Some Result of LAND-BASED SURVEY

12 – 23 August 2017

01-10 July 2018

EAST COAST PENINSULAR MALAYSIA

Ledhyane Ika Harlyan

MATSUISHI Takashi Fritz

Faculty of Fisheries Sciences, Hokkaido University

19 SEPTEMBER 2018

Conventional Fisheries Management and Stock Assessment

1. Catch statistics **by Species** (Total catch + **Species composition**)
2. **Single Species** Stock assessment
3. Productivity estimation (MSY / Prediction) **for the species**
4. Catch limit / Effort limit
5. **Species Specific** Fisheries Management Measures
    1. Effort control **for the species**
    2. Gear selectivity **for the species**
    3. Seasonal / Areal Closure **for the species**
6. Implementation and MCS

Objectives

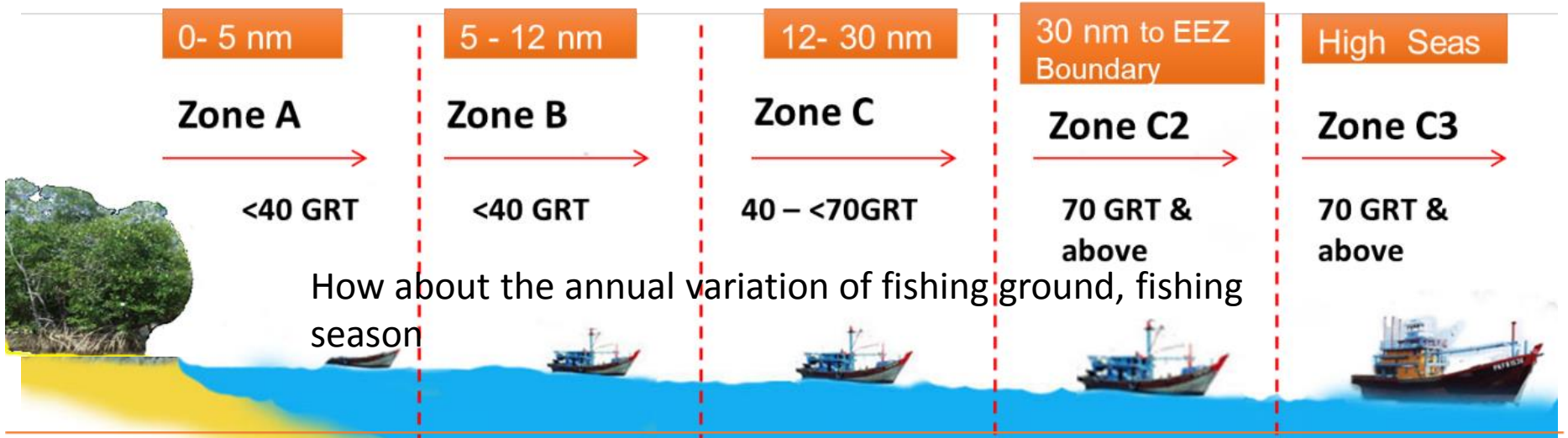
- To find a possibility to conduct **conventional single species management**
  - Whether specific species has specific **fishing ground**
  - Whether specific species has **fishing season**
  - How about the **annual variation** of fishing ground, fishing season

- To proof that "*conventional single species management is impossible*" is quite difficult.
- Enough survey and analysis are necessary to proof.

Fisheries Management

A ZONATION

Malaysian waters fishing zones

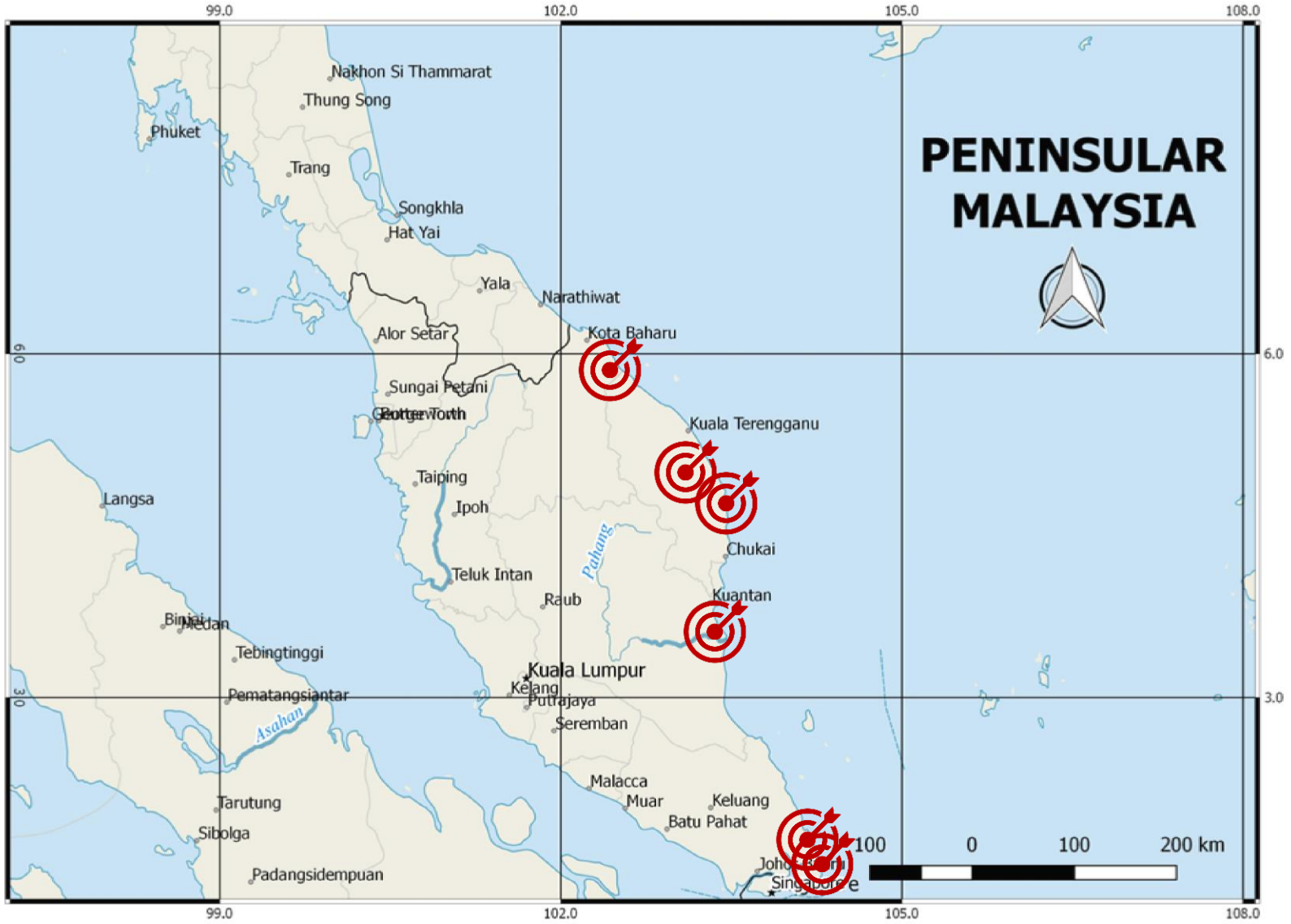


How about the annual variation of fishing ground, fishing season

Fishing Gears	Traditional (owner operator), Anchovy Purse Seiners	Trawlers, Purse Seiners (owner operator)	Trawlers, Purse Seiners (owner operator & non owner operator)	Trawlers, Purse Seiners (owner operator & non owner operator)	Tuna Longliners & Tuna Purse Seiners
No. of Vessel (56,211)	48,252	4,949	1,977	1,028	5
No. of Fishermen (140,949)	85,373	20,457	17,169	17,871	79
Landings (1,486,051)	442,938	353,714	352,078	337,322	

Source: Current status of purse seine fisheries in the south east Asian region (Hassan, 2015)

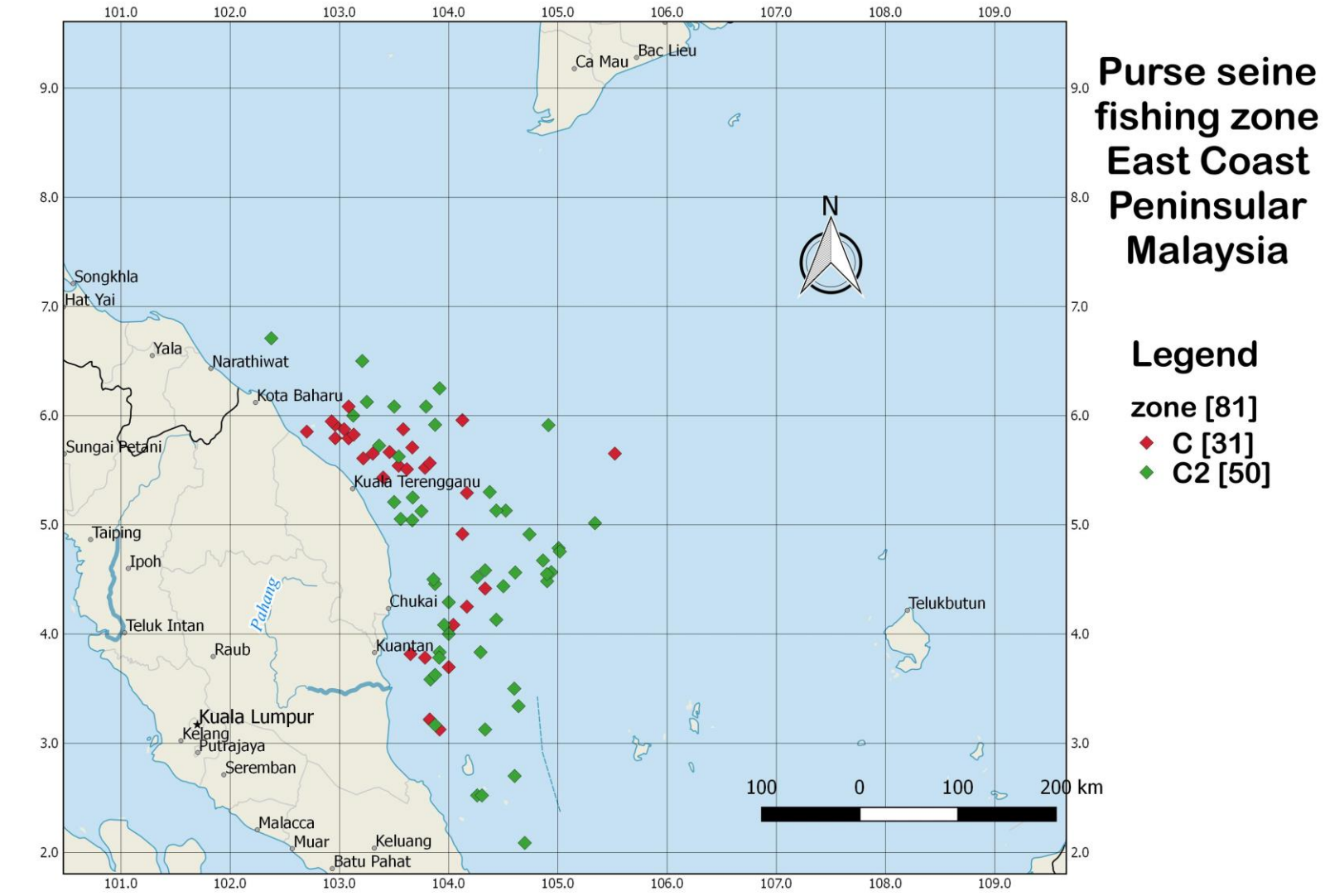
Research Sites



1. Tok Bali fishing port , Kelantan
2. Pulau Kambing fishing port, Terengganu
3. Kuala Besut fishing port, Terengganu
4. Kuantan fishing port ,Pahang
5. Endau fishing port, Johor
6. QL fishing port, Johor

12-23 August 2017
01-10 July 2018

Area study profile : Vessel zones



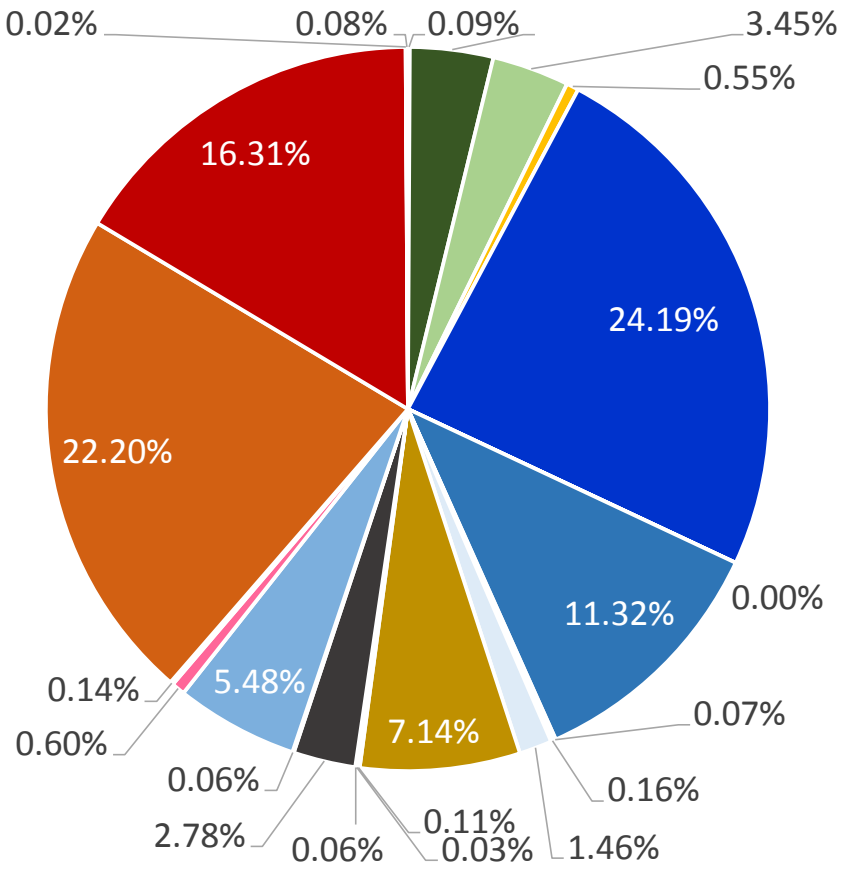
Portraying the zone distribution over East coast peninsular Malaysia (ECPM) area

- Purse seine fisheries use C and C2 vessels

- Vessels are well distributed
- Some vessels in the inner zones go further
- Vessels from Southern areas go fishing to the Northern areas
- Southern areas have less potential fishing areas (due to country borders) than the Northern areas

Species Composition

(survey data 2017 and 2018)

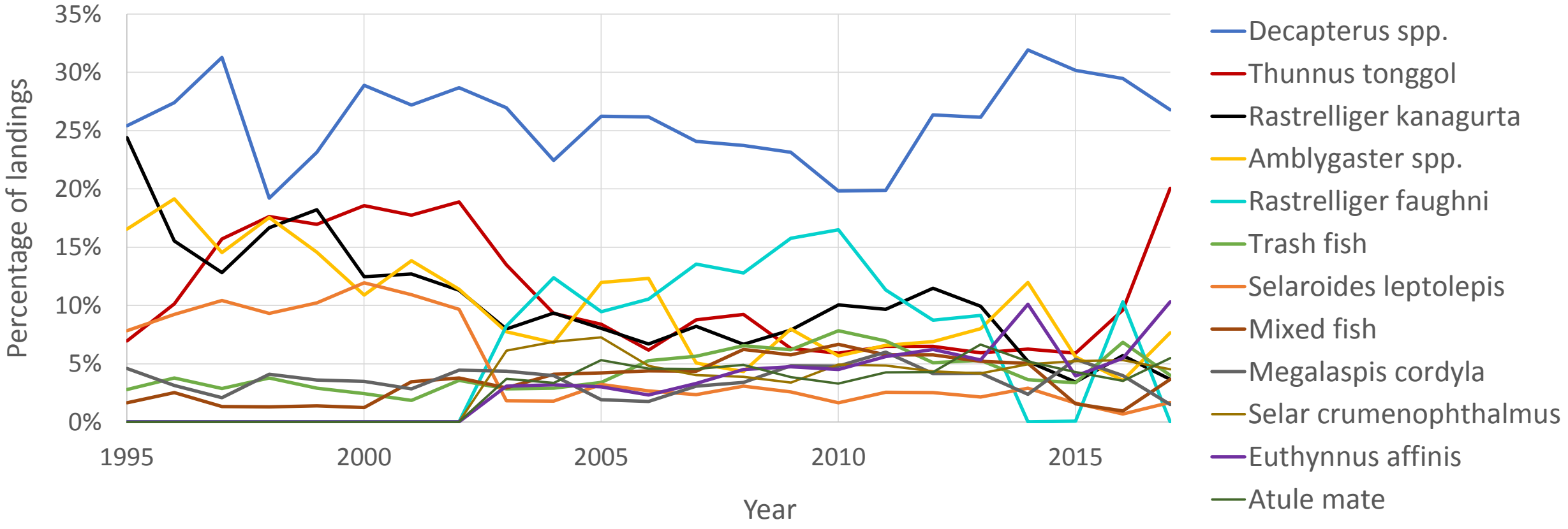


- Alepes spp
- Amblygaster spp
- Atule mate
- Carangoides armatus
- Decapterus spp
- Epeneus sulphureus
- Euthynnus affinis
- Leiognathidae
- Loligo spp
- Megalaspis cordyla
- Mixed fish
- Pampus argentus
- Pterocaesio spp
- Rastrelliger brachysoma
- Rastrelliger kanagurta
- Scomberomorus spp
- Selar crumenophthalmus
- Selaroides leptolepis
- Sphyraena spp
- Thunnus tonggol
- Trash fish
- Trichiurus lepturus
- Trichiurus spp.

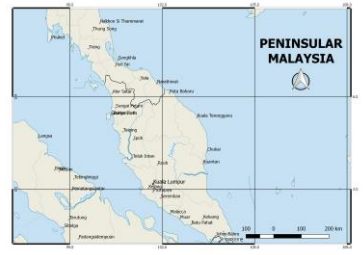
- **There are 23 species found during the surveys**
- **The composition is dominated by some species; Decapterus spp (24.19%), Thunnus tonggol (22.2%), Euthynnus affinis (11.32%) and compiled with small amount of other species.**
- **It represented the catch statistics of 1995 – 2017**

Species composition

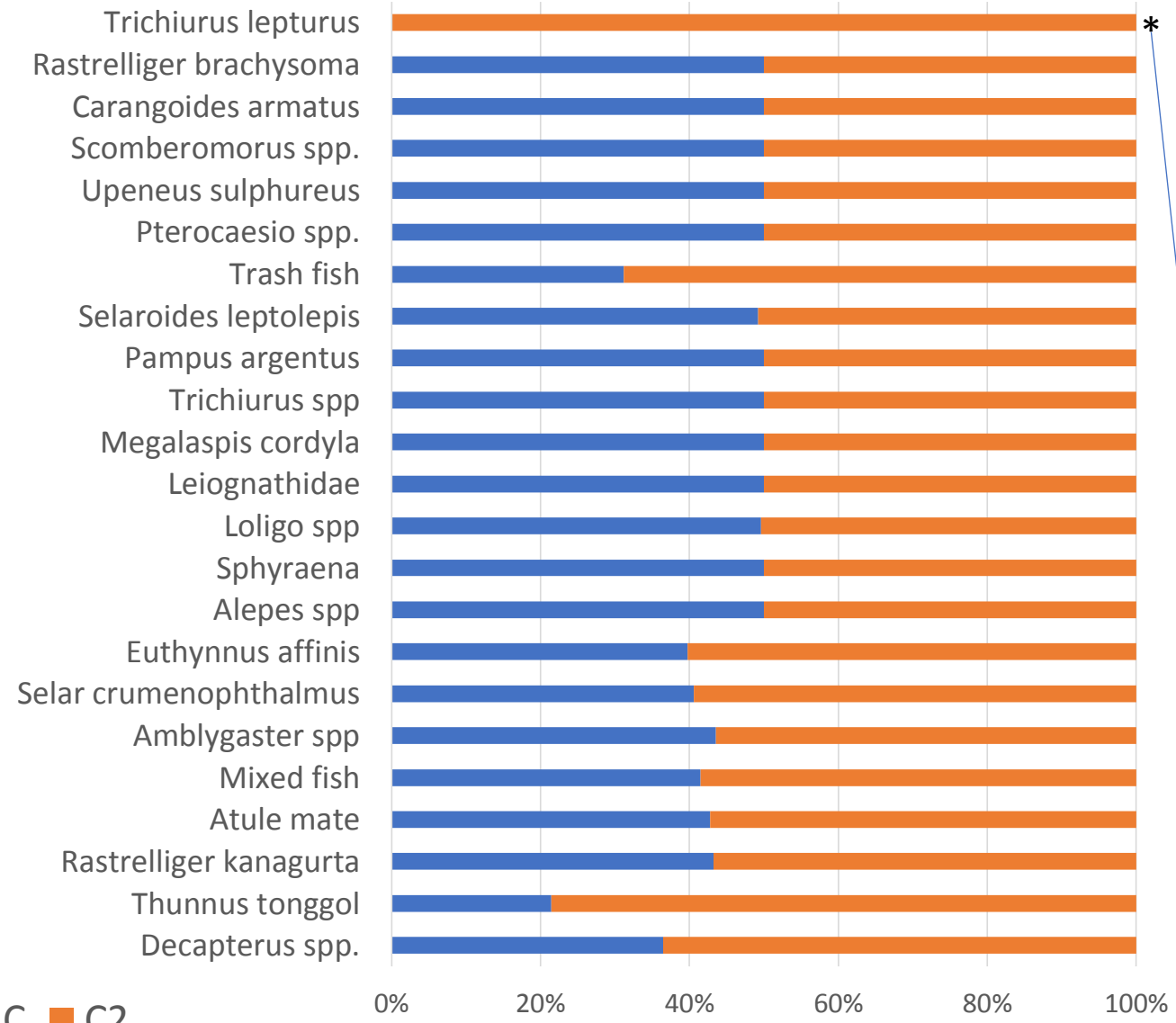
(catch statistics data 1995 – 2017)



- The landings of these 12 species are 89.14% of total landings all species
- Overall species composition has slightly changed over 20 years
- Some species began their contribution in the early 2000s



Area study profile : Vessel zones



Species proportion of each zone type

- Zone C and C2 seemed to have quite similar species on their catches
- Almost for all species are caught more by C2 vessels

* Very rare (0.02%)

Area study profile : Vessel zones

Species Diversity in each vessel zone

```
> #Diversity (Shannon)
> Hz<-diversity(z2)
> Hz
[1] 2.249570 2.083728
```

Evenness in each vessel zone

```
> specn<-specnumber(z2)
> specn
[1] 22 23
> Jz<-Hz/log(specn)
> Jz
[1] 0.7277706 0.6645614
```

Species richness

```
Species Accumulation Curve
Accumulation method: exact
Call: specaccum(comm = z2)


Sites     1.0  2
Richness 22.5 23
sd        0.5  0
```

Bray-Curtis analysis

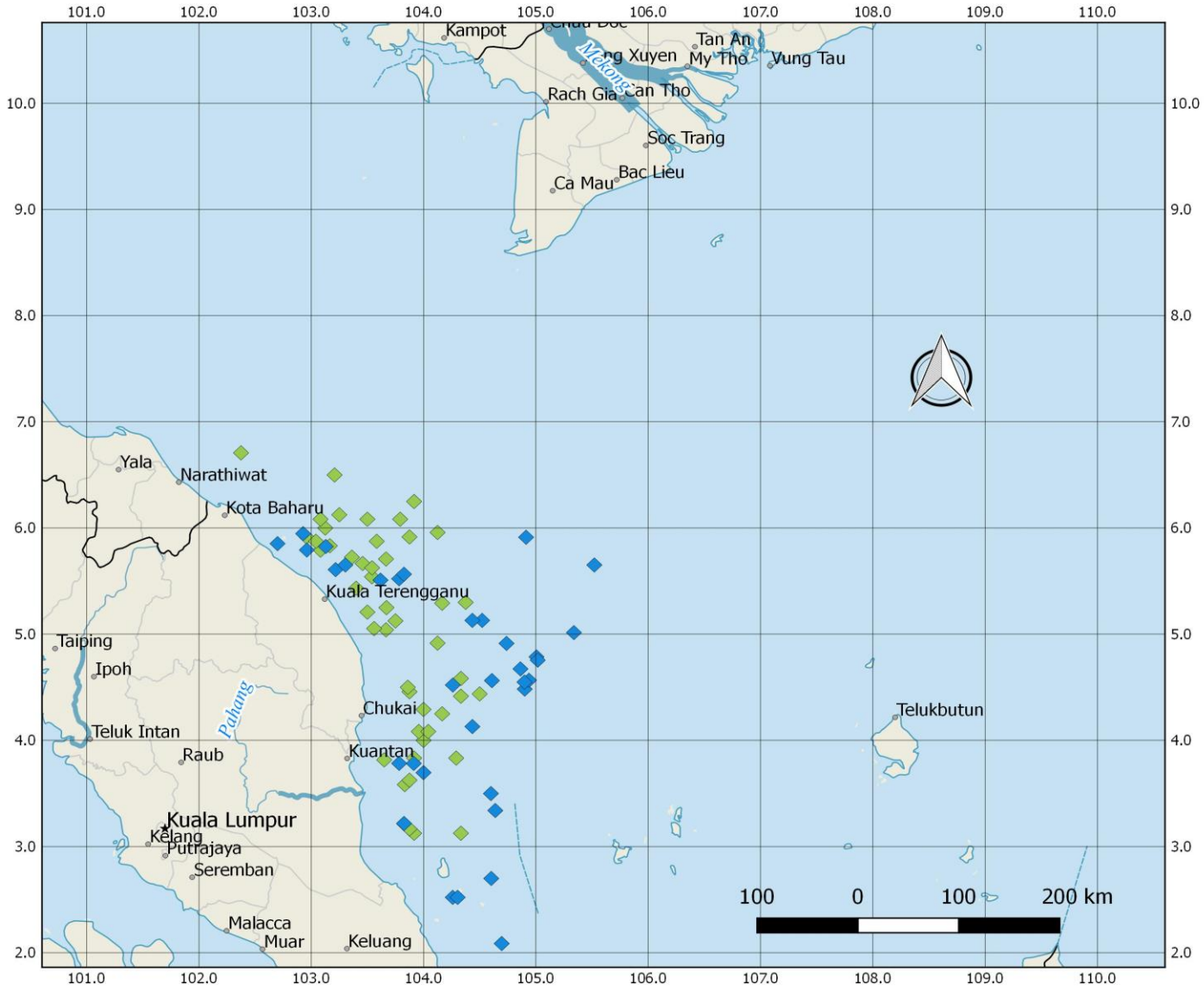
```
Call:
anosim(x = z2.dist, grouping = zone)
Dissimilarity: bray

ANOSIM statistic R:
      Significance: 0.5

Permutation: free
Number of permutations: 1
```

Similarity percentage analysis

	average	sd	ratio	ava	avb	cumsum
Thunnus tonggol	1.044e-01	NA	NA	47539	173987	0.3550
Decapterus spp.	6.670e-02	NA	NA	108781	189577	0.5817
Trash fish	5.768e-02	NA	NA	57990	127864	0.7779
Euthynnus affinis	2.496e-02	NA	NA	58478	88718	0.8628
Mixed fish	1.343e-02	NA	NA	39667	55936	0.9084
Selar crumenophthalmus	1.124e-02	NA	NA	29308	42927	0.9467
Atule mate	5.609e-03	NA	NA	20210	27005	0.9657
Amblygaster spp	5.506e-03	NA	NA	22450	29120	0.9845
Rastrelliger kanagurta	4.302e-03	NA	NA	16559	21771	0.9991
Selaroides leptolepis	1.238e-04	NA	NA	4580	4730	0.9995

The distribution of two vessel zones has similar performances, the dissimilarity (if any) mainly comes from *Thunnus tonggol*

Area study profile : Period of survey



Purse seine fishing ground East Coast Peninsular Malaysia

Legend

Period of surveys

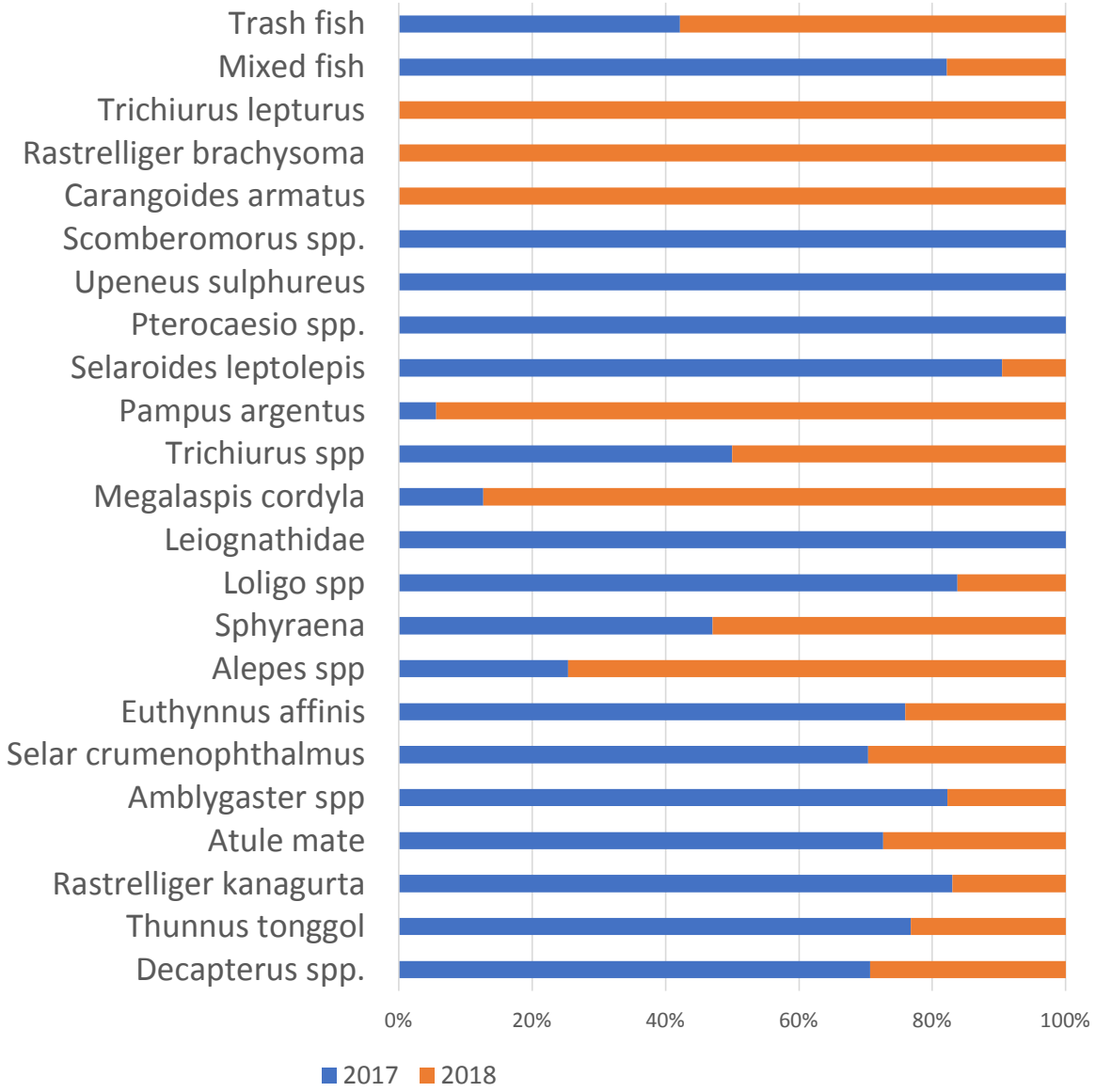
- 2017
- 2018

Period of surveys:

1. August 2017
2. July 2018

- In 2018, fishers tried go fishing to the southern part and ZEE areas
- Some areas are noticed as potential fishing grounds (overlapped areas)

Area study profile : Period of survey



Species proportion of each period survey

- **Some dominant species in 2017 become less appearance in 2018**
- **New species caught in 2018**

Area study profile : Period of survey

Species Diversity in each period

```
> #Diversity (Shannon)
> Hy<-diversity(y2)
> Hy
[1] 2.031968 2.017335
```

Evenness in each period

```
> specn<-specnumber(y2)
> specn
[1] 20 19
> Jy<-Hy/log(specn)
> Jy
[1] 0.6782877 0.6851338
```

Species richness

```
Species Accumulation Curve
Accumulation method: exact
Call: specaccum(comm = y2)


Sites     1.0  2
Richness 19.5 23
sd        0.5  0
```

Bray-Curtis analysis

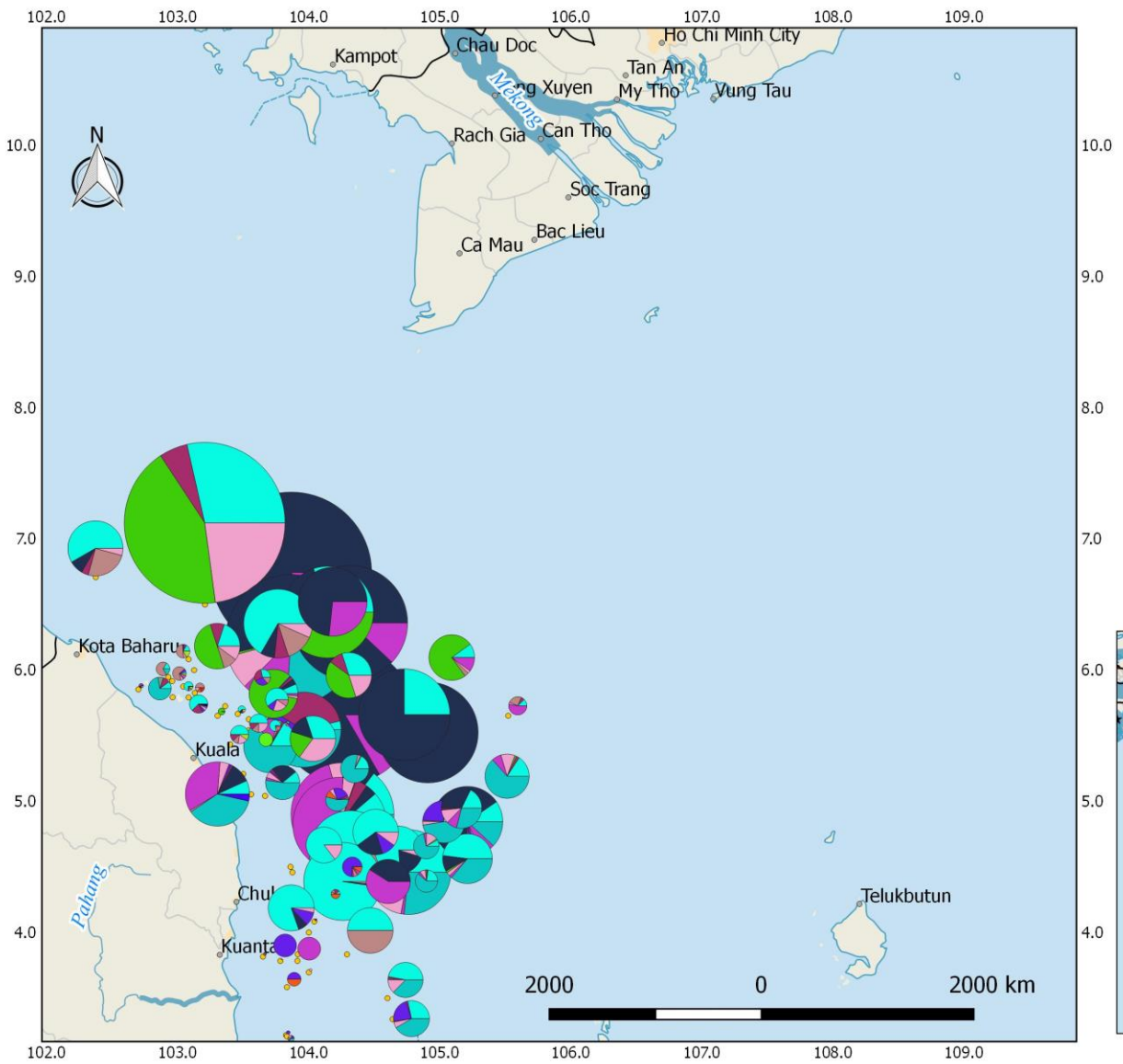
```
Call:
anosim(x = y2.dist, grouping = year)
Dissimilarity: bray

ANOSIM statistic R:
      Significance: 0.5

Permutation: free
Number of permutations: 1
```

Similarity percentage analysis

	average	sd	ratio	ava	avb	cumsum
Thunnus tonggol	1.188e-01	NA	NA	133539	40448.6	0.2605
Decapterus spp.	9.999e-02	NA	NA	133981	55595.9	0.4798
Euthynnus affinis	5.873e-02	NA	NA	67378	21339.9	0.6086
Mixed fish	4.592e-02	NA	NA	45967	9969.5	0.7094
Trash fish	2.562e-02	NA	NA	53890	73973.6	0.7656
Amblygaster spp	2.396e-02	NA	NA	23950	5170.0	0.8181
Selar crumenophthalmus	2.231e-02	NA	NA	30208	12719.0	0.8671
Rastrelliger kanagurta	1.833e-02	NA	NA	18069	3702.0	0.9073
Atule mate	1.558e-02	NA	NA	19610	7395.0	0.9414

The distribution of two period surveys has similar performances, the dissimilarity (if any) mainly comes from *Thunnus tonggol*

Area study profile : Fishing ground

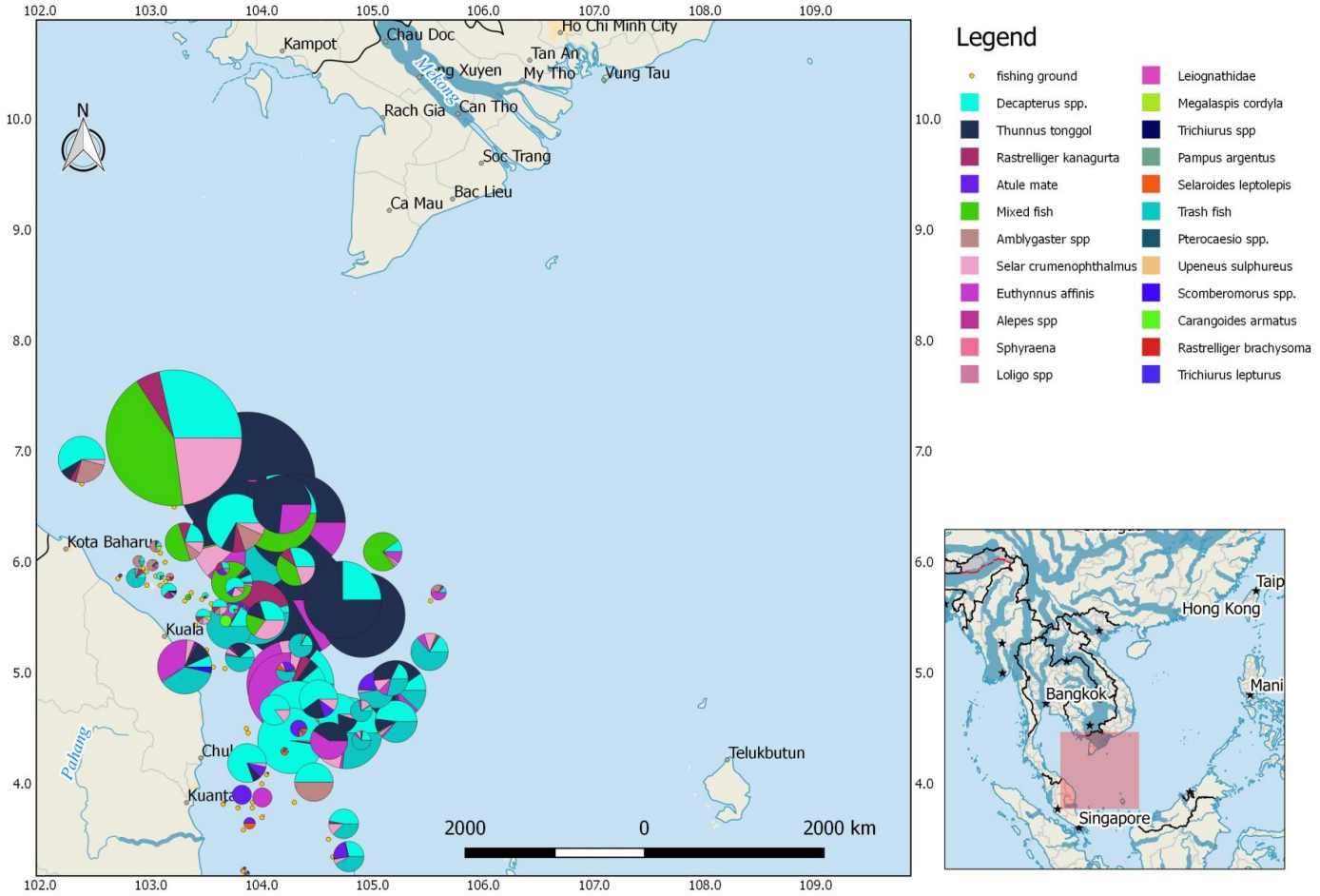


Portraying "the multispecies condition"

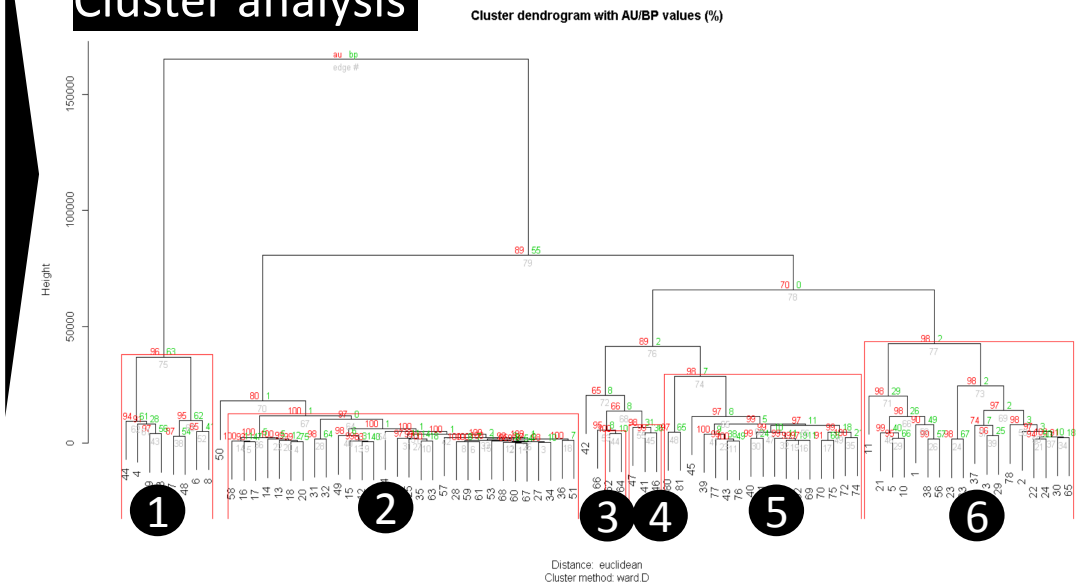
- Each fishing grounds comprises various species
- Species are widely distributed
- Need to be clustered

**The diameter shows the number of individuals caught*
***color shows the species*

Area study profile : Fishing ground

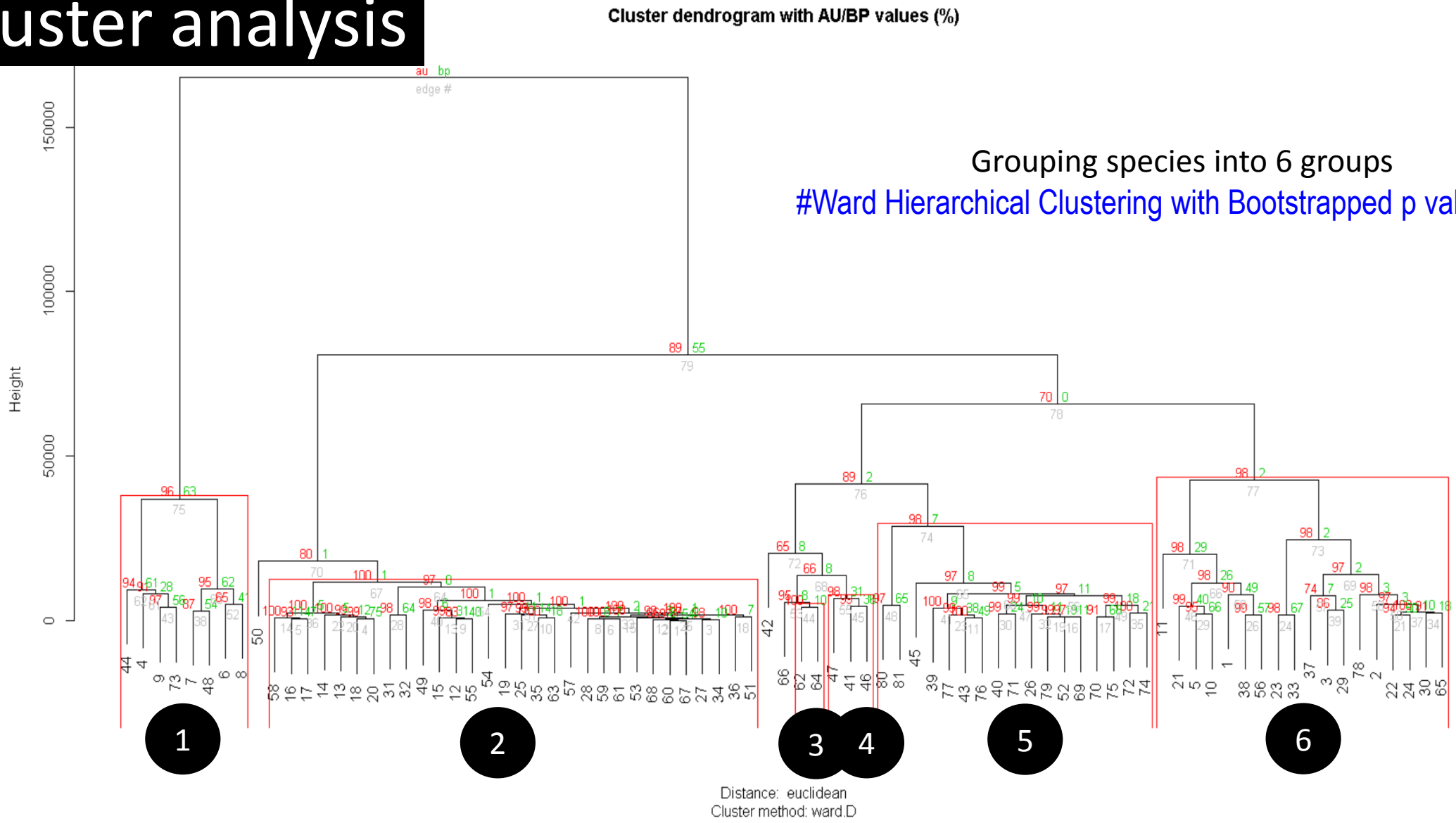


Cluster analysis



Area study profile : Fishing ground

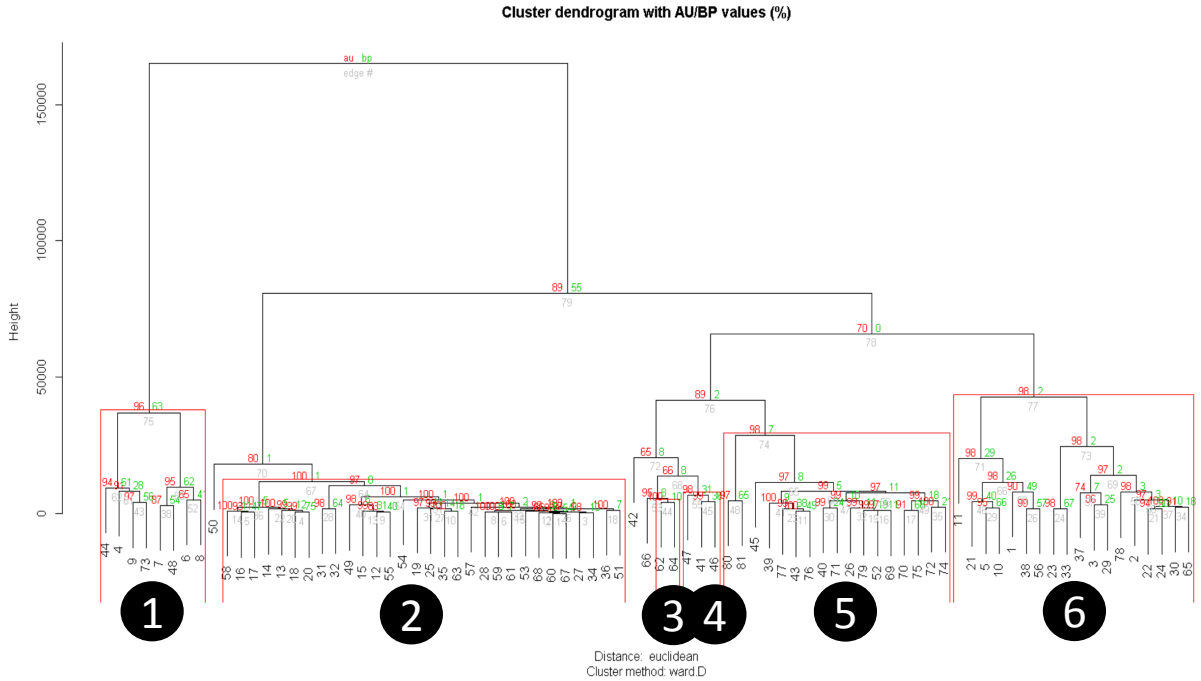
Cluster analysis

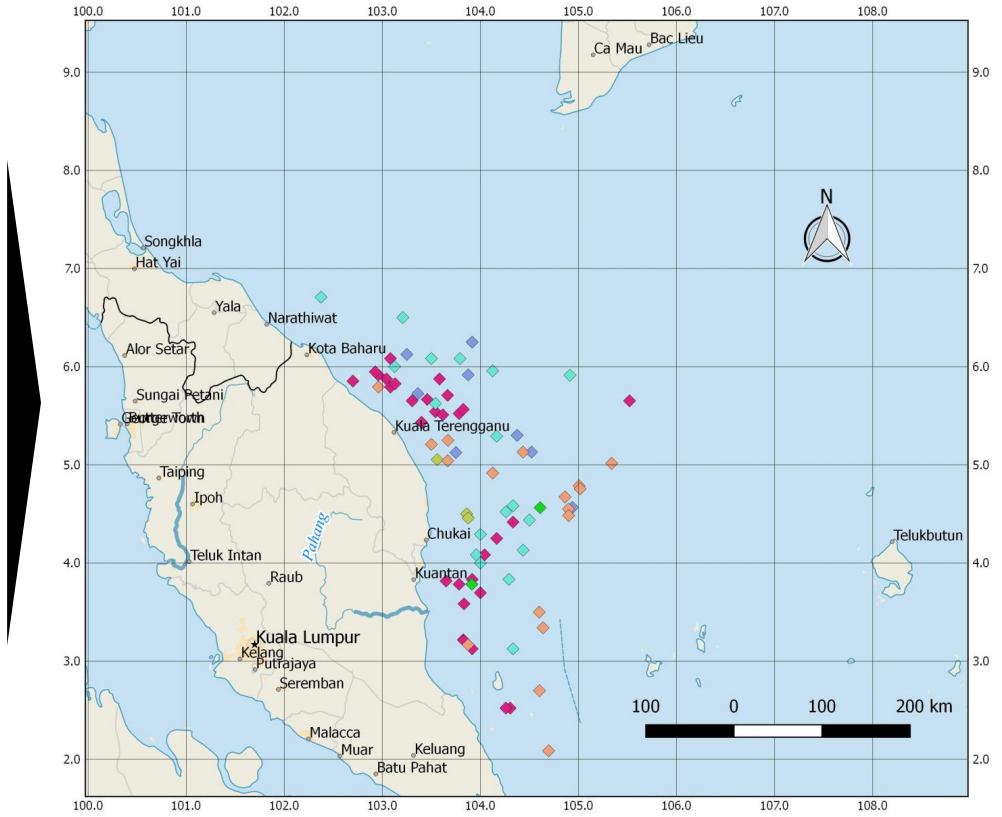


Grouping species into 6 groups

#Ward Hierarchical Clustering with Bootstrapped p values

Area study profile : Fishing ground





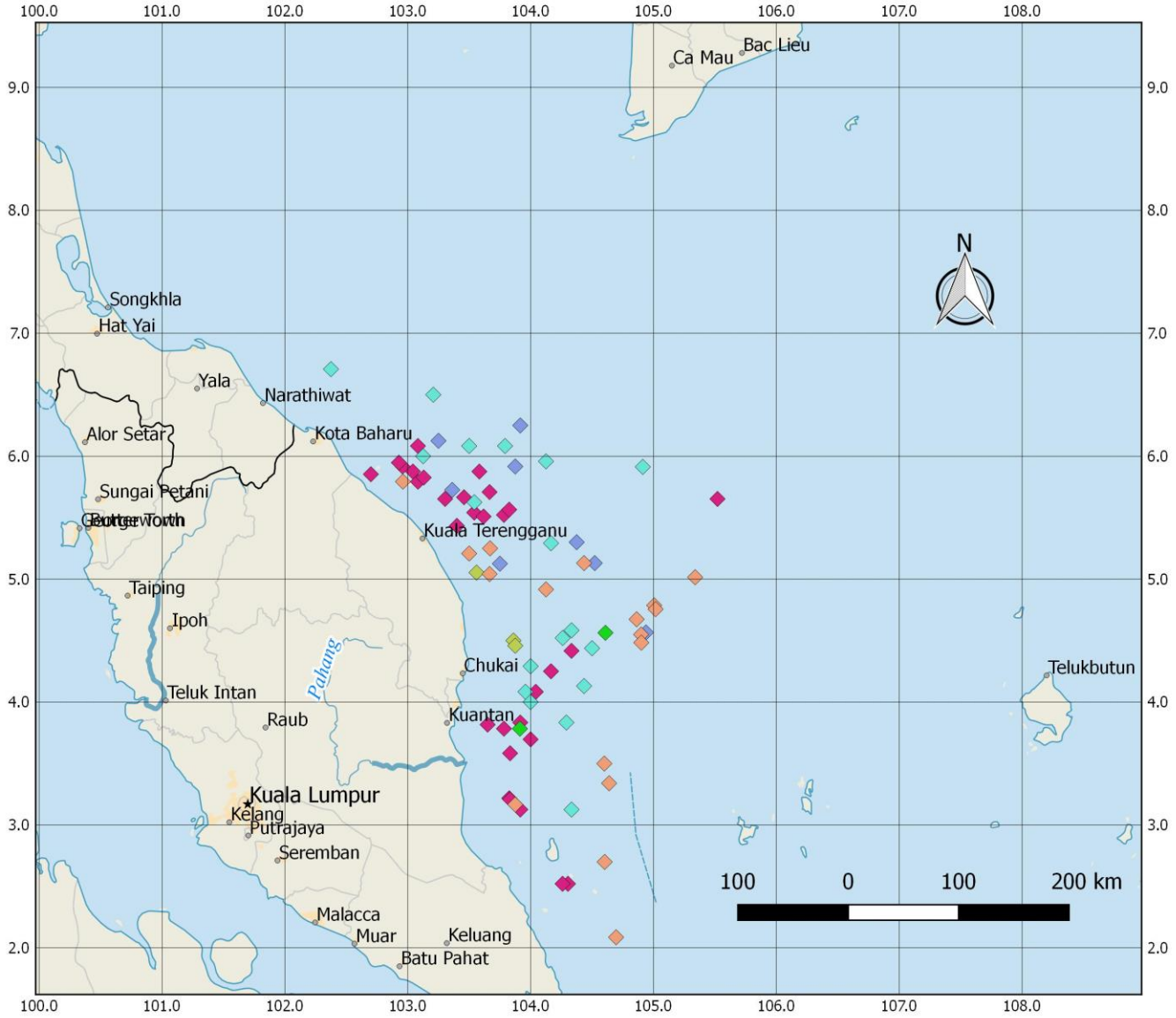
Purse seine fishing ground East Coast Peninsular Malaysia

Legend

clustered fg2

- I
- II
- III
- IV
- V
- VI

Area study profile : Fishing ground



Purse seine fishing ground East Coast Peninsular Malaysia

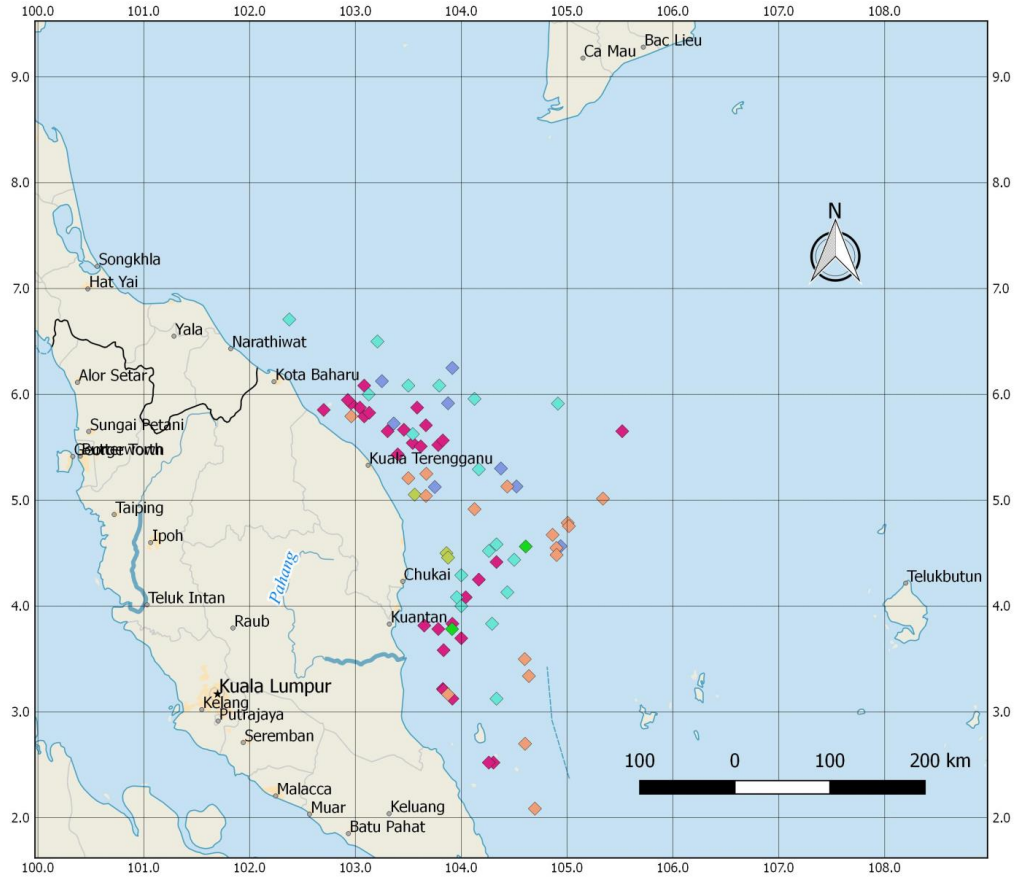
Legend

clustered fg2

- I
- II
- III
- IV
- V
- VI

1. Some species are dominant in certain areas
   - Thunnus tonggol dominates cluster I
   - Decapterus dominates cluster VI
   - Species are widely distributed
2. Difficult to localize fishing areas

Area study profile : Fishing ground



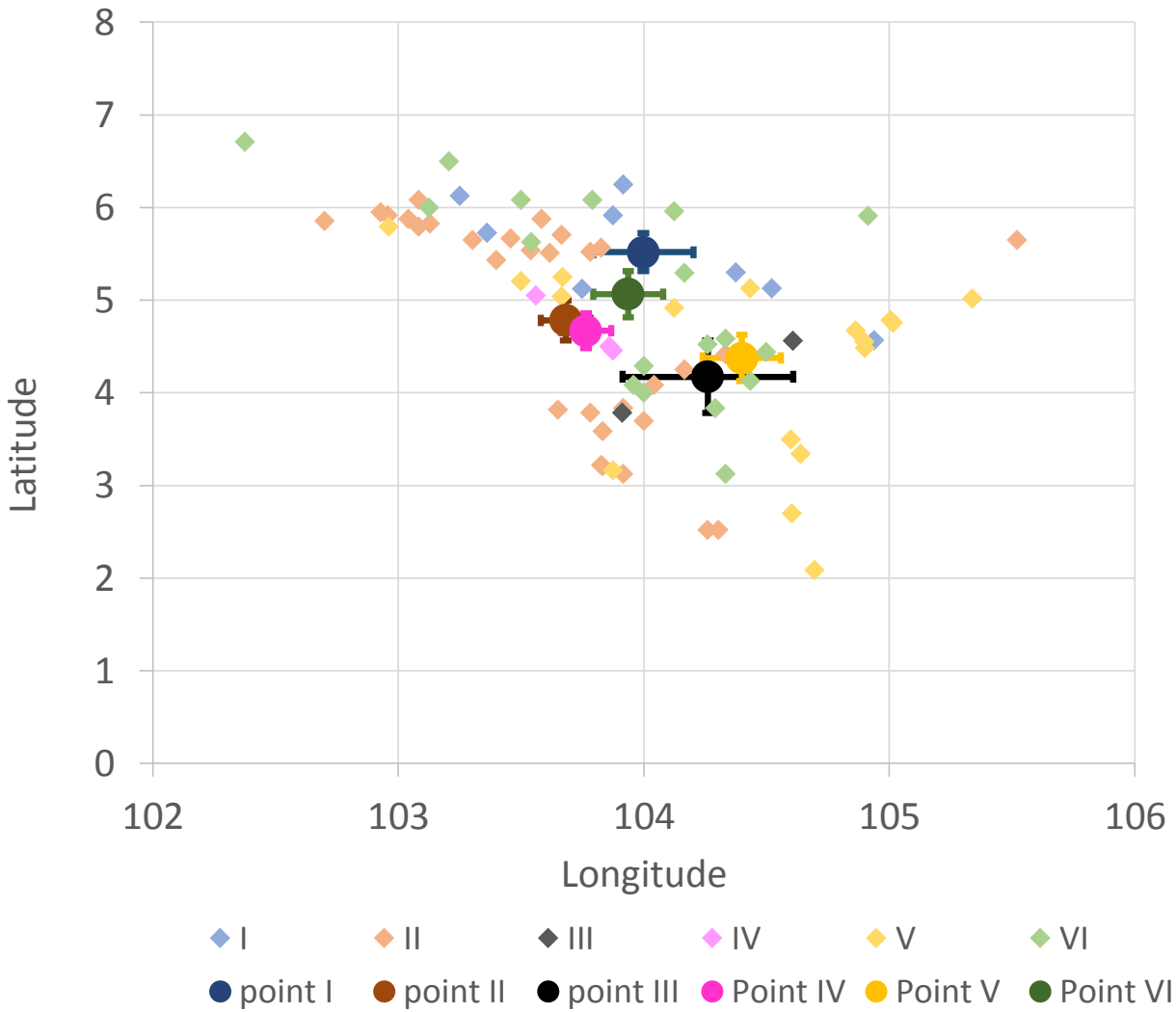
Purse seine fishing ground East Coast Peninsular Malaysia

Legend

clustered fg2

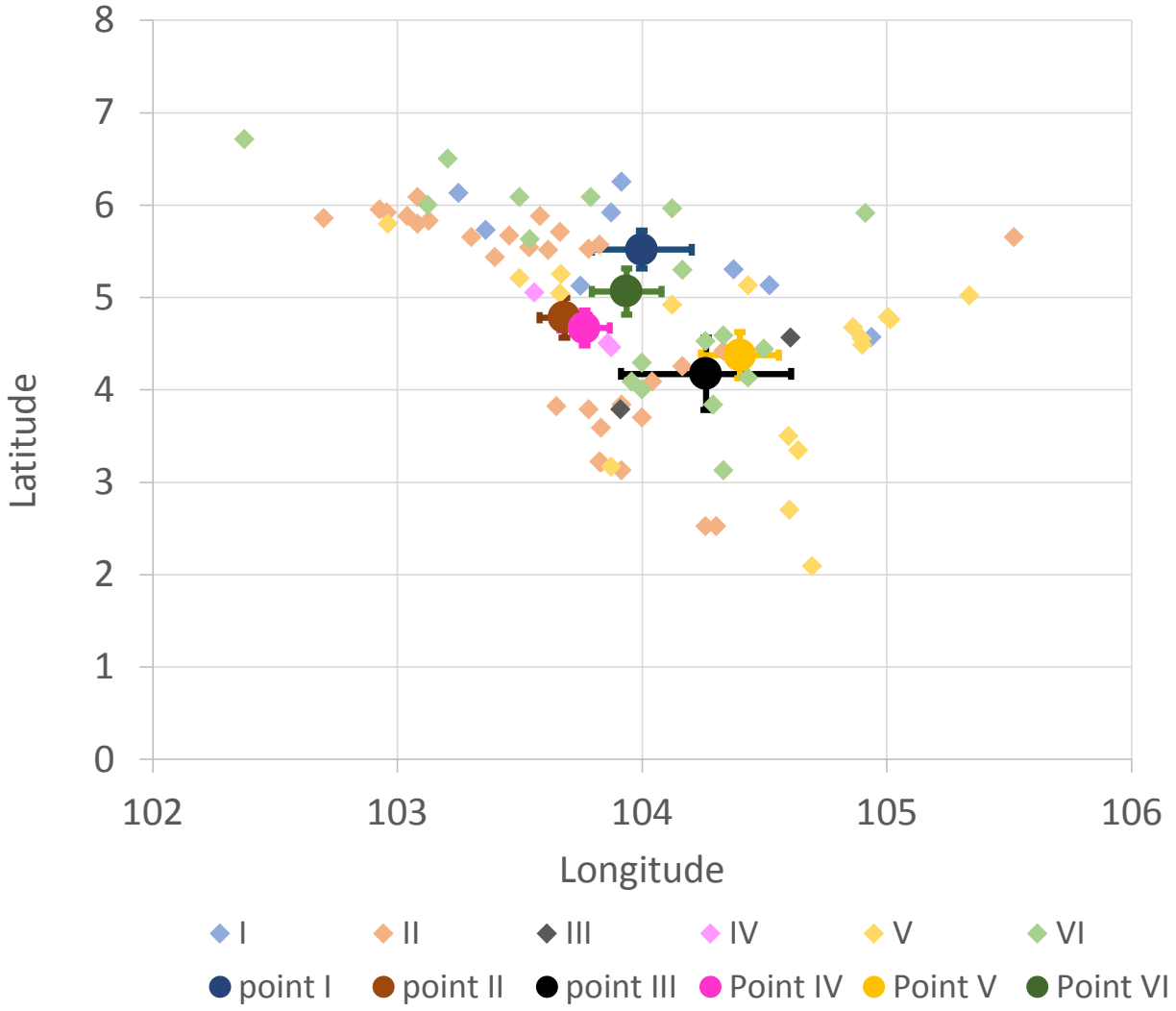
- I
- II
- III
- IV
- V
- VI

Clustered group of fishing grounds

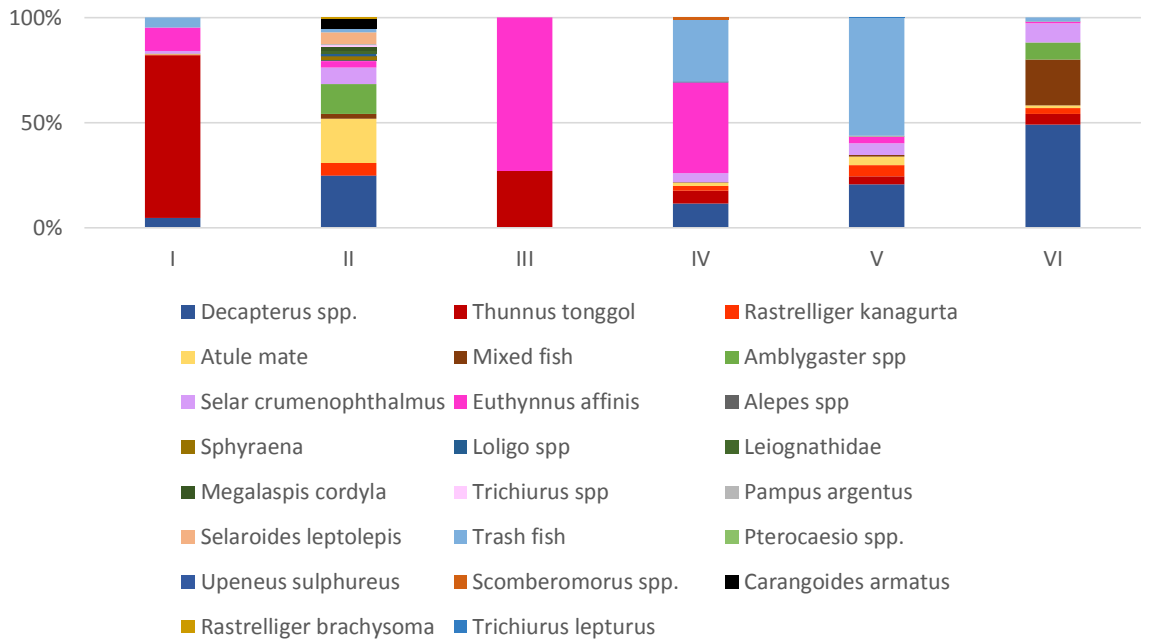


Area study profile : Fishing ground

Clustered group of fishing grounds

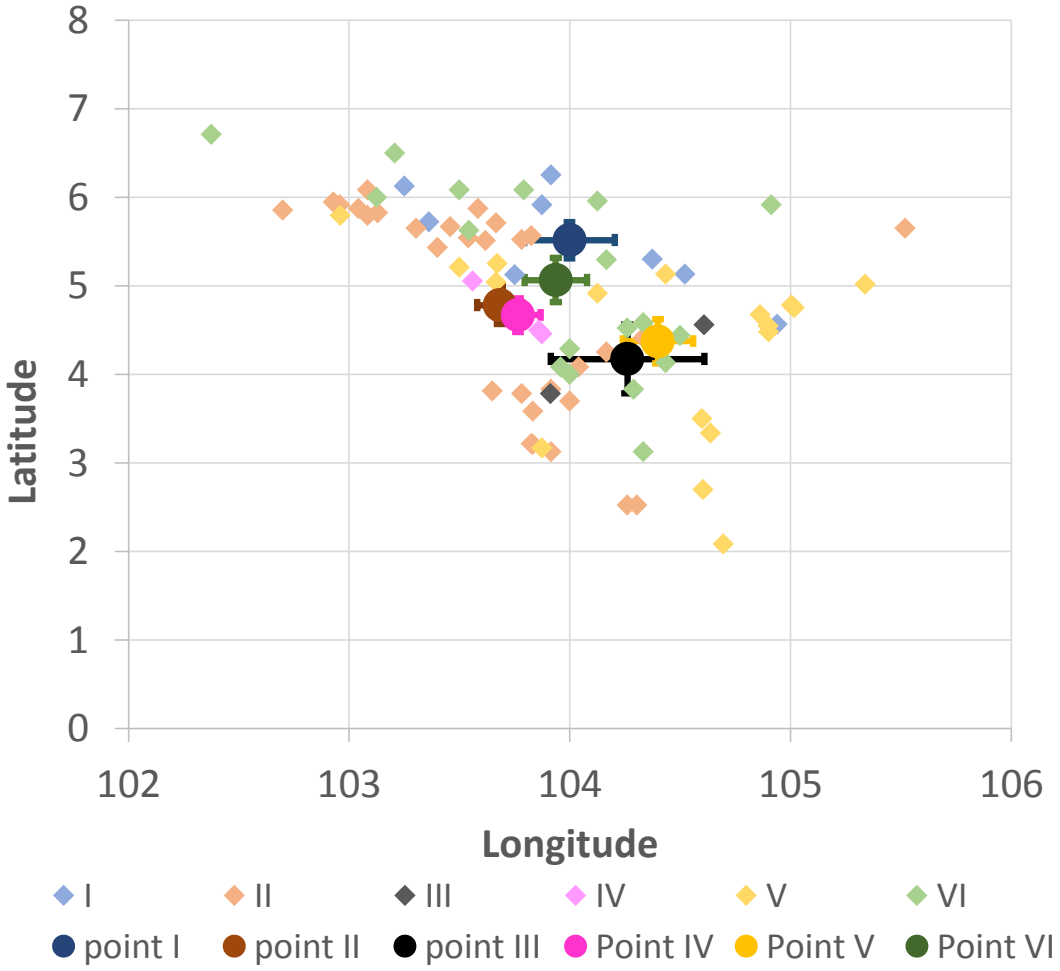


- Some locations of clustered fishing ground are overlapped:
  1. II and IV
  2. III and V
- Some are close to the other: I and VI
- This might affect the species composition

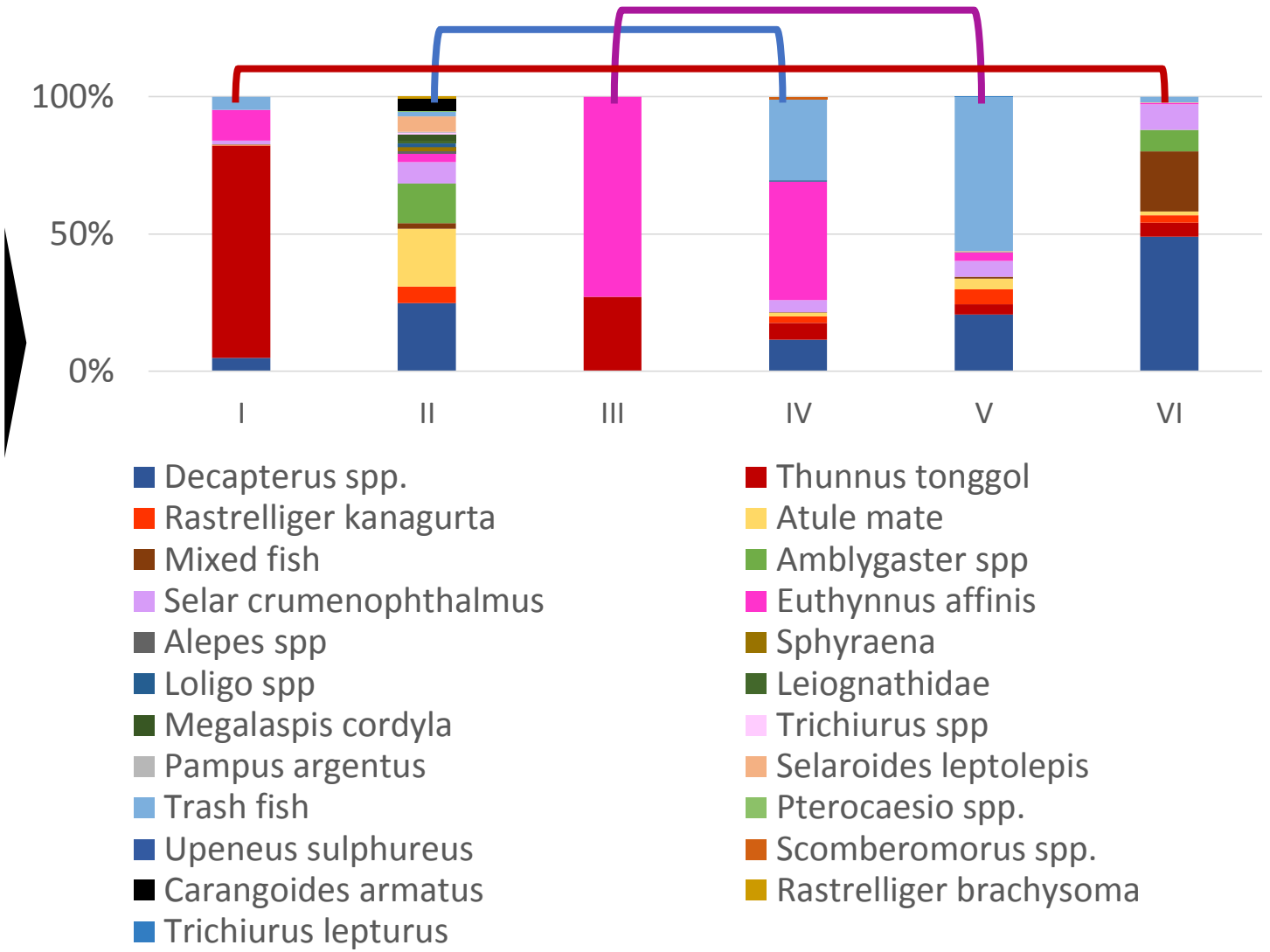


Area study profile : Fishing ground

Clustered group of fishing grounds

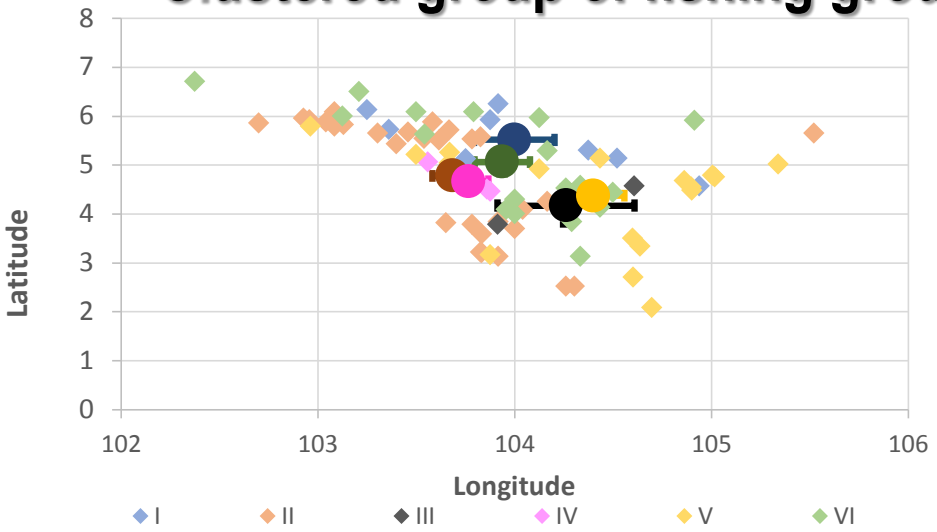


Clustered group of species graph

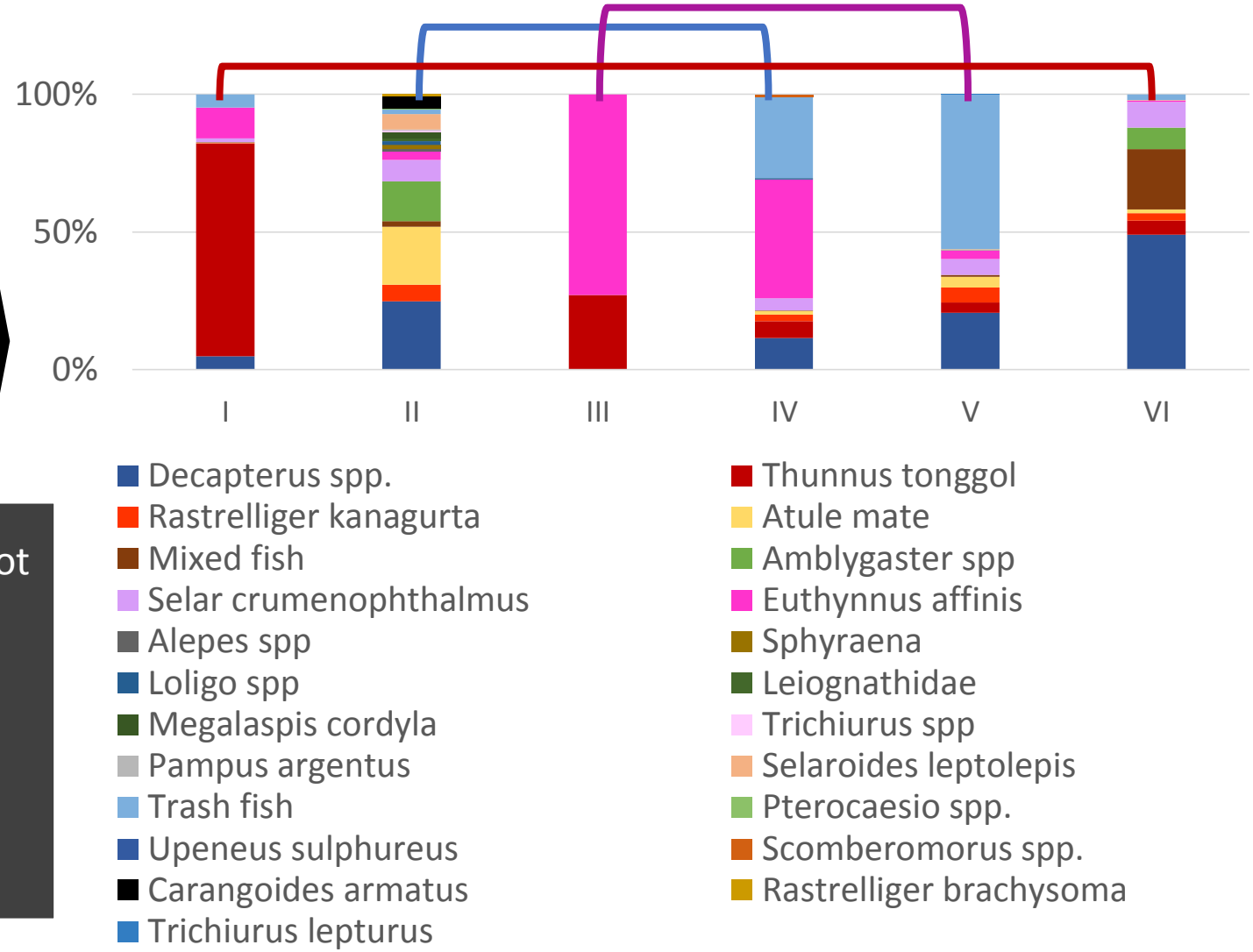


Area study profile : Fishing ground

Clustered group of fishing grounds



Clustered group of species graph



- The neighboring/overlapped fishing ground could not reflect species composition
- Species are diversely distributed around East Coast Peninsular Malaysia
- Potential fishing area: 103°30 - 104°30° E;
  4°- 6° N

5 Area study profile : Fishing ground

To determine the most contributive species to create overall variances

Bray-Curtis analysis

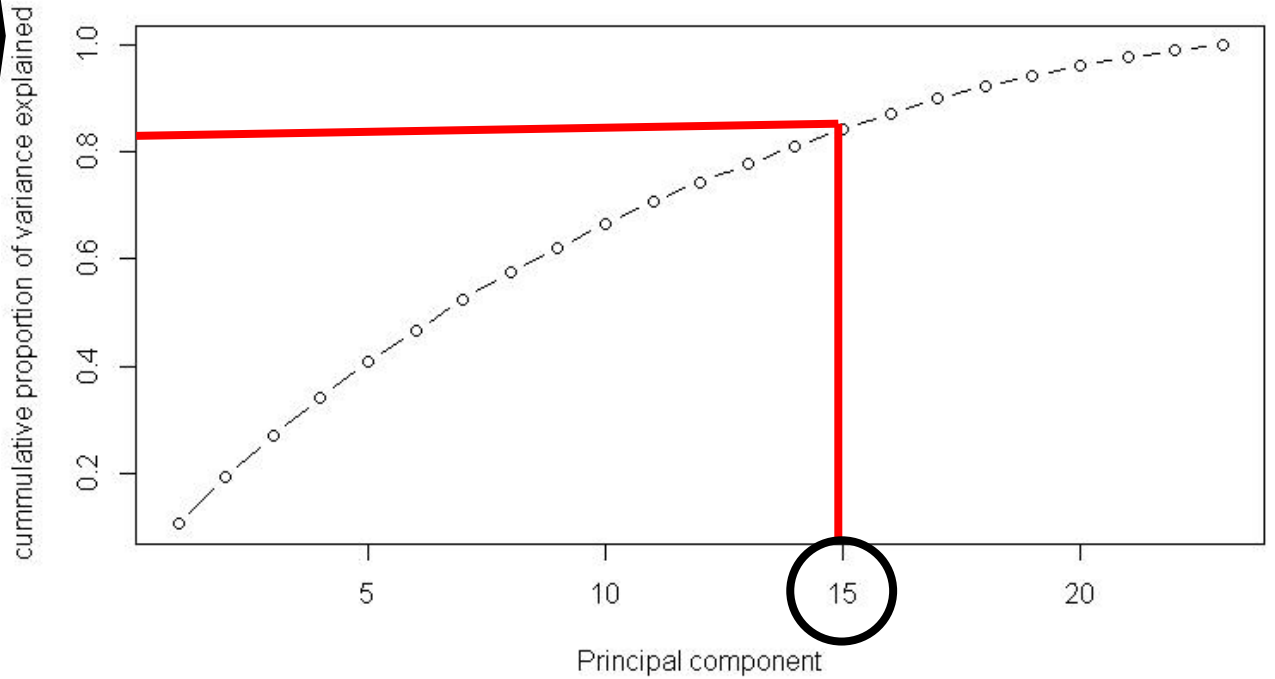
```
Call:
anosim(x = fgsp2.dist, grouping = FG)
Dissimilarity: bray

ANOSIM statistic R:
      Significance: 0.001

Permutation: free
Number of permutations: 999
```

Significantly diverse

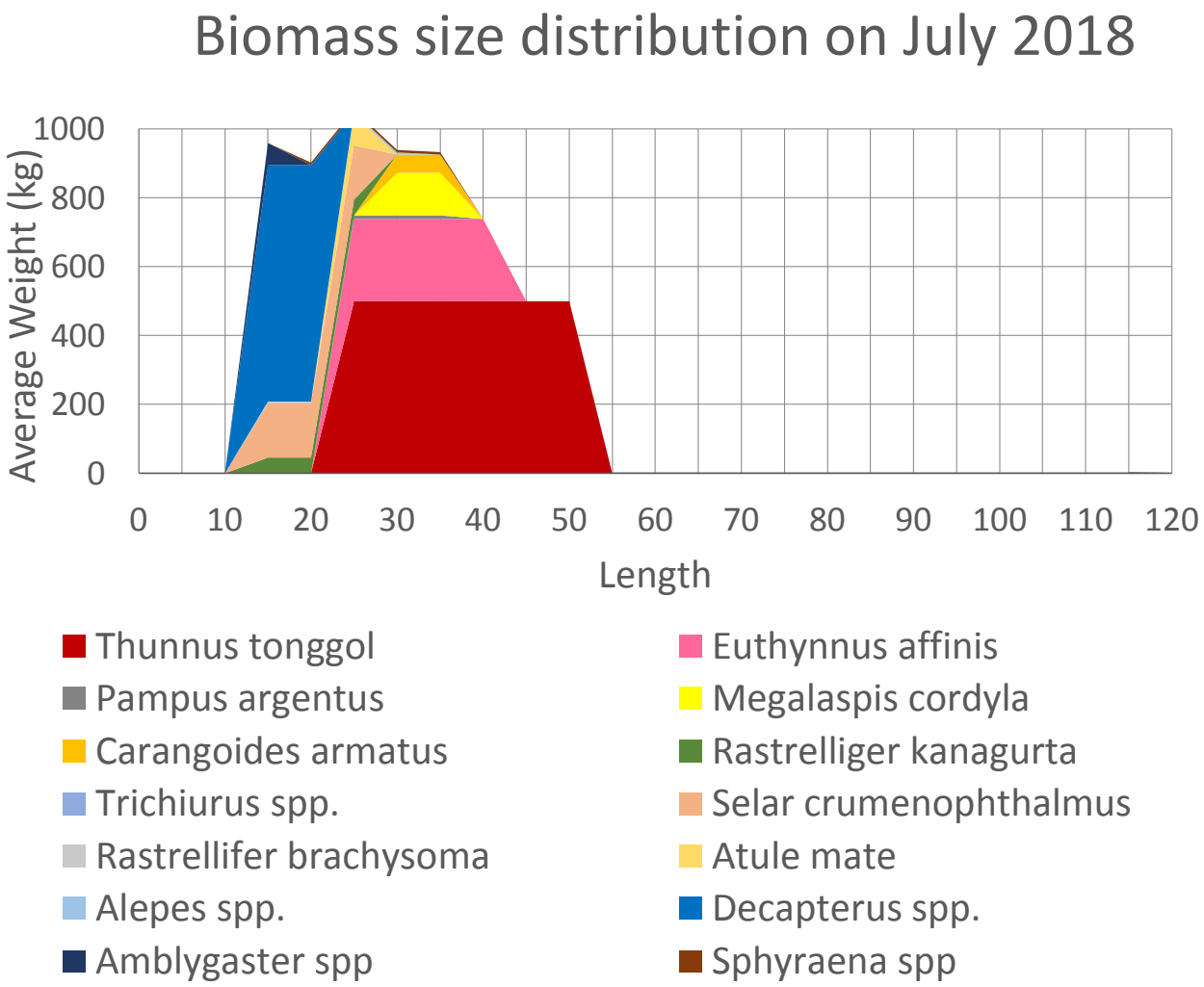
Principal Component Analysis (PCA)

The analysis was performed on 81 individuals, described by 23 variables

Too many variables and observations



Area study profile：Biomass size distribution

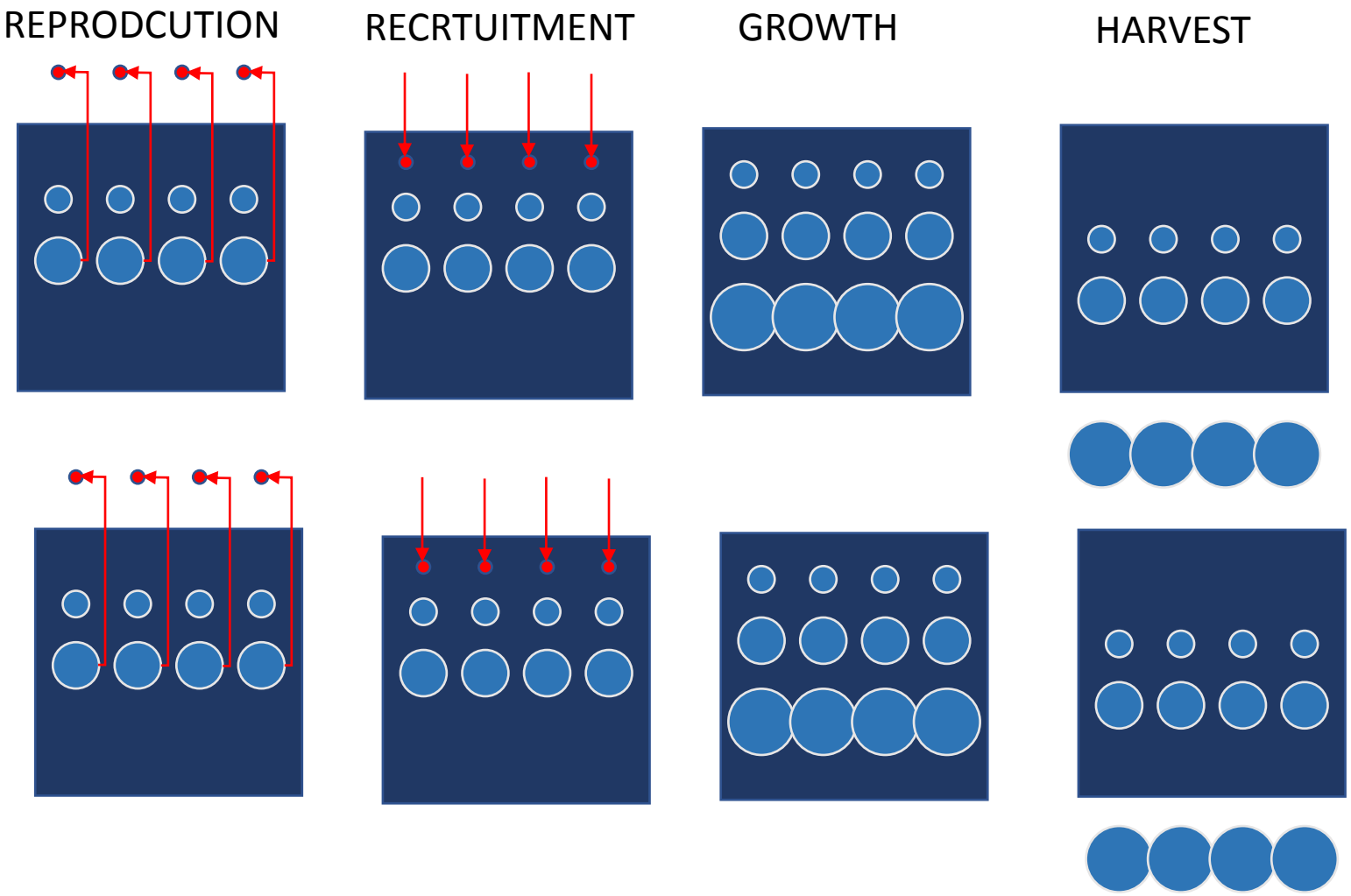


Need more data for validating this result

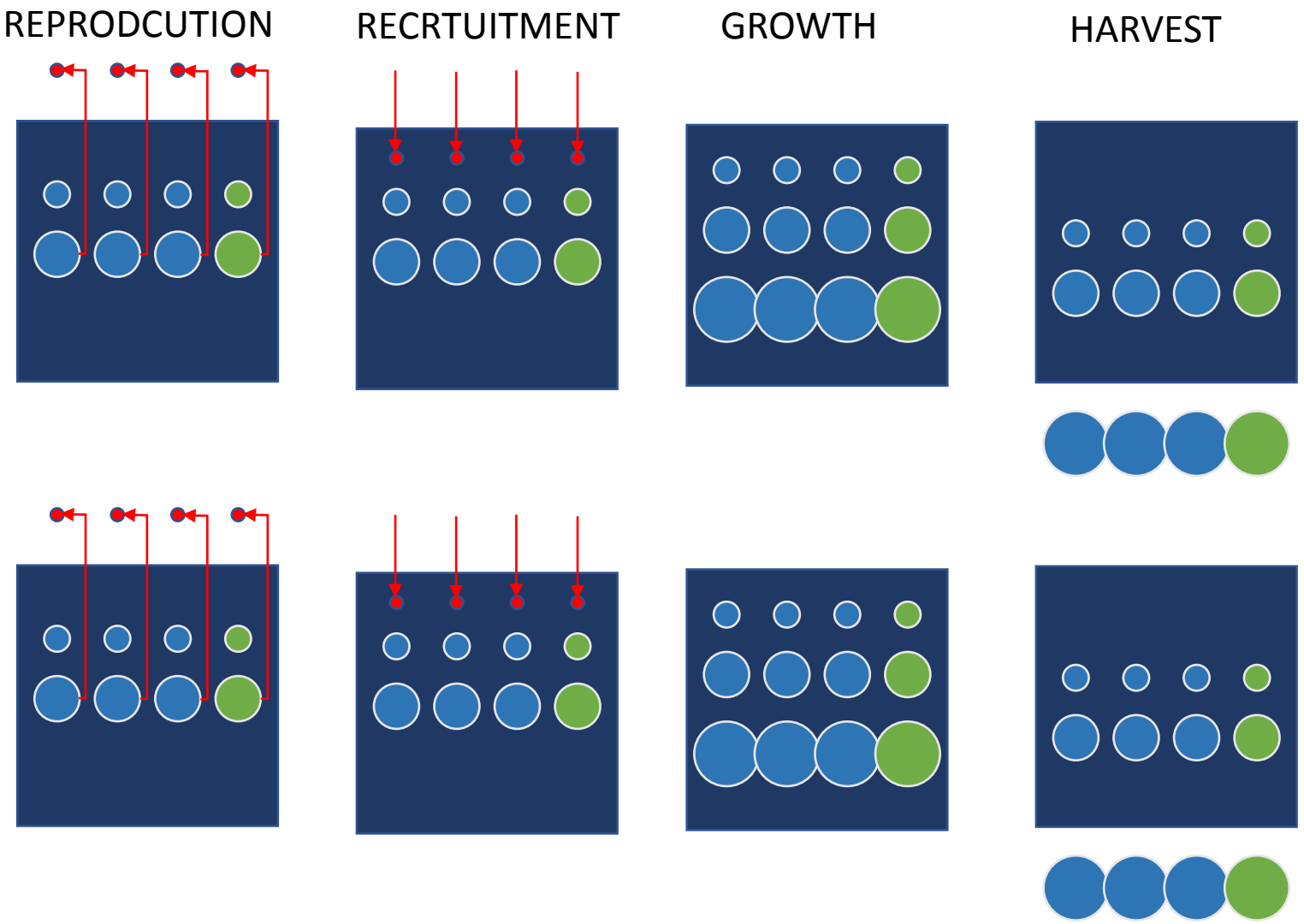
To observe and confirm the shift of biomass size of the landed species in the different period

Initial information for conducting species-specific fisheries management

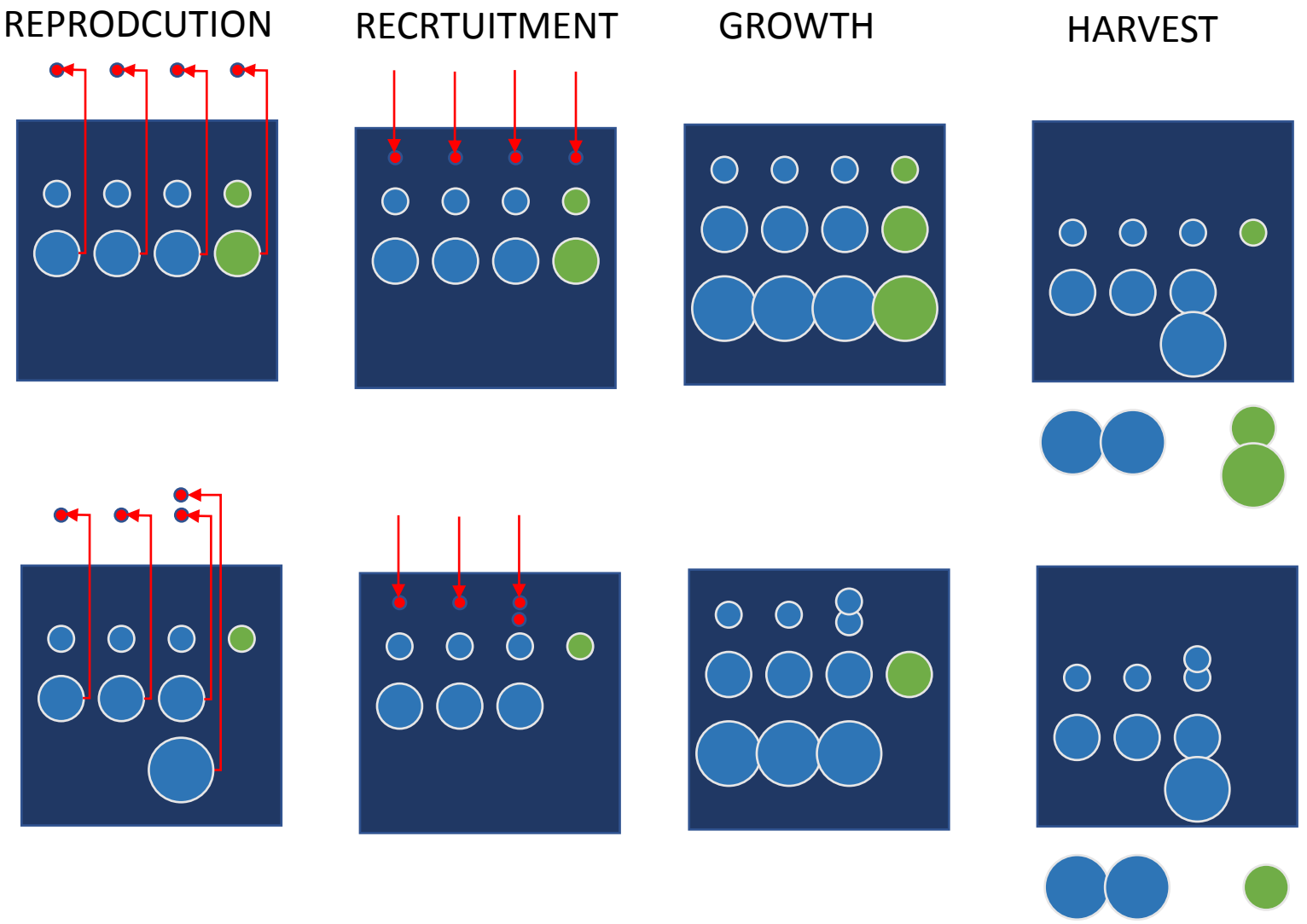
Production Cycle of Capture Fishery



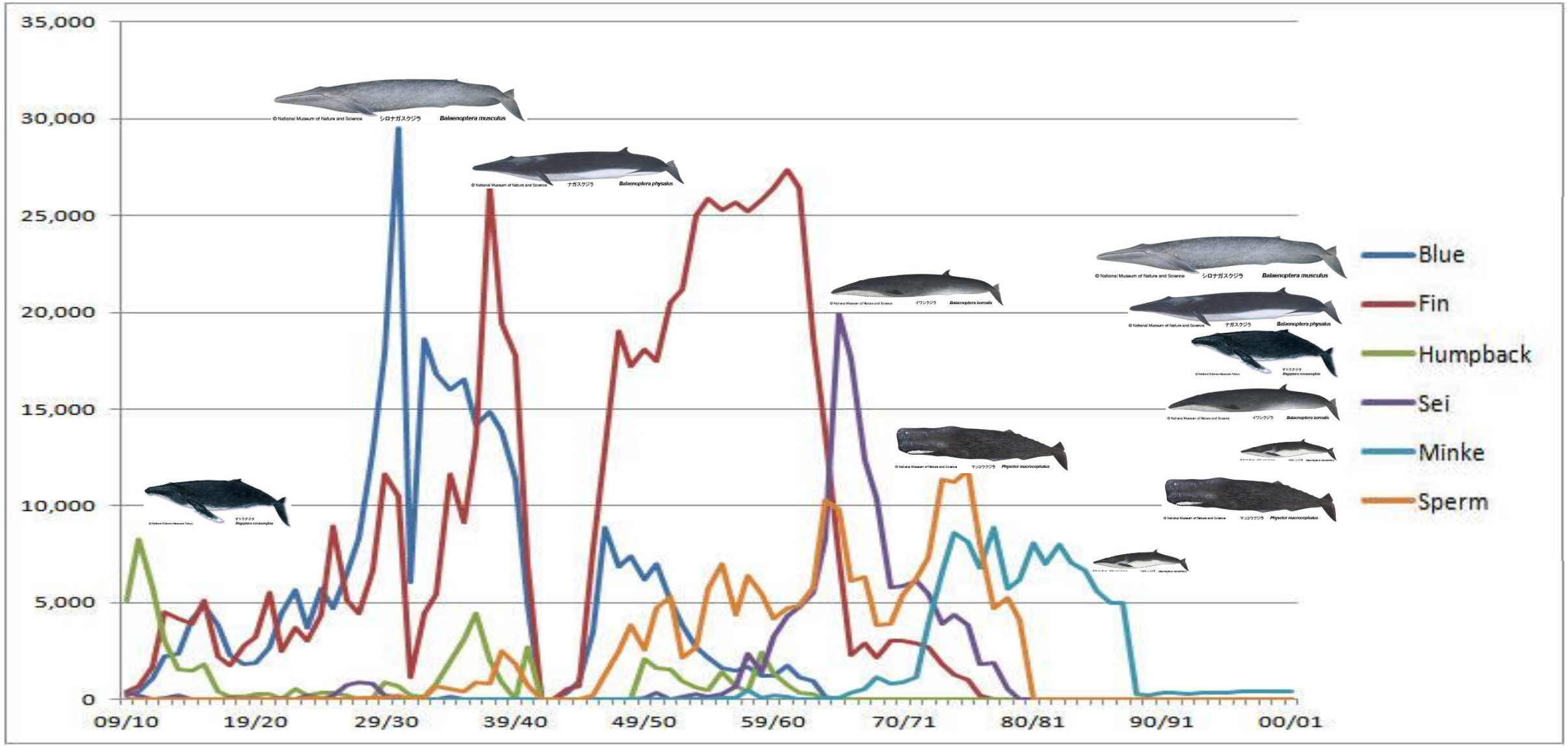
Non selective Fisheries



Selective Fisheries



Number of Whale Capture in Antarctic Sea



Conclusion

- By using land-based survey result and statistical analysis, for most of the species, it is difficult to specify fishing ground and season for the specific species, and also the yearly variation is large.
- Purse seine fishery is NON selective fisheries for species. It is very difficult to implement a species specific fisheries management.
- To implement effective fisheries management, single species management is impossible, and because of the non selective fisheries, multi-species management can be applicable for the purse seine fisheries in this region.
- However, some species like neritic tuna can be paid special attention and can be conserve by single species management because the fishing ground is different.