kampot Seagrass Nursery and Spawning Area
2) Kampong Som (Tentative)
3) Koh Kong (tentative)

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INDONESIA
Candidate *Refugia* Site

1) Riau Islands
2) Bangka Belitung waters
3) Riau Province Coast (Tentative)
4) West Kalimantan Waters (Tentative)

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The PHILIPPINES
Candidate *Refugia* Site

1) Lingayen Gulf
2) Masinloc
3) Busuang
4) Malampaya Sound (Tentative)
5) Batangas Coast (Tentative)

THAILAND
Candidate *Refugia* Site

1) Koh Chang Strait
2) Chumporn Group
3) Pha Ngan Island
4) Samui Island
5) Pattani Bay (Tentative)

VIETNAM
Candidate *Refugia* Site

1) Bach Long Vi Island Area
2) Hon La-Hon Nom Islands Area
3) East of Southern Part of Vietnam from Binh Thuan Province to Con Dao Island
4) Phu Quoc Island around area in Kien Giang Province
5) Haiphong-Nam Dinh Sea waters (Tentative)
6) West of Southern Part of Vietnam from Hon Chuoi to Phu Quoc Island (Tentative)

Legend

Seagrass nursery and spawning Area ○

Coral Reef Area ▬

Fisheries Management Intervention

Establishment of "Fish *Refugia*"

Protecting specific life stage/s of a fish stock

Enhance Recruitment

Sustainable Fisheries

Russel's axiom

(Russel 1931)
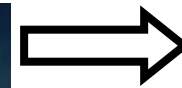
Growth ⟹   ⟹ **Natural Death**
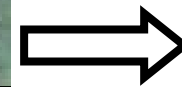
Recruitment ⟹   ⟹ **Fishing**

Surplus production
(Schaefer 1954, Fox 1970)
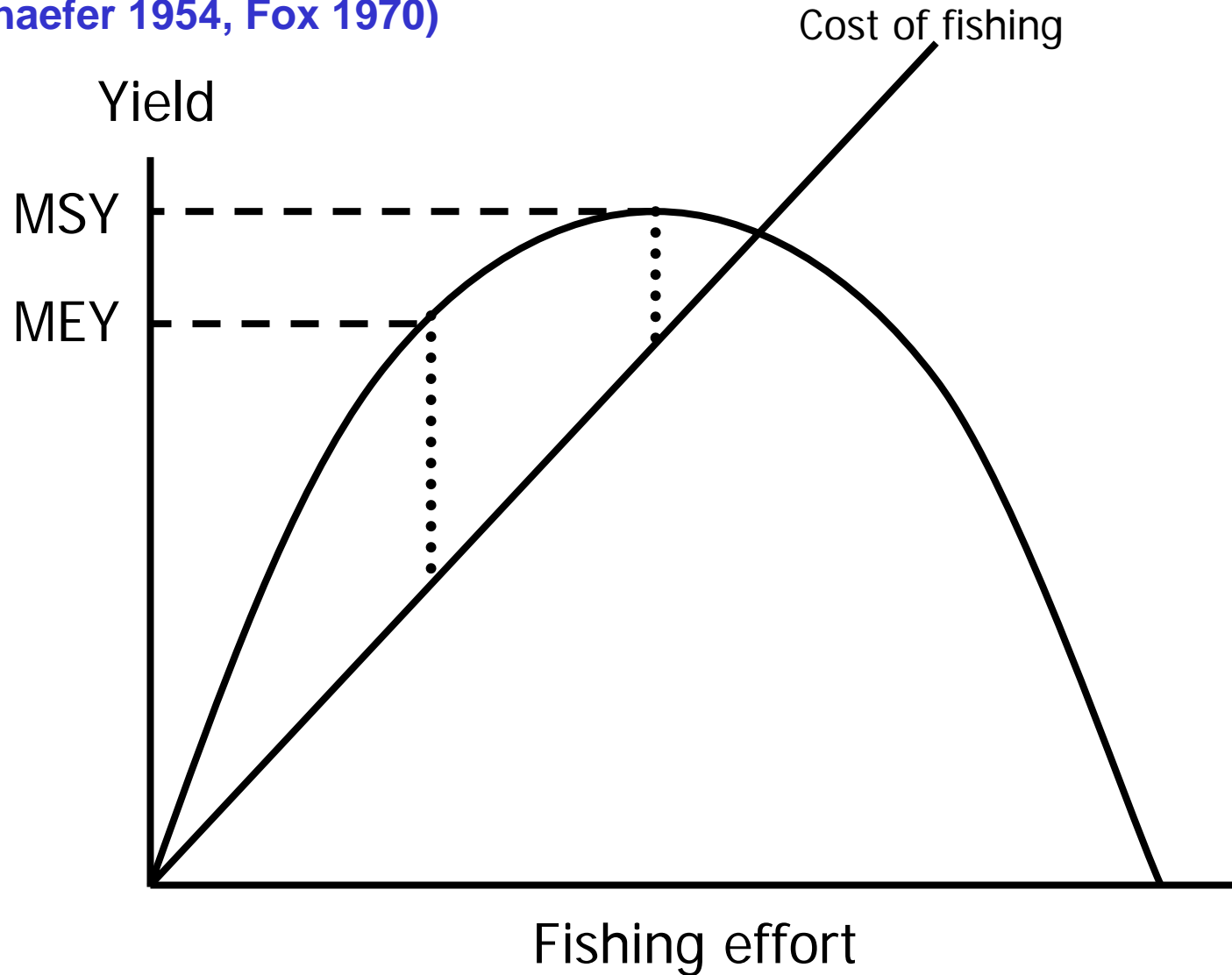
Yield per recruit analysis
(Beverton and Holt 1957)
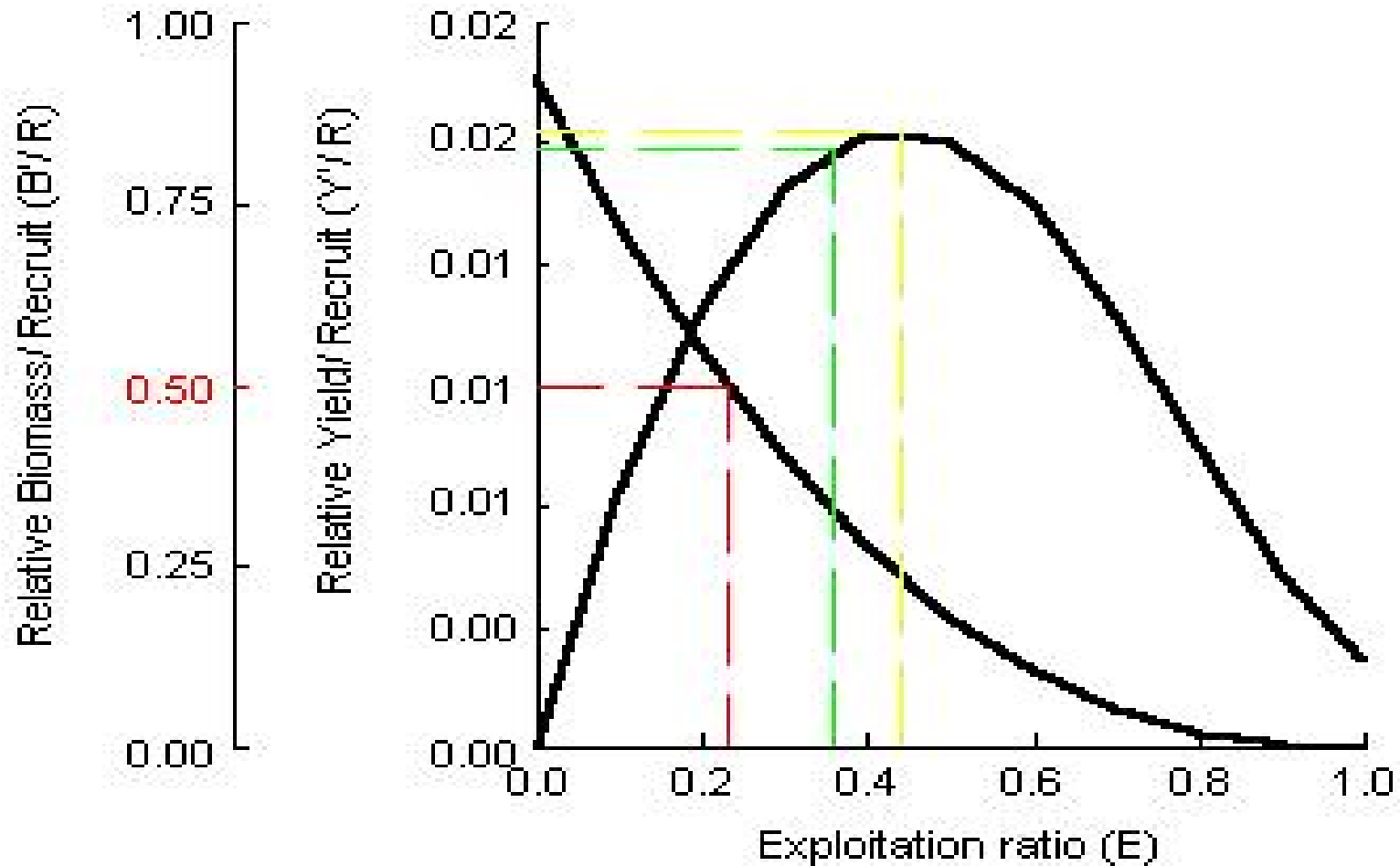
Stock-Recruitment curve
(Ricker 1954, Beverton and Holt 1957)
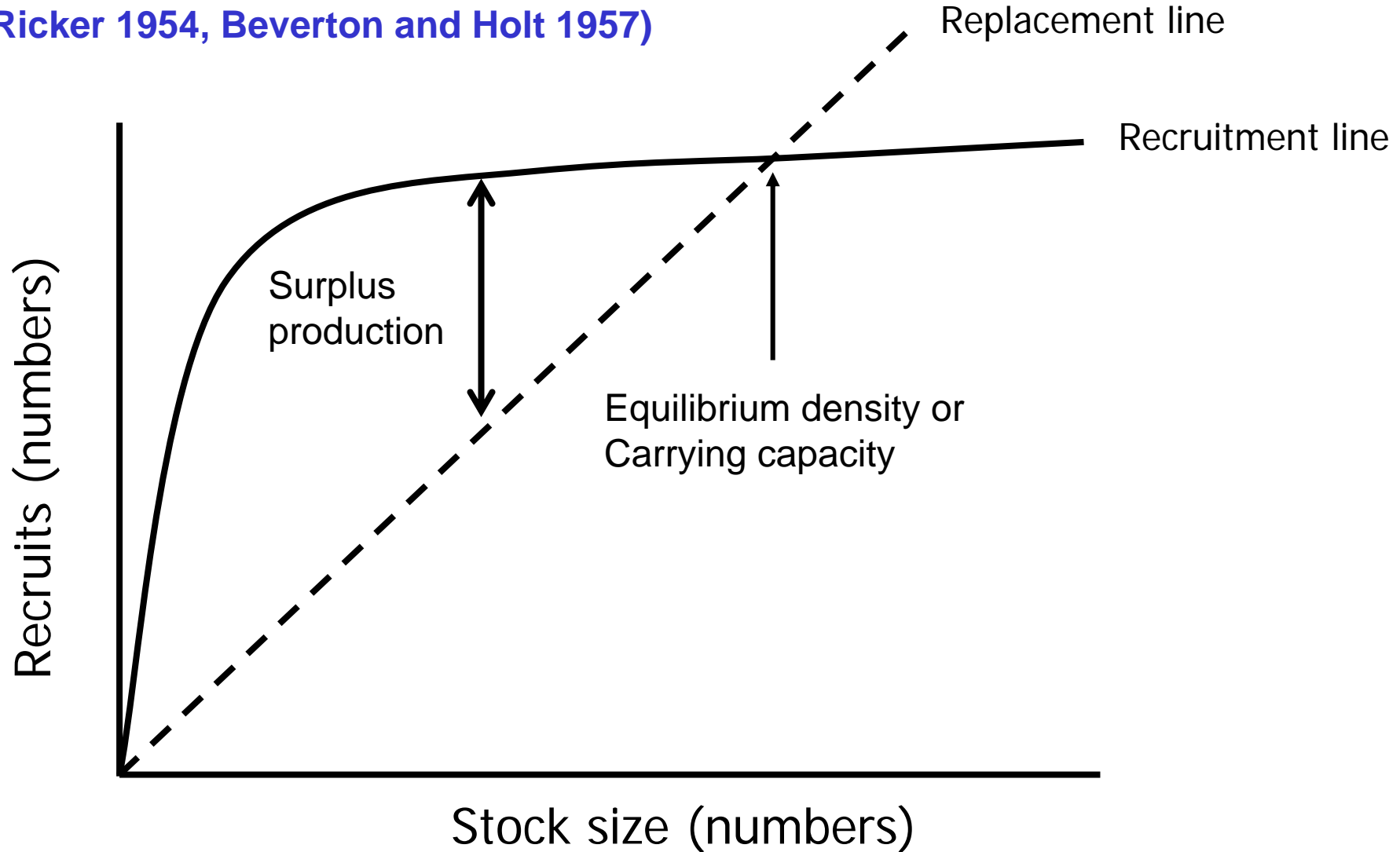
Replacement line

Recruitment line

Recruits (numbers)

Surplus
production

Equilibrium density or
Carrying capacity

Stock size (numbers)

Recruitment

Spawning stock size

Fecundity (spawning strength)
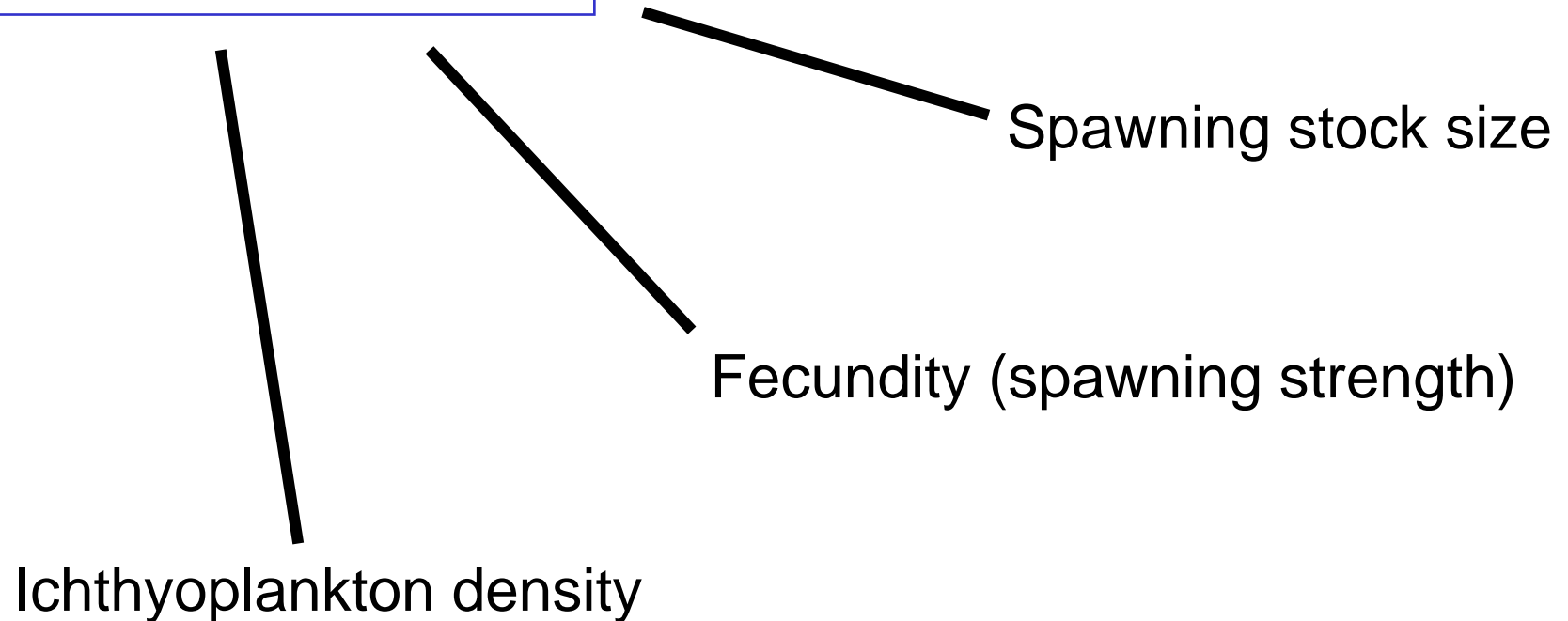
Ichthyoplankton density

Ichthyoplankton survey

Provides information on potential recruits:

– **What species of fish?**

– **Where they are found?**

– **How many (density)?**

– **Seasonal fluctuations?**
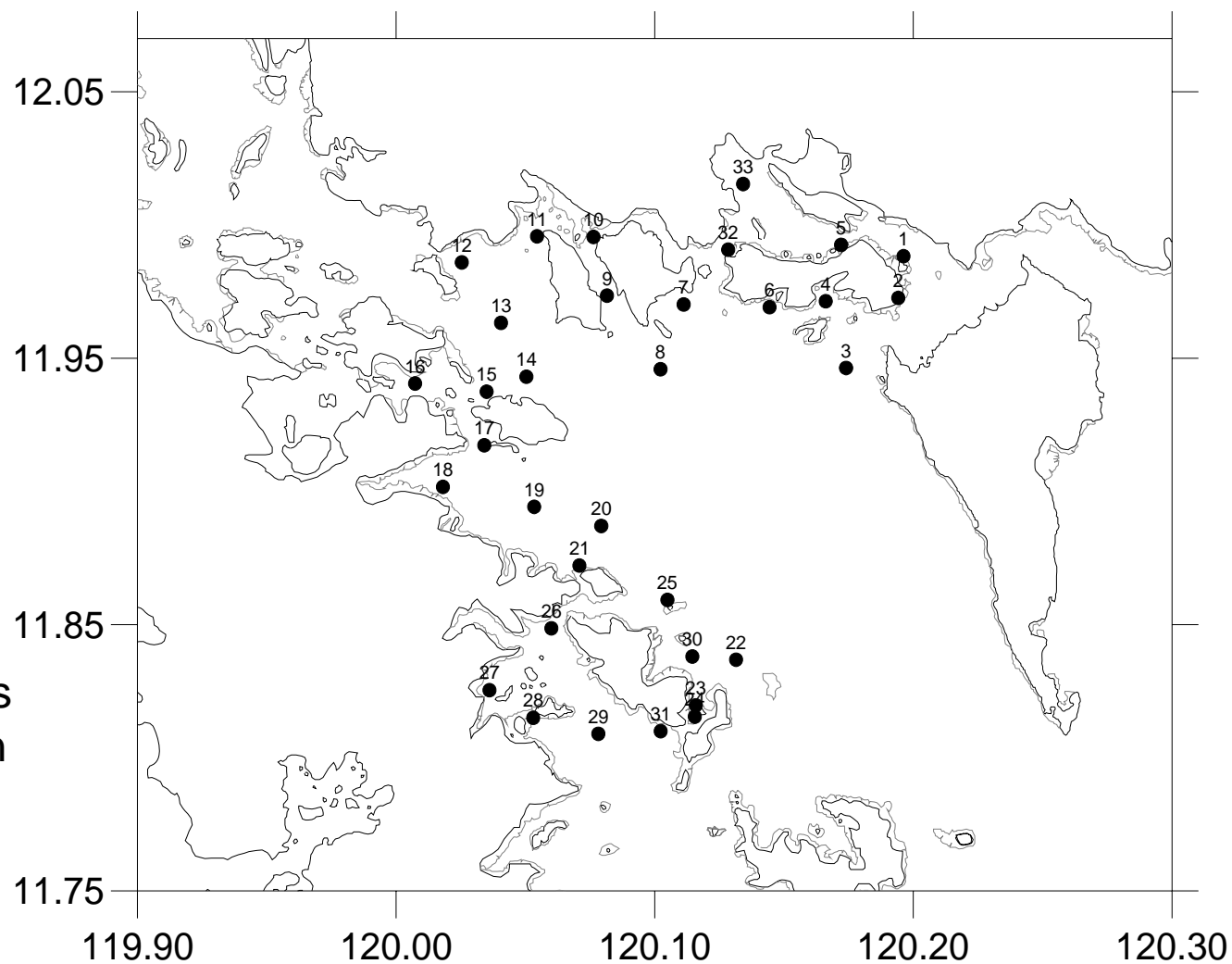
**Plankton
stations**

Map of plankton stations
in Calamianes, Palawan
in May 2004 (Campos
2004)

**Fish eggs
distribution**

Density (no./100m³)
distribution of fish eggs
in Coron Bay in April
2004 (Campos 2004)
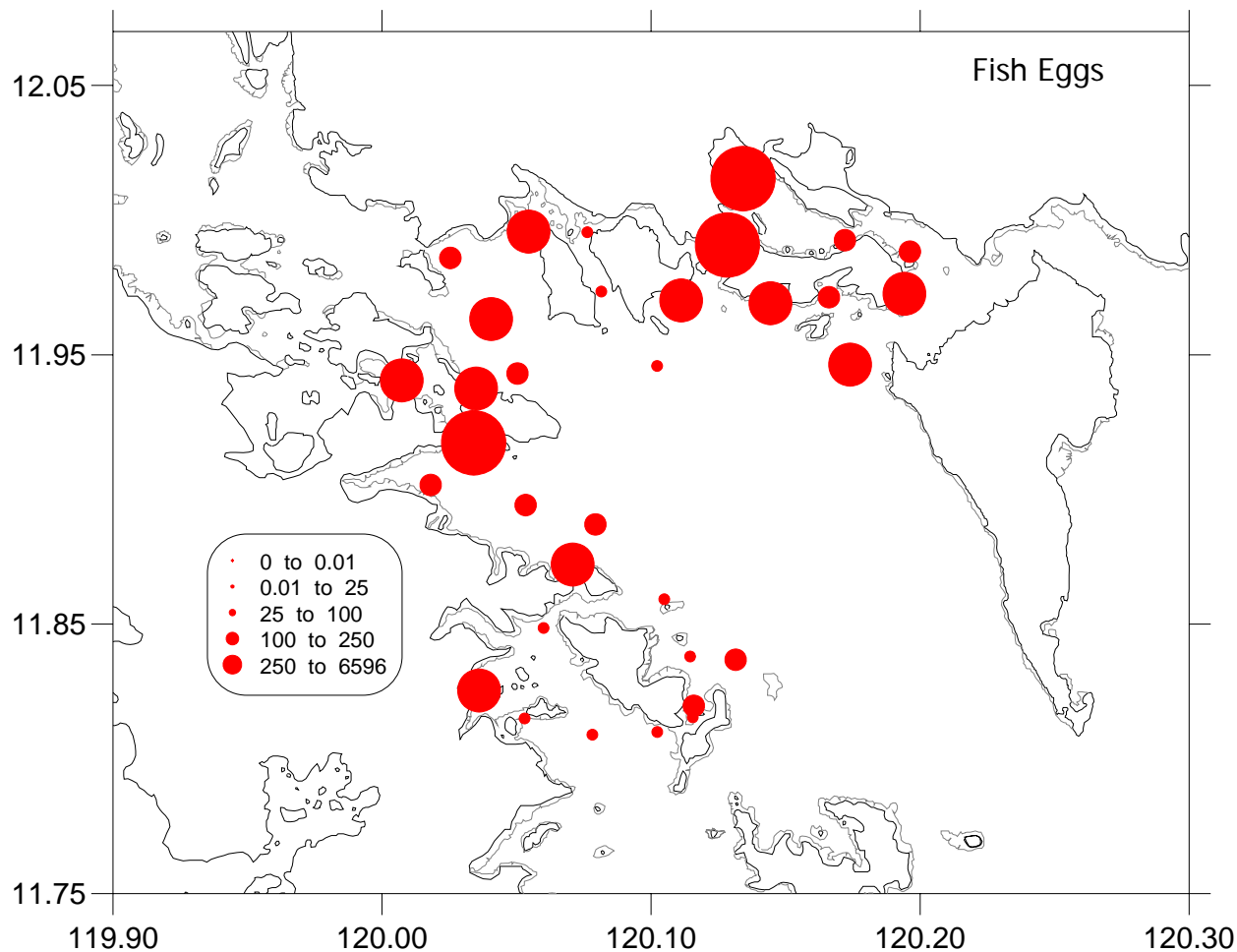
Fish Eggs

·	0 to 0.01
·	0.01 to 25
•	25 to 100
●	100 to 250
●	250 to 6596

Fish larvae distribution

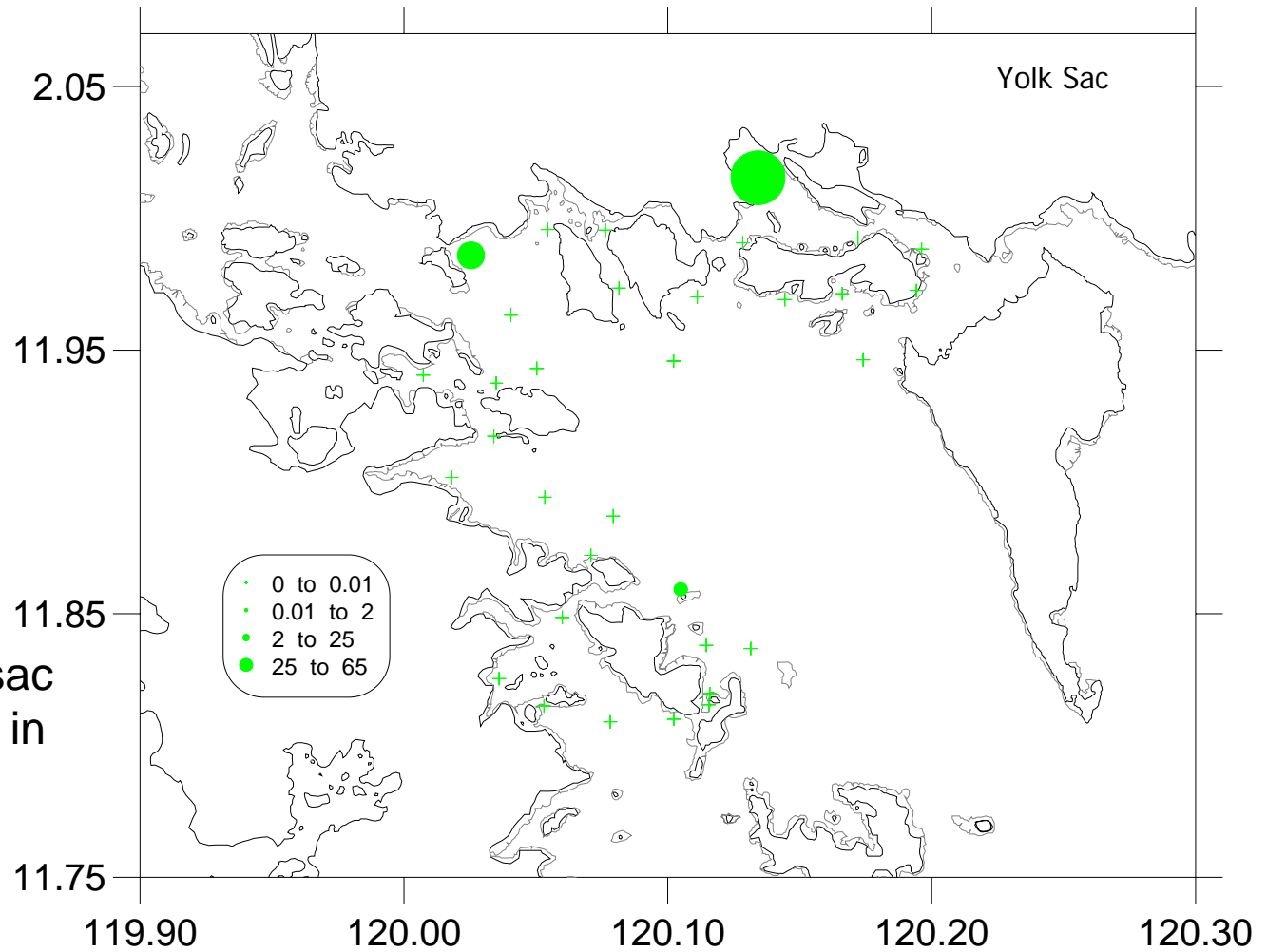Density (ind./100m³) distribution of fish larvae in Coron Bay in April 2004. (Campos 2004)
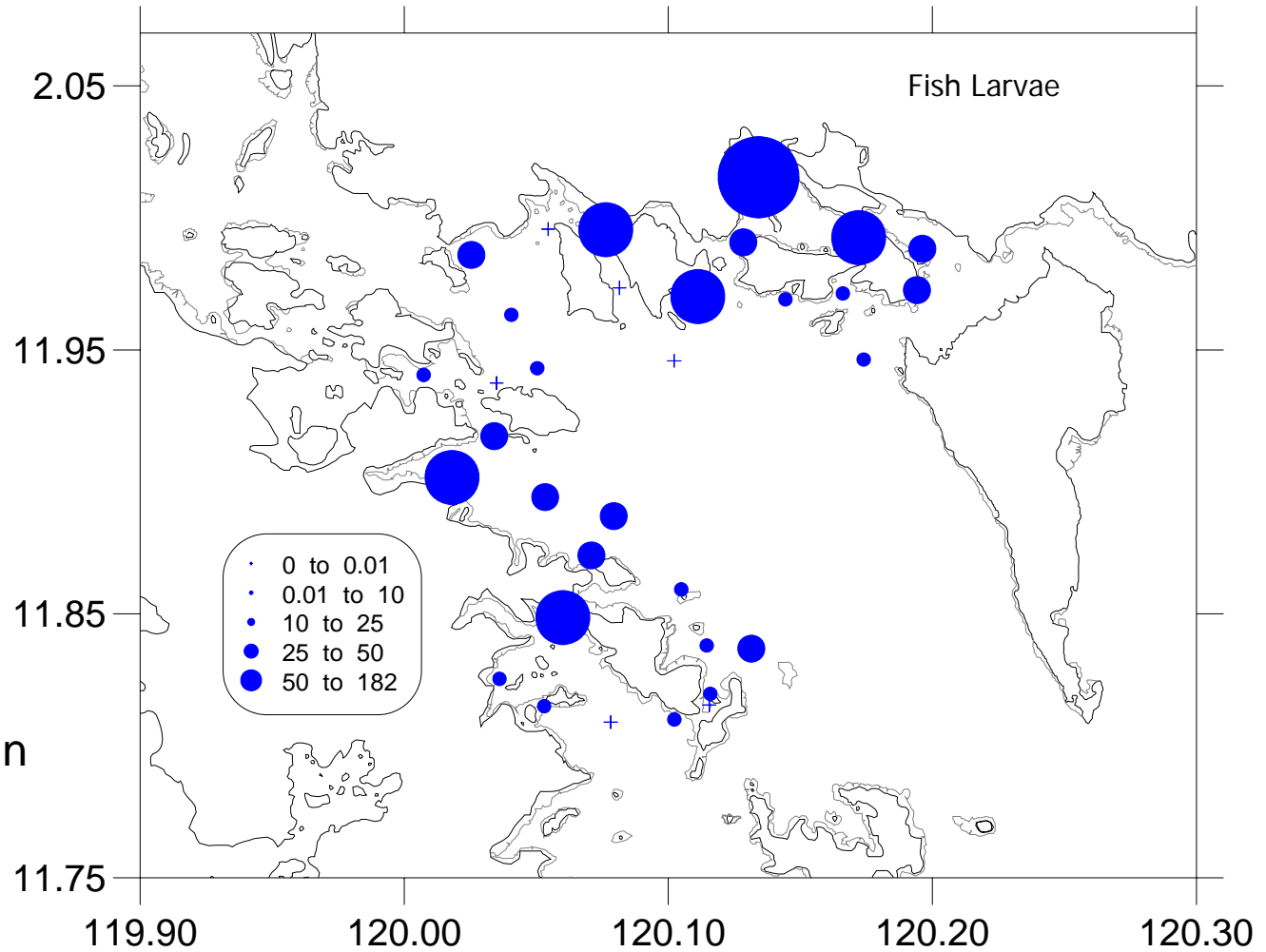
Fish Larvae

Legend:
- 0 to 0.01
- 0.01 to 10
- 10 to 25
- 25 to 50
- 50 to 182

Yolk sac larvae distribution

Yolk Sac

·	0 to 0.01
·	0.01 to 2
●	2 to 25
●	25 to 65

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

Fish larvae composition

Larvae Families	Larval Density (ind/100m^3)	Standard deviation	Relative Abundance (%)
Gobiidae	4.99	12.68	29.4
Mullidae	2.58	5.39	15.2
Pomacentridae	1.33	3.98	7.8
Scombridae	1.07	1.78	6.3
Atherinidae	0.98	3.23	5.8
Terapontidae	0.87	2.61	5.1
Blenniidae	0.63	1.54	3.7
Monacanthidae	0.41	1.64	2.4
Cynoglossidae	0.35	2.04	2.1
Sphyraenidae	0.21	0.73	1.2
Labridae	0.20	0.85	1.2
Clupeidae	0.13	0.58	0.8
Callionymidae	0.13	0.41	0.7
Sillaginidae	0.12	0.72	0.7
Apogonidae	0.06	0.37	0.4
Lethrinidae	0.06	0.37	0.4
Engraulidae	0.05	0.27	0.3
Carangidae	0.05	0.27	0.3
Trichiuridae	0.05	0.27	0.3
Gerreidae	0.04	0.24	0.24
Polynemidae	0.04	0.24	0.24
Priacanthidae	0.04	0.20	0.21

Circulation pattern

General tidal circulation in Coron Bay (Villanoy 2006).
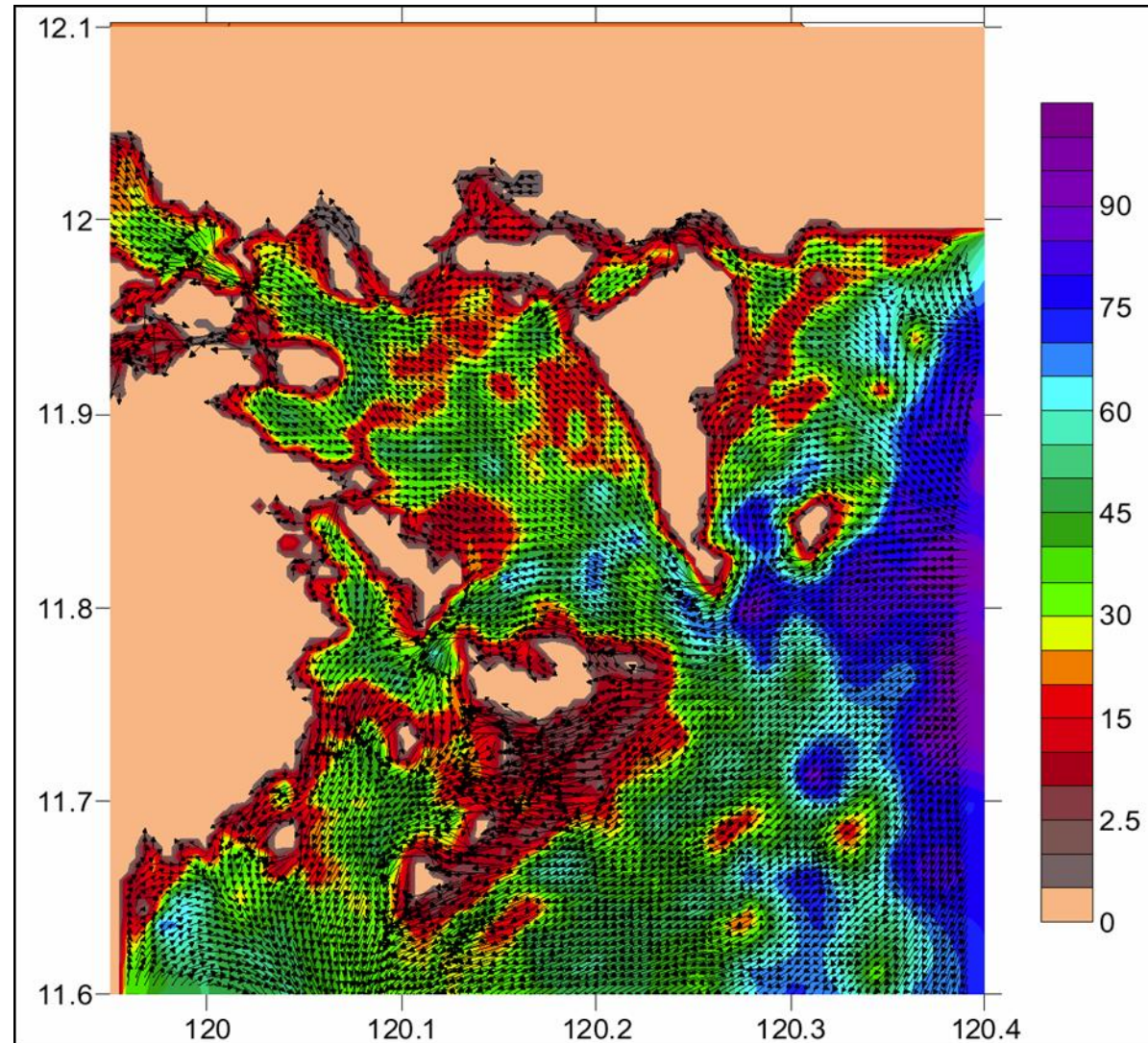
**Dispersal
simulation**

Simulation of
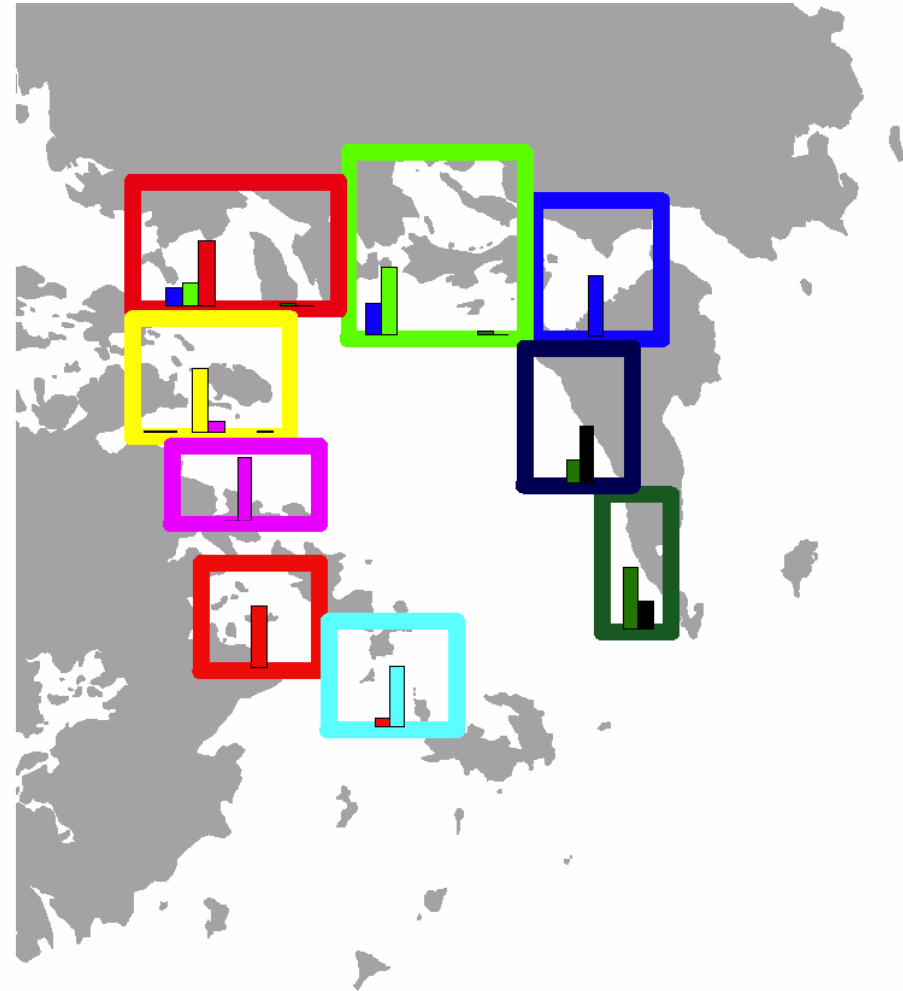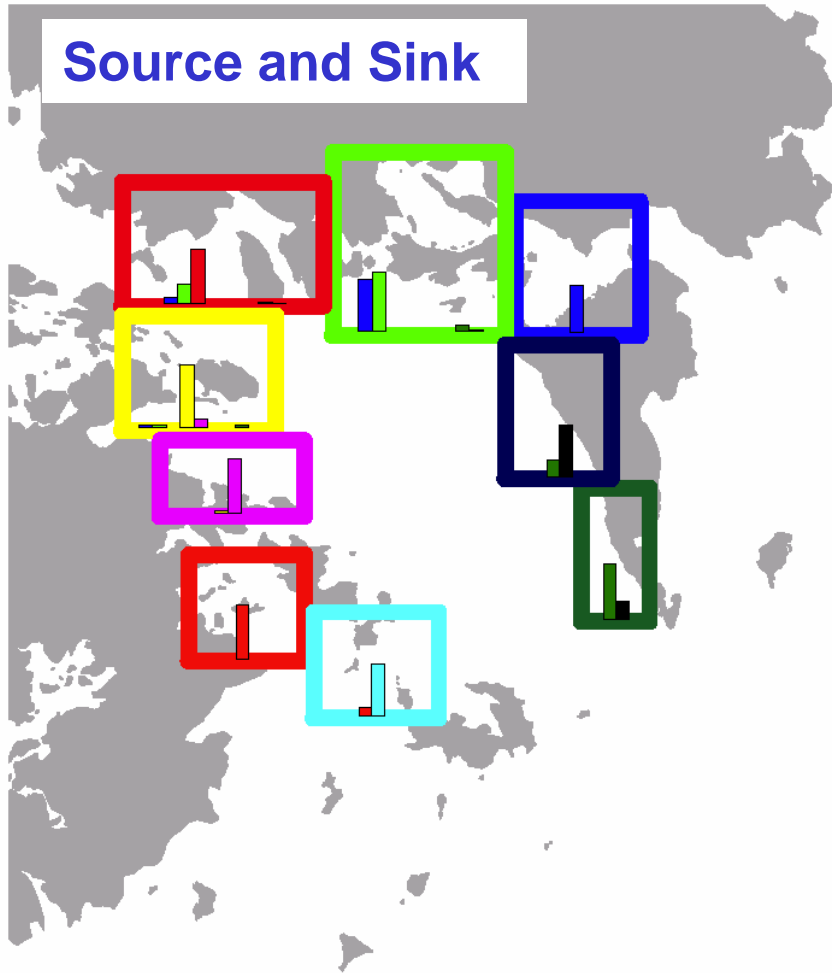dispersal in Coron
Bay (Villanoy 2006).
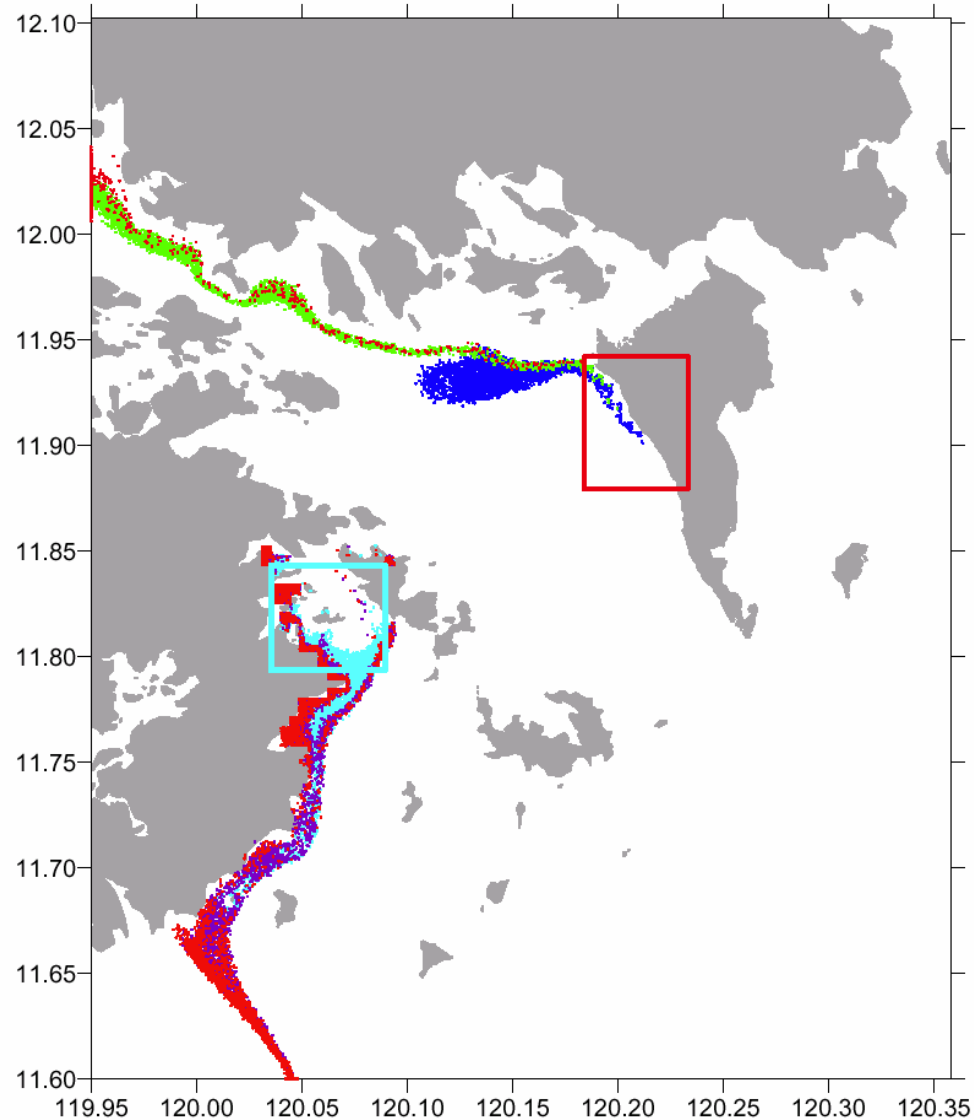
Source and Sink

April Dispersal
Source areas and relative amounts of dispersed particles settling in each of the areas marked by the colored boxes. Colored bars within each box represent the sources of the particles that settled in a particular box. L= 20 days, R=30 days. (Villanoy, 2006)

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Source and Sink

January Dispersal
Sink areas and relative amounts of particles dispersed from each of the areas marked by the colored boxes. Colored bars within each box represent where the particles released from a source box ended up. L=20 days, R=30 days.

**Simulated
dispersal**

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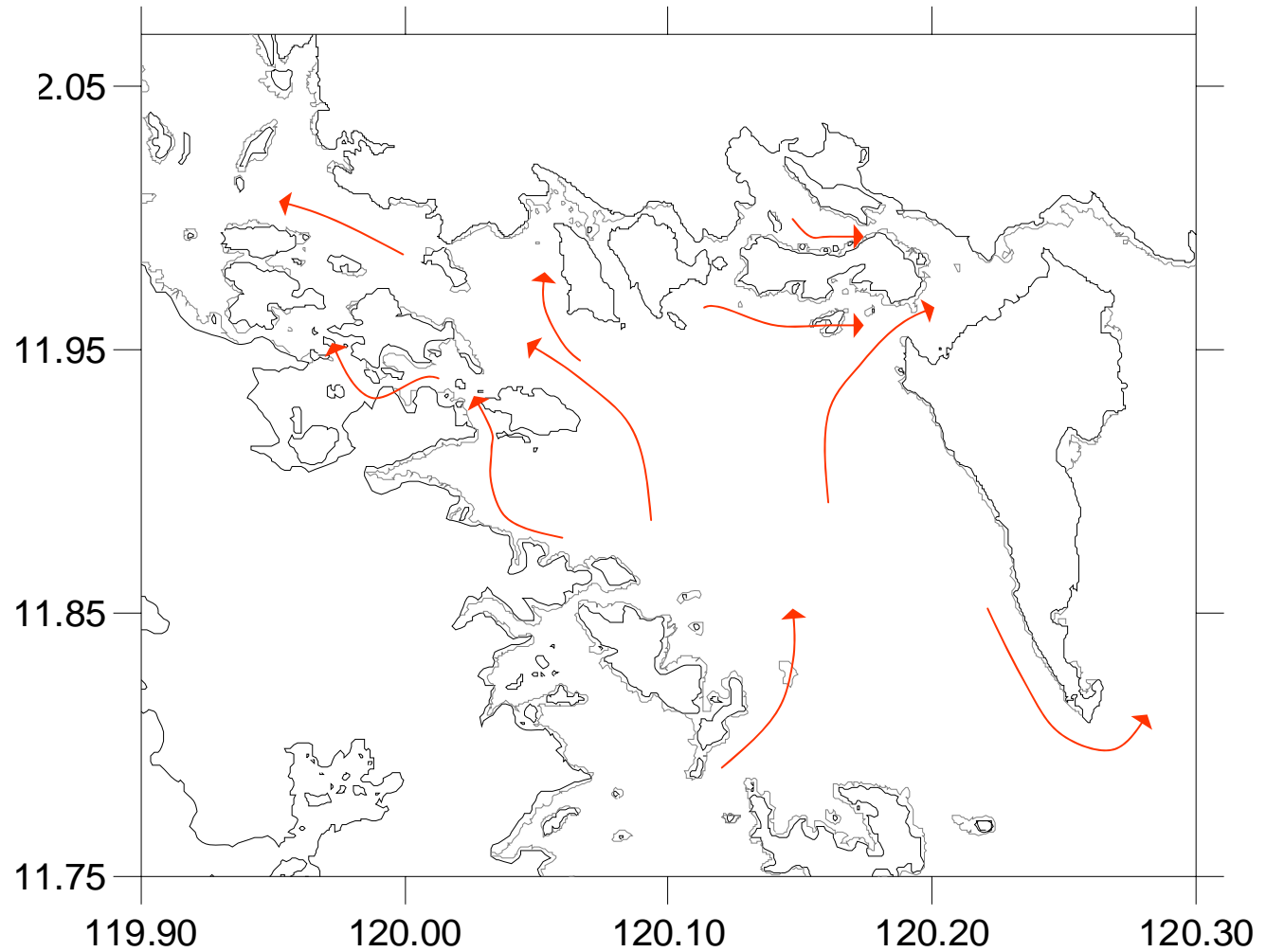
**Simulated
dispersal**

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.
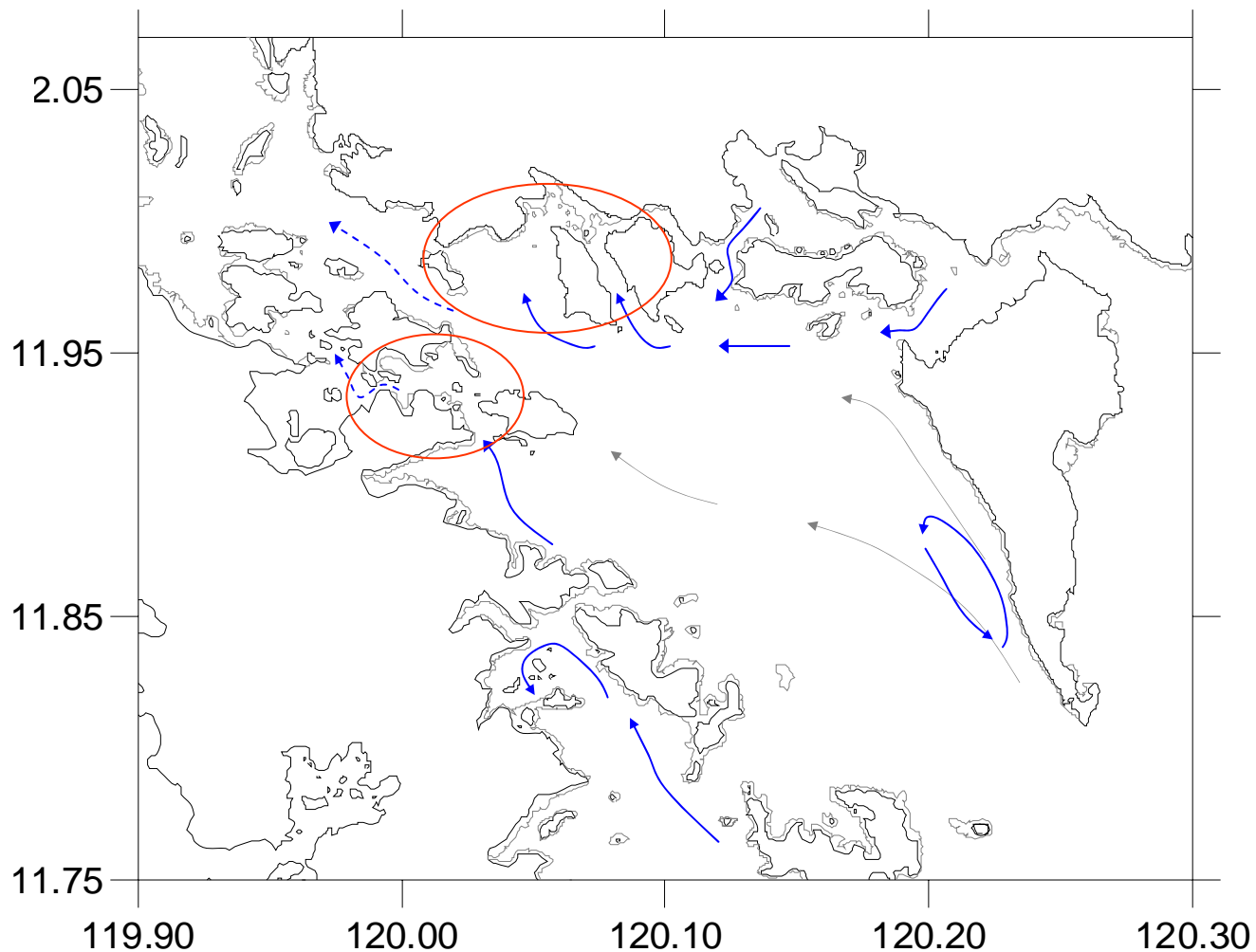
Obeserving closed season for rabbit fish, *Siganus canaliculatus*

Siganus canaliculatus
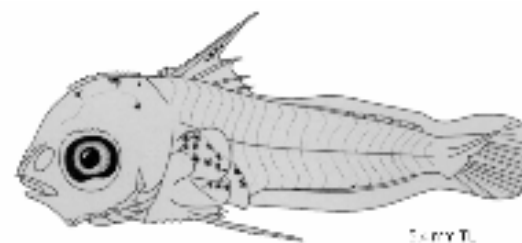
S. fuscescens (Source: American Society of Ichthyologists and Herpetologists)
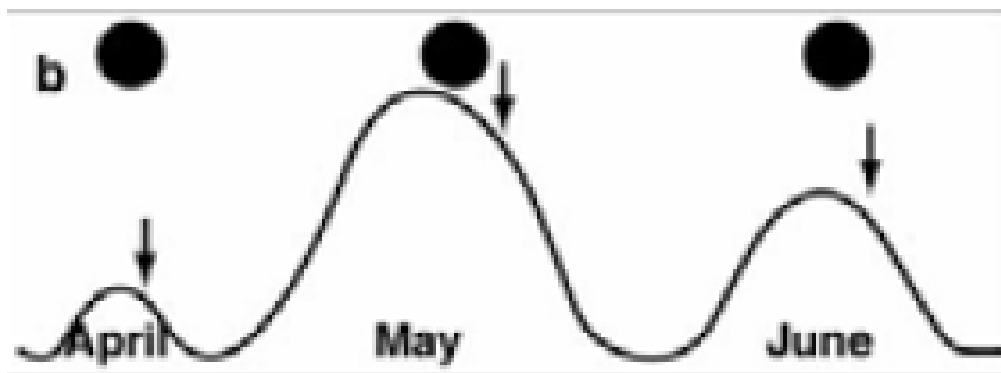
Obeserving closed season for rabbit fish, *Siganus canaliculatus*
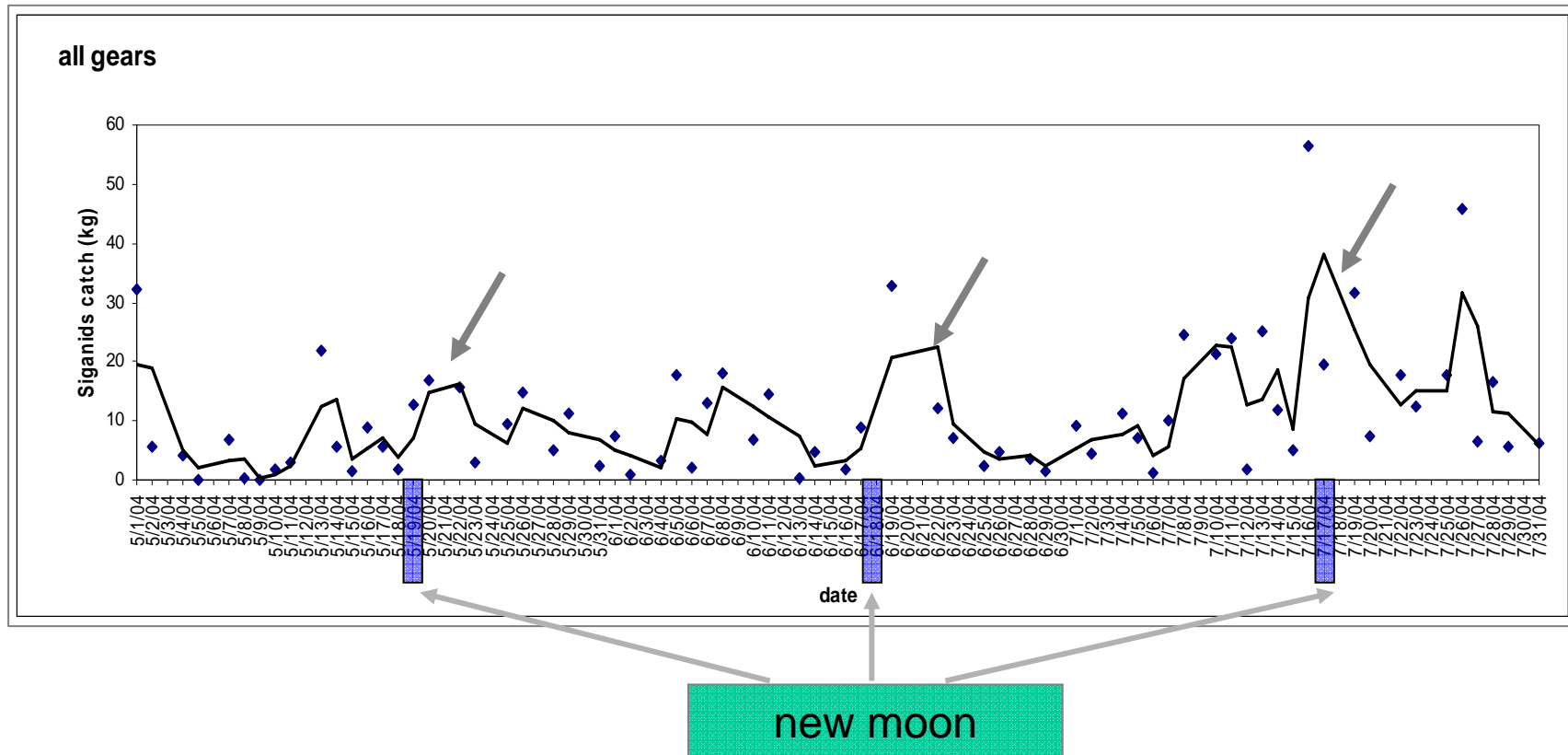
Catch monitoring data from various gears catching rabbit fish in
Danajon Bank from May to July 2004

Major seagrass areas

Closed Season:

– In seagrass areas

– 4th, 5th, 6th nights after the new moon

– March, April & May
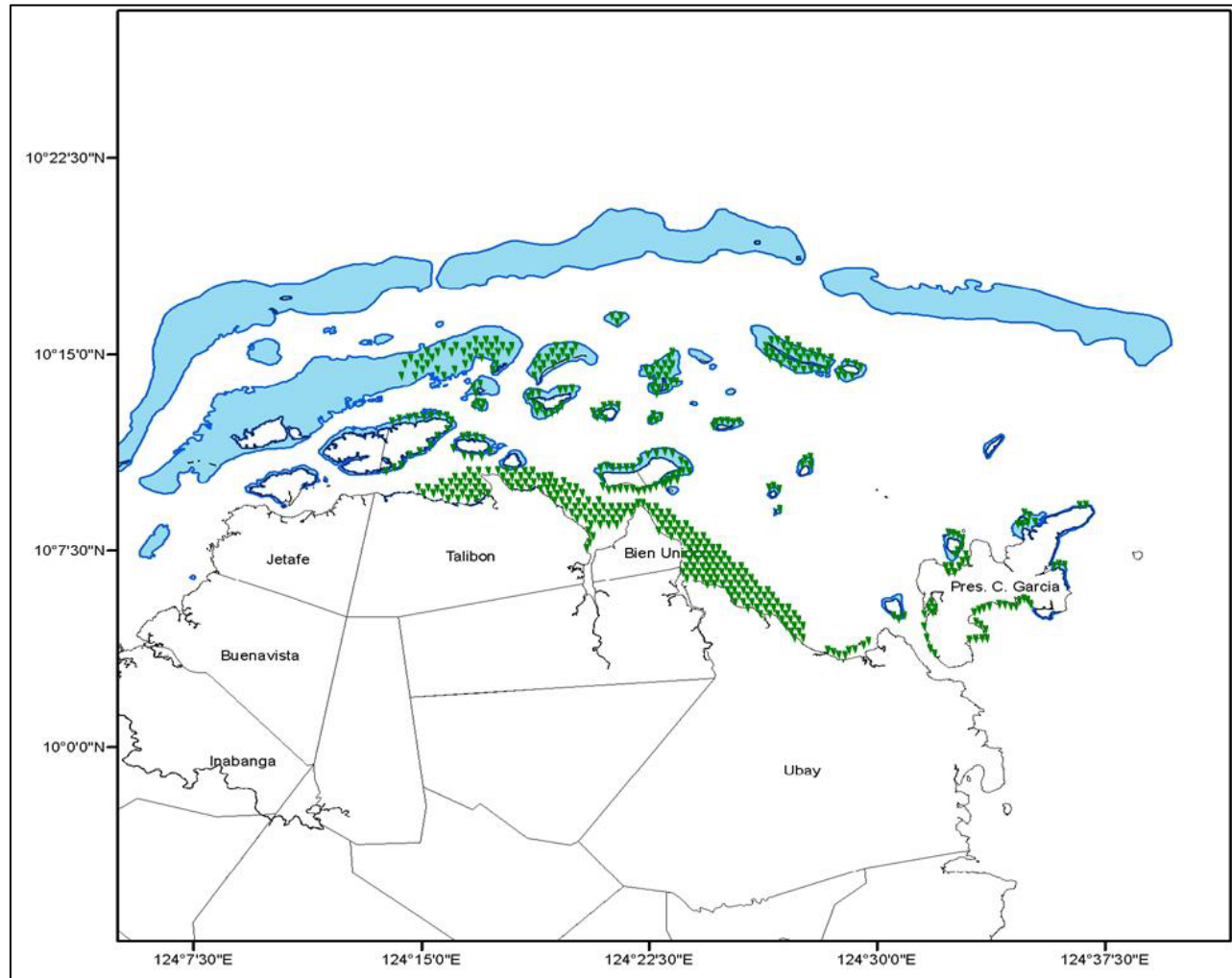
Closed season for red grouper, *Plectropomus leopardus*
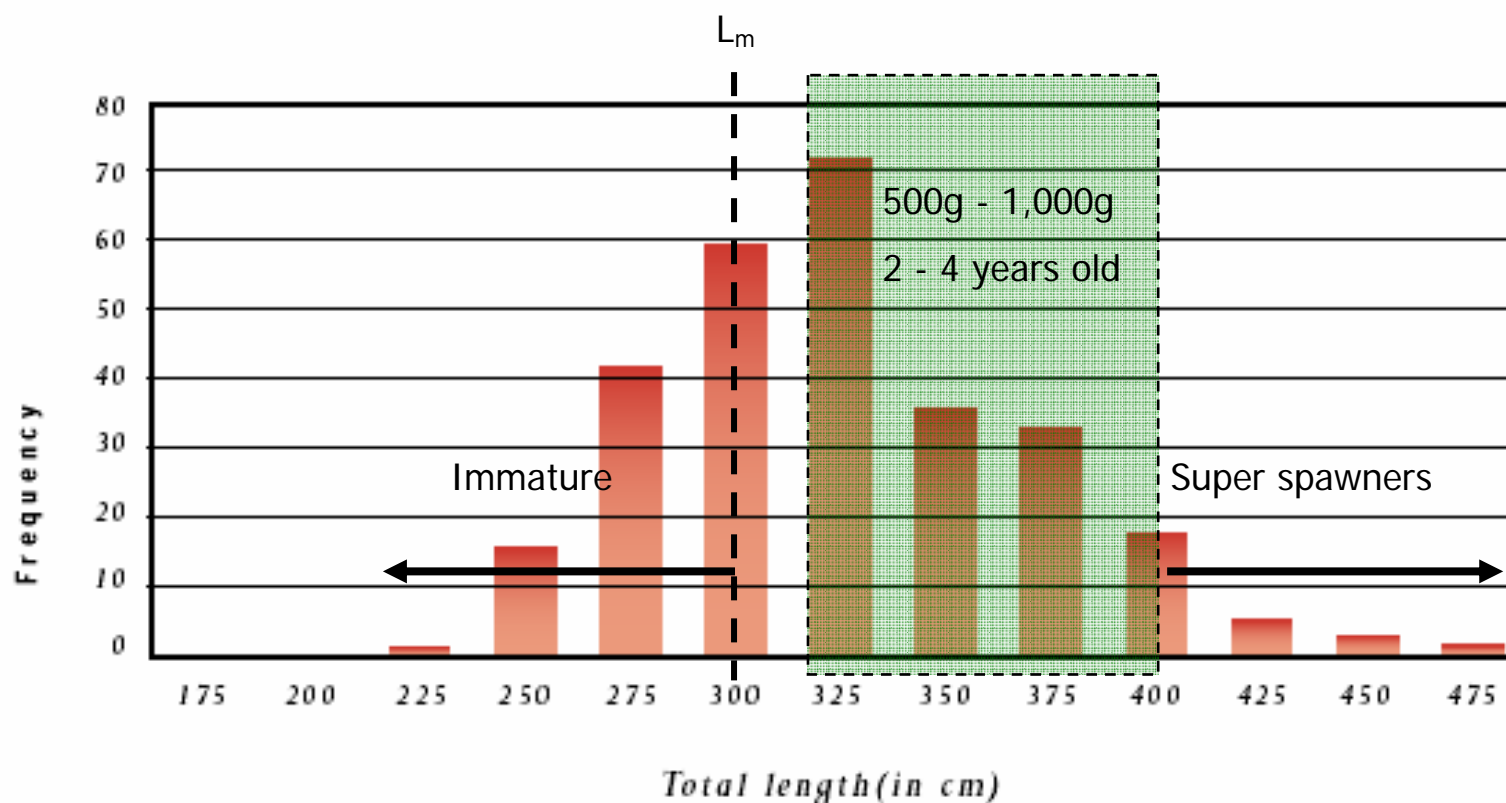
Length frequency distribution of *Plectropomus leopardus* in Calamianes in 1998 (Mamauag *et al.* 2002)

Ban on harvest of berried lobster
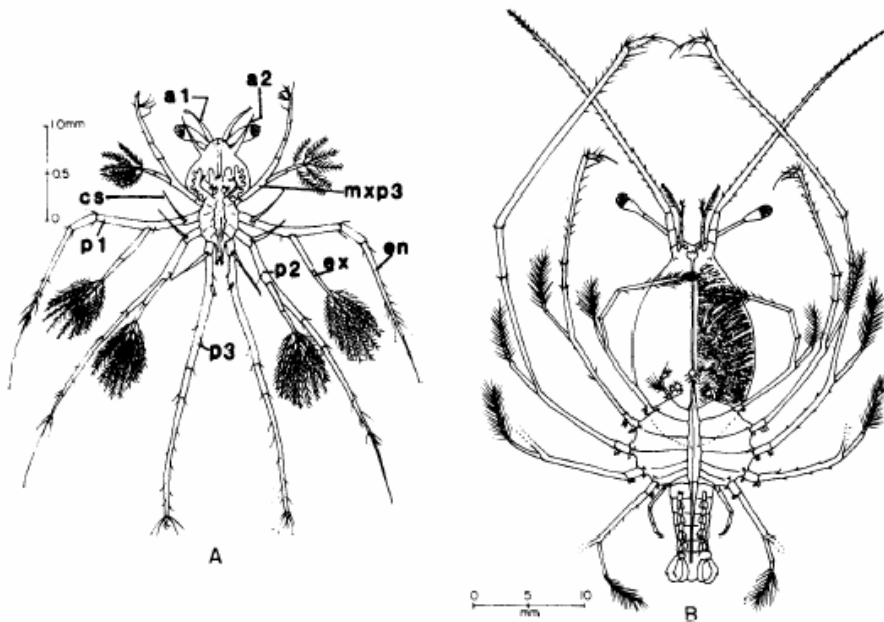
Panulirus larva, (A) Stage I and (B) Stage IX

Alternative sampling gears

- Beach seine
- Push net
- Fry gathering net

Beach seine

Push net

Fry net
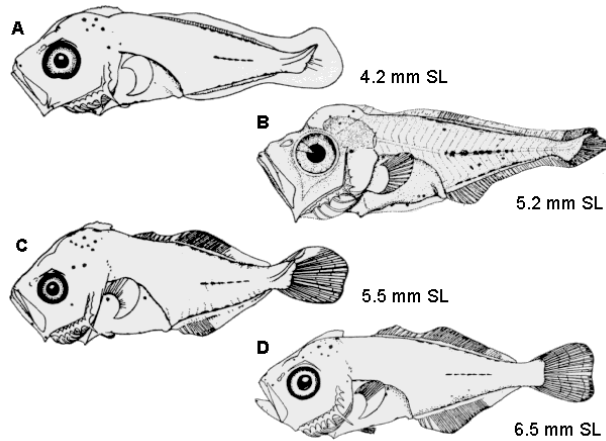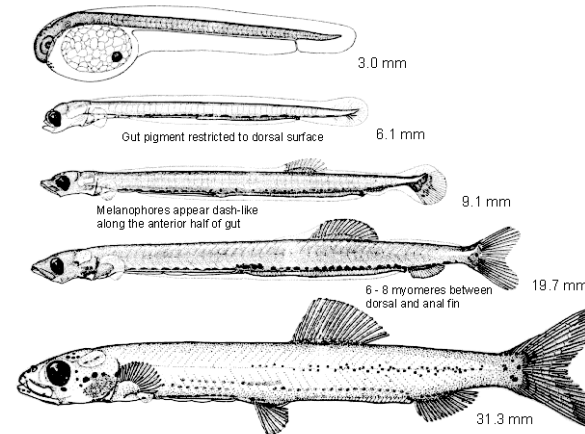
Catch of beach seine

Catch of push net

Species of interest

Tuna
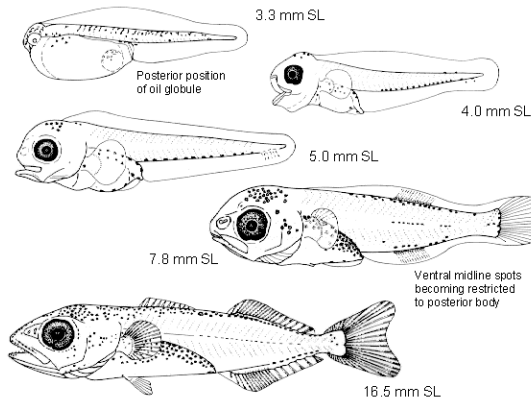
Scombrids

Carangids

Sardines