

Progress of the Sub-regional Activities  
Implementation in GoT Countries:  
Indo-Pacific Mackerel

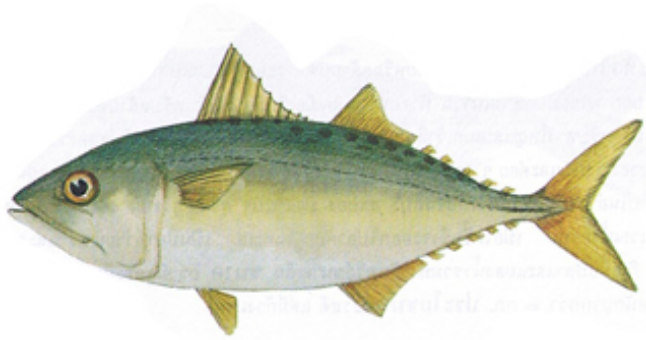
SEAFDEC-Sweden Project

# Outline

- Activities implemented in GoT sub-region and major findings
- Plan for joint/collaborative management of Indo-Pacific Mackerel resources in the GoT sub-region

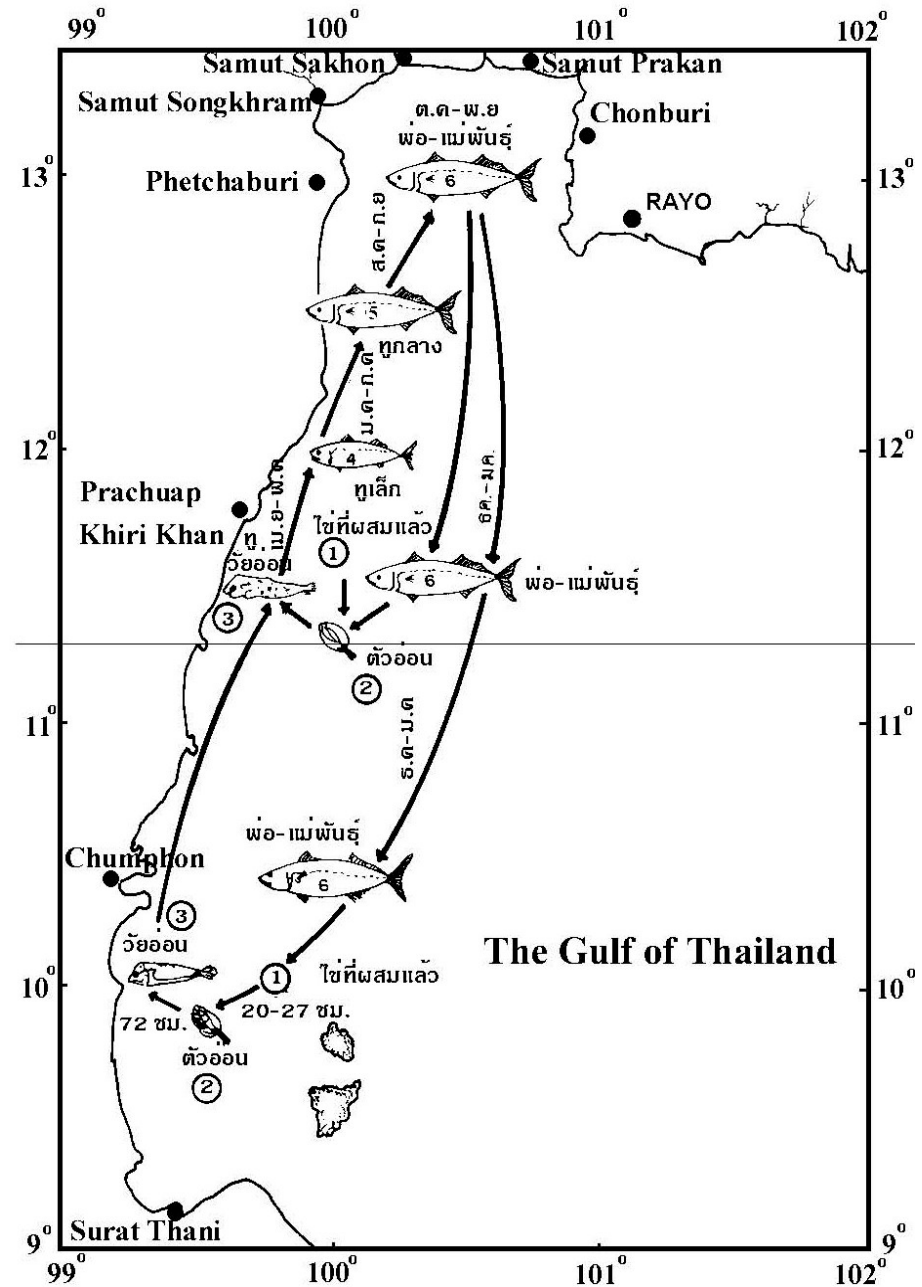


# Shared stock ?



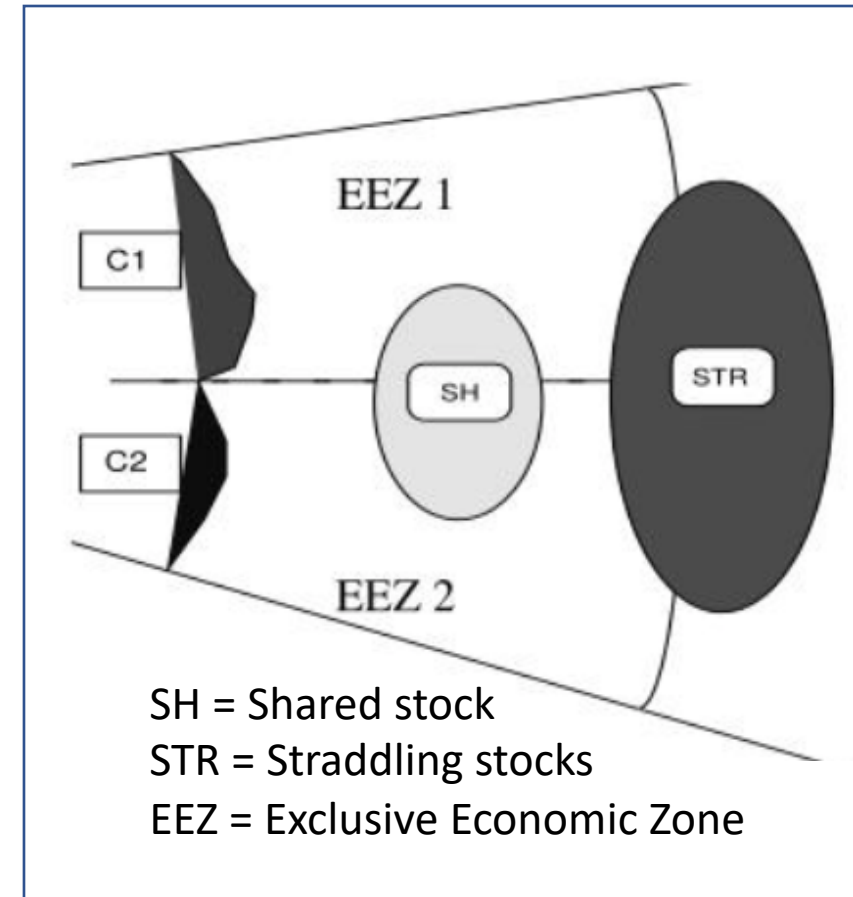
*Rastrelliger brachysoma*

(Platoo)



# Shared Stocks ?

- Transboundary stocks: fish resources crossing the EEZ boundary of one coastal State into the EEZ (s) of one, or more, other coastal States
- Highly migratory species: the resources to be found both in coastal State EEZ and the adjacent high seas, consisting of the major tuna species
- Straddling stocks: all other species to be found both within the coastal State EEZ and the adjacent high seas
- Discrete high seas fish stocks: fish stocks to be found exclusively in the high seas



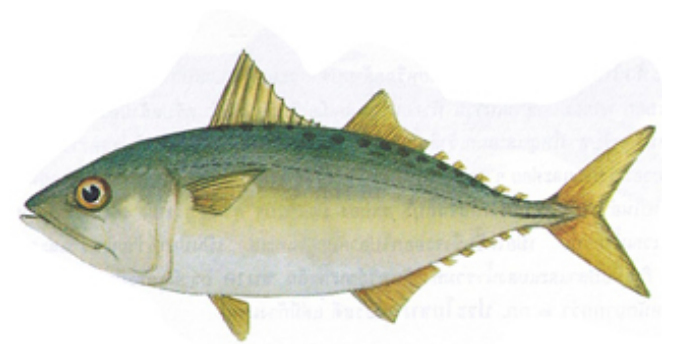


# Activities in GoT Sub-region

A series of bilateral and sub-regional initiatives/activities (research, consultation for information gathering and discussion, capacity building programs, etc.) in collaboration with GoT (CMTV) countries

## Information gathering

- Status and trend: information gathering based on existing data
- DNA study on stock structure (research activities in CTV countries)



*Rastrelliger brachysoma*

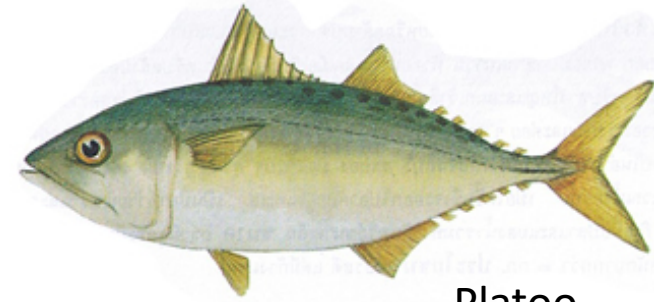
(Platoo)

# Gulf of Thailand Sub-regional Initiatives on Transboundary Fish Stocks

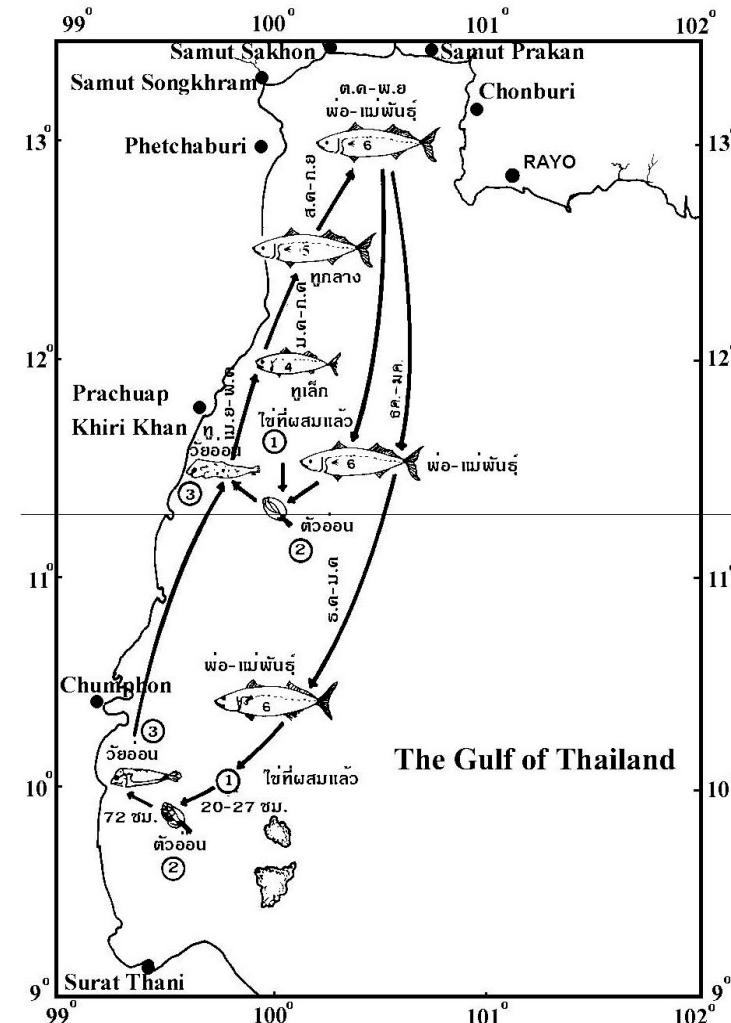
- Platoon was prioritized as economically important species for the GoT countries (Cambodia, Malaysia, Thailand, and Viet Nam)
- At the 5<sup>th</sup> Meeting of the GoT in 2015, SEAFDEC was suggested to:
  - Encourage GoT countries to formulate policies by including data collection activities in the national policy frameworks to support long-term fisheries management
  - Conduct sub-regional activities for better understanding stock status and migratory pattern of Platoon which will be used as a basis for establishing agreements on coordinated national measures for transboundary stock.

# Information Gathering

- Scientific name: *Rastrelliger brachysoma*
- Common name: short mackerel, Indo-Pacific mackerel
- Habitat: shallow waters of Southeast Asia
- Fishing gear: gillnet, purse seine, trawl

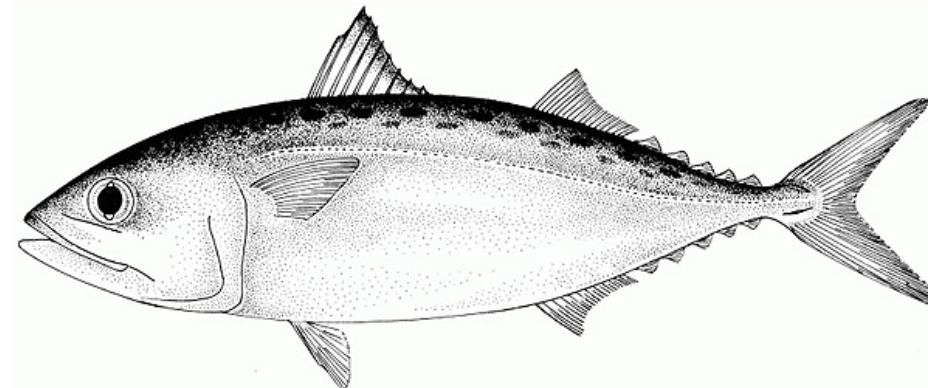
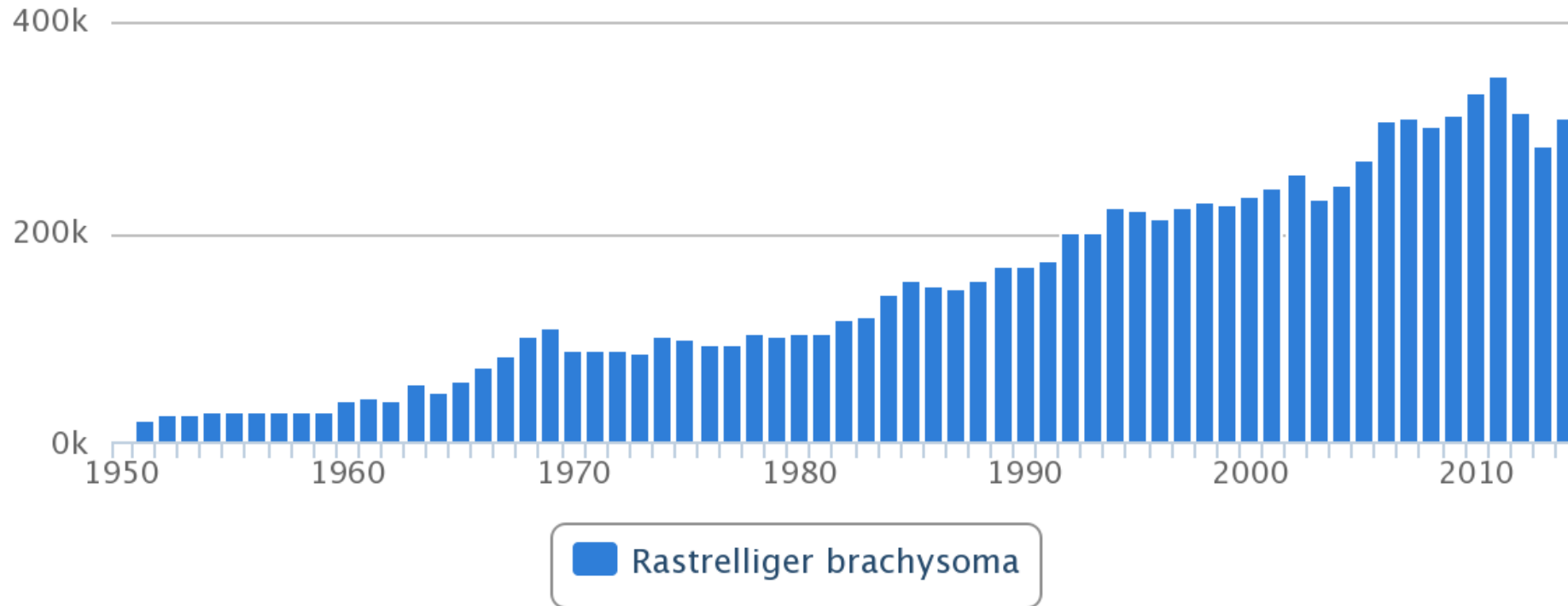


Platoo

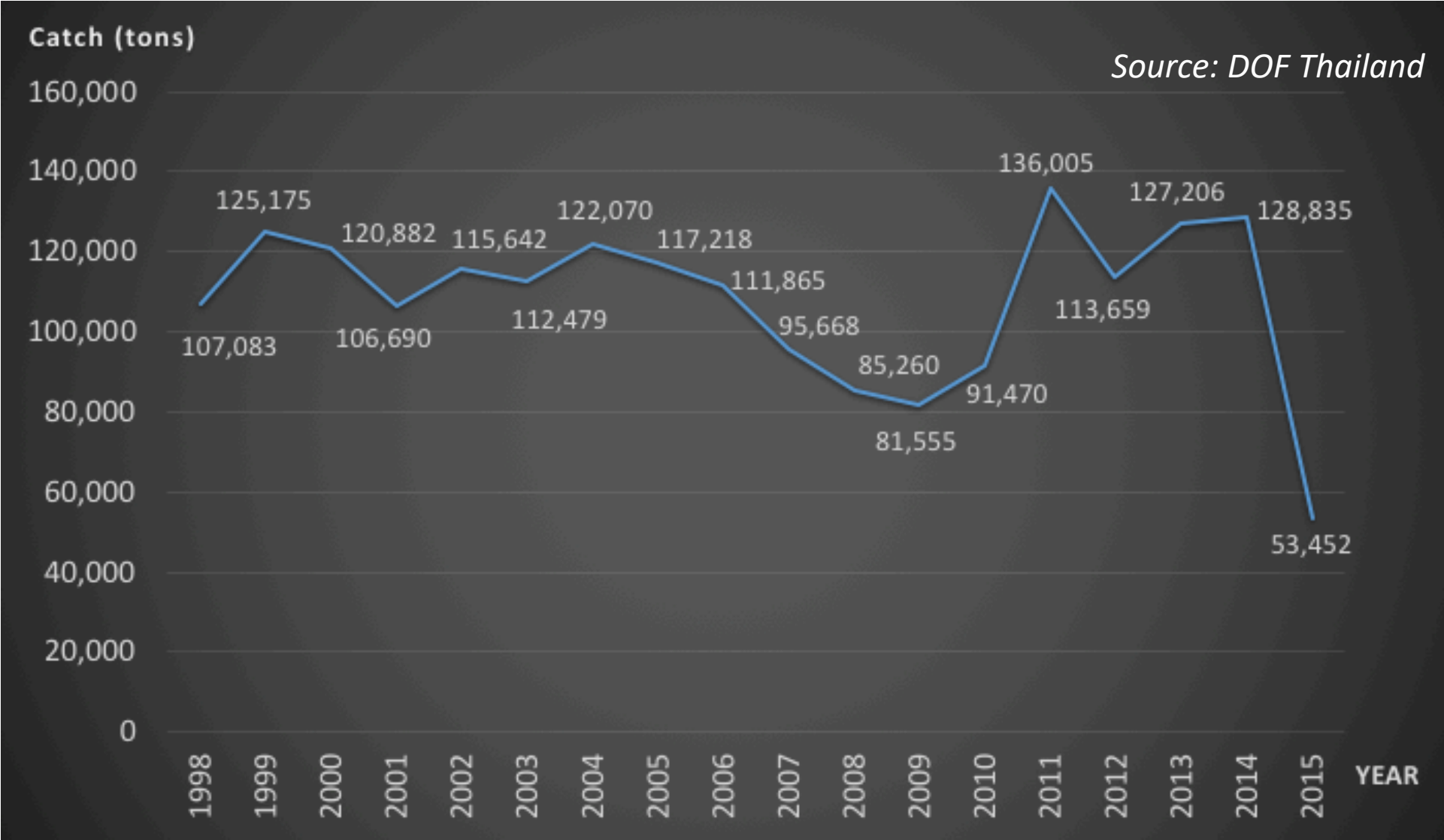


# Global Capture Production for species (tonnes)

Source: FAO FishStat



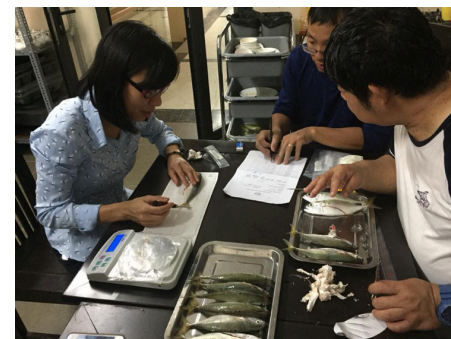
# Landing of Plattoo 1998-2015





# Sub-regional Initiatives for Transboundary Fish Stocks in GoT

- Expert Group Meeting on Stock Status and Geographical Distribution of AIB Species in the GoT, Sep. 2016
- Technical Meeting on Planning for Development of Stock Study for AIB Species in the GoT, Feb. 2017
- Stock Study on Indo-Pacific Mackerel in GoT since late 2017
- Workshop on results from DNA study for IPM in GoT, Dec. 2018



# Stock Status (2017)

Species	Status		
	Decreasing	Stable	Increasing
Anchovy	Viet Nam	Thailand	Malaysia
Indo-Pacific Mackerel		Malaysia Thailand	
Blue swimming crab	Thailand Viet Nam		

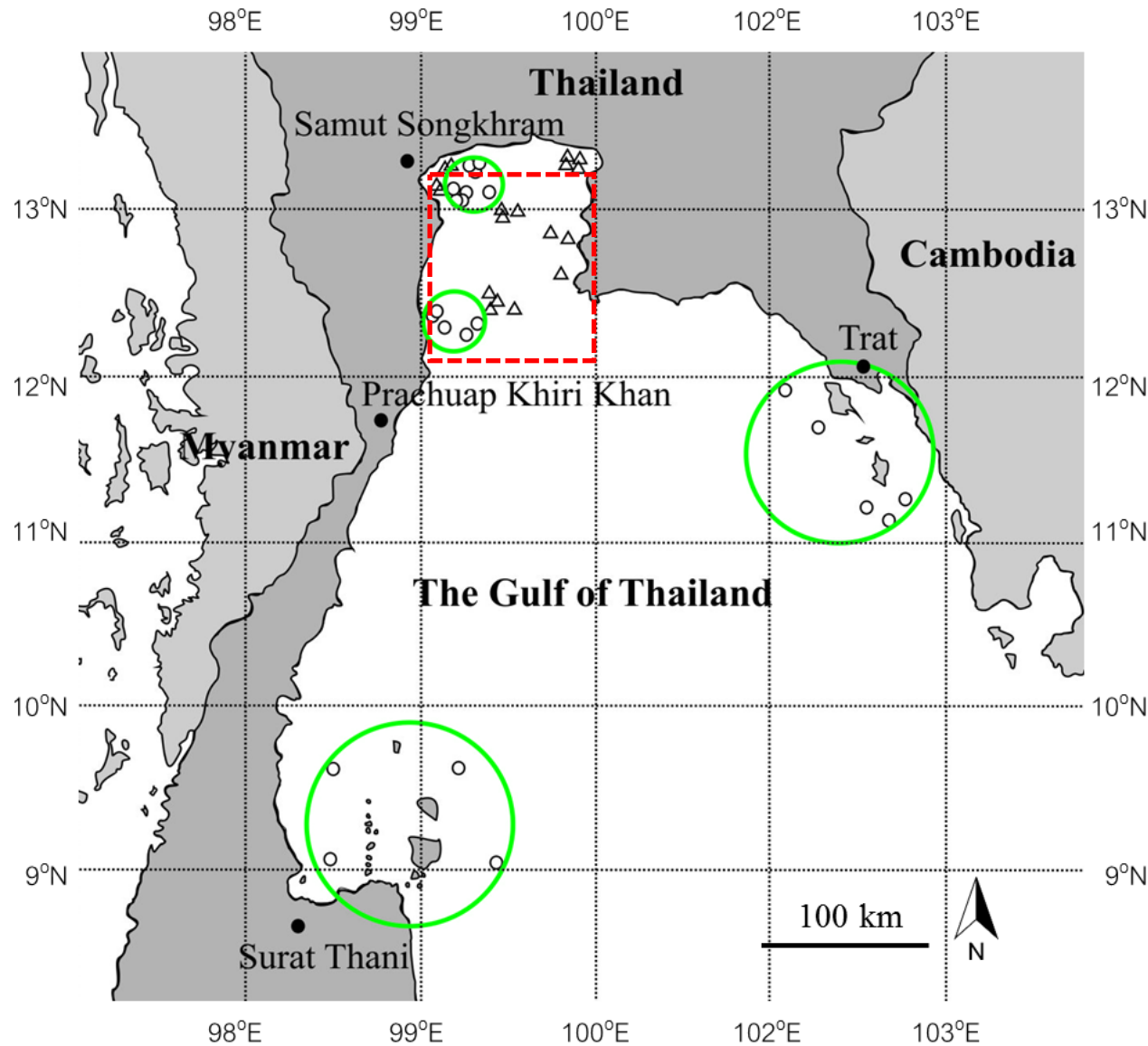


# DNA study on stock structure

- Population structure and genetic mixed-stock analysis (MSA) of short mackerel (*Rastrelliger brachysoma*)
- Identify major population contributing to fishery catches in the upper Gulf of Thailand



# Materials and Methods

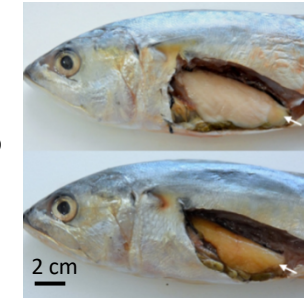


Baseline populations  
from 4 spawning grounds

n=32;  
TL<5 mm.



n=143;  
gonad stage 4-5



○ n=175

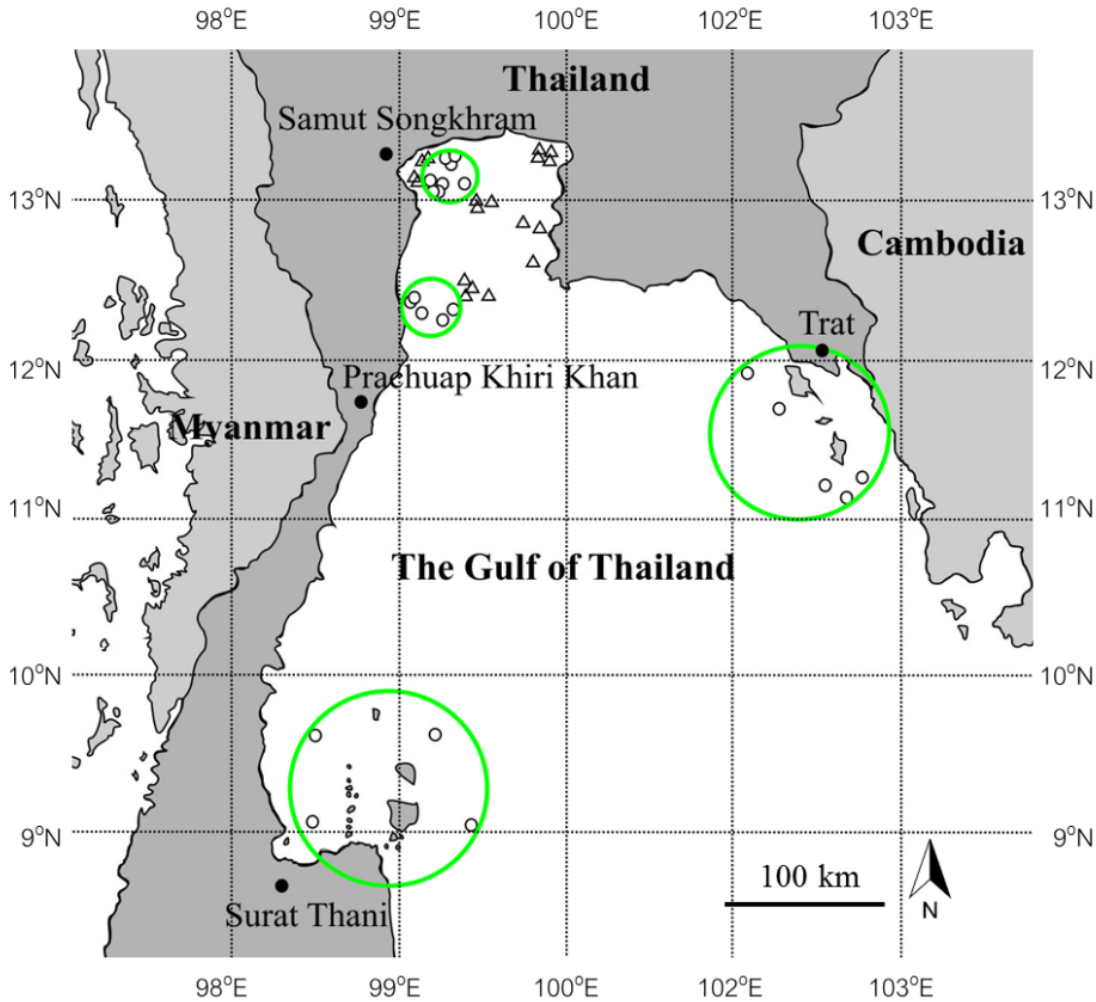
Mixed-stock fishery catches  
from the upper gulf of Thailand



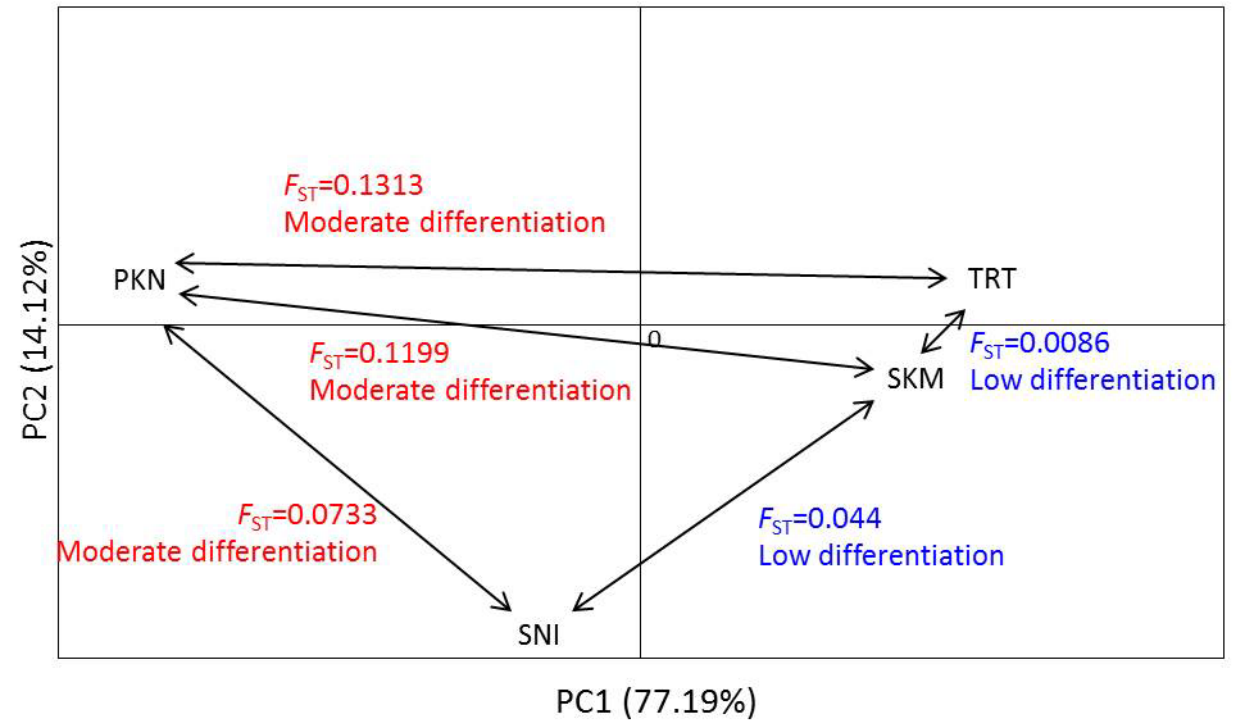
△ n=462; TL=16.23 cm ±1.64 SD.

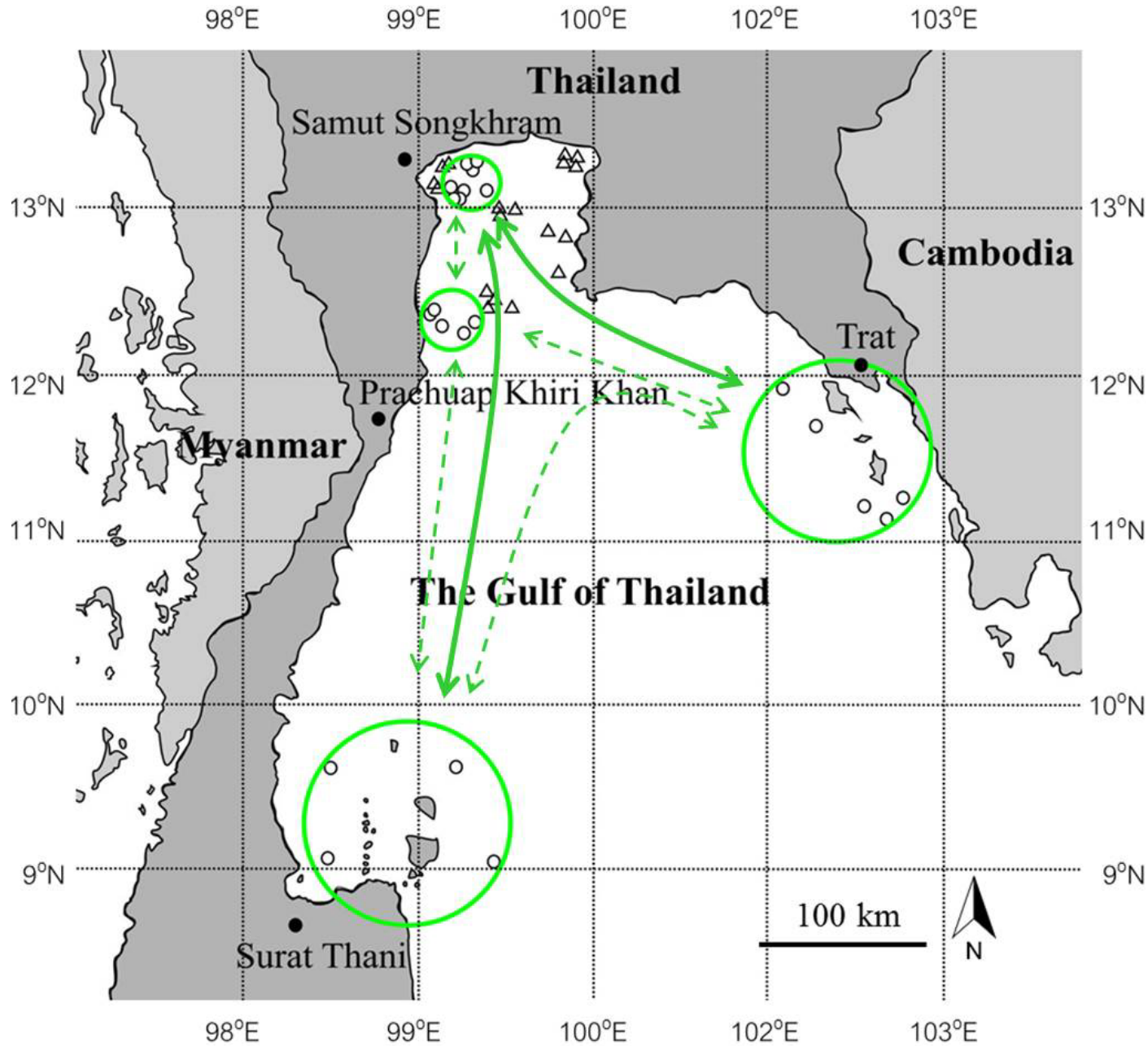
# Results and Discussion

Genetic differentiation ( $F_{ST}$ )  
among baseline populations



SKM = Samut Songkhram  
PKN = Prachuap Khiri Khan  
TRT = Trat  
SNI = Surat Thani



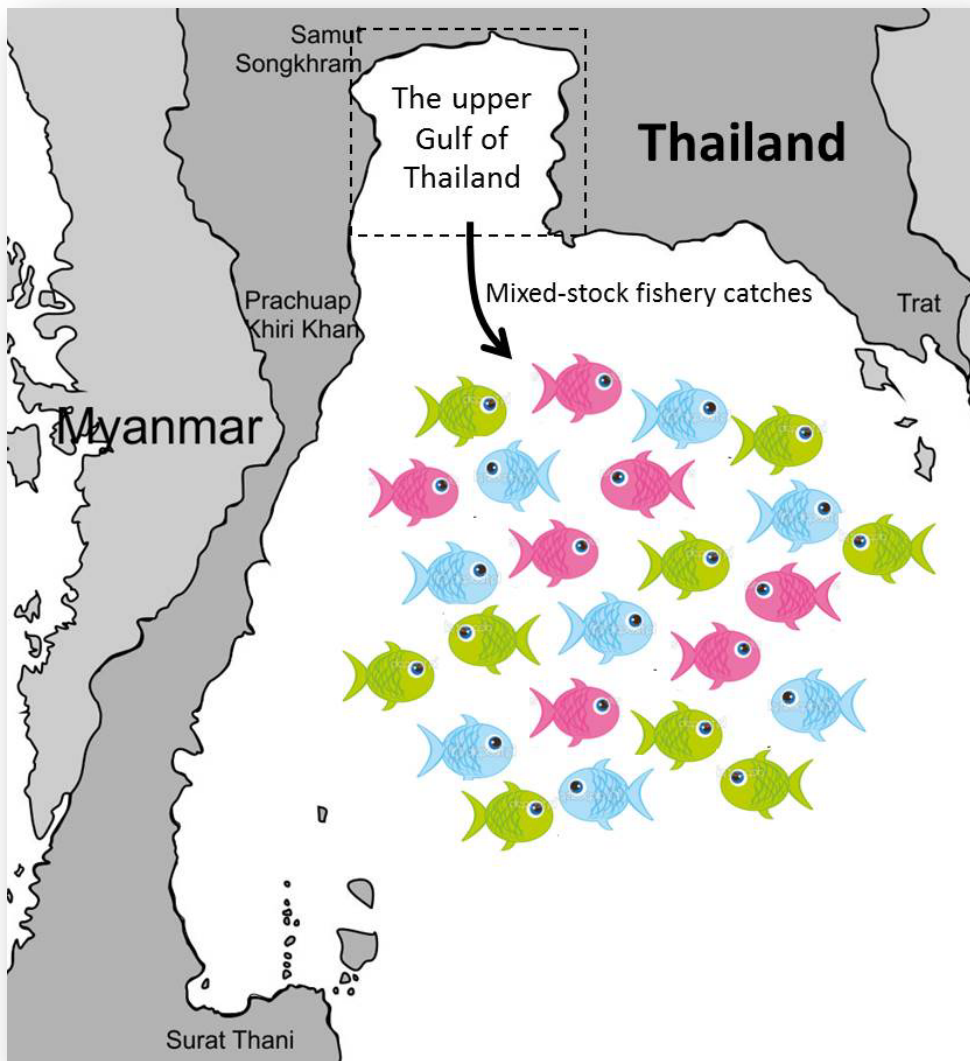


# Results and Discussion

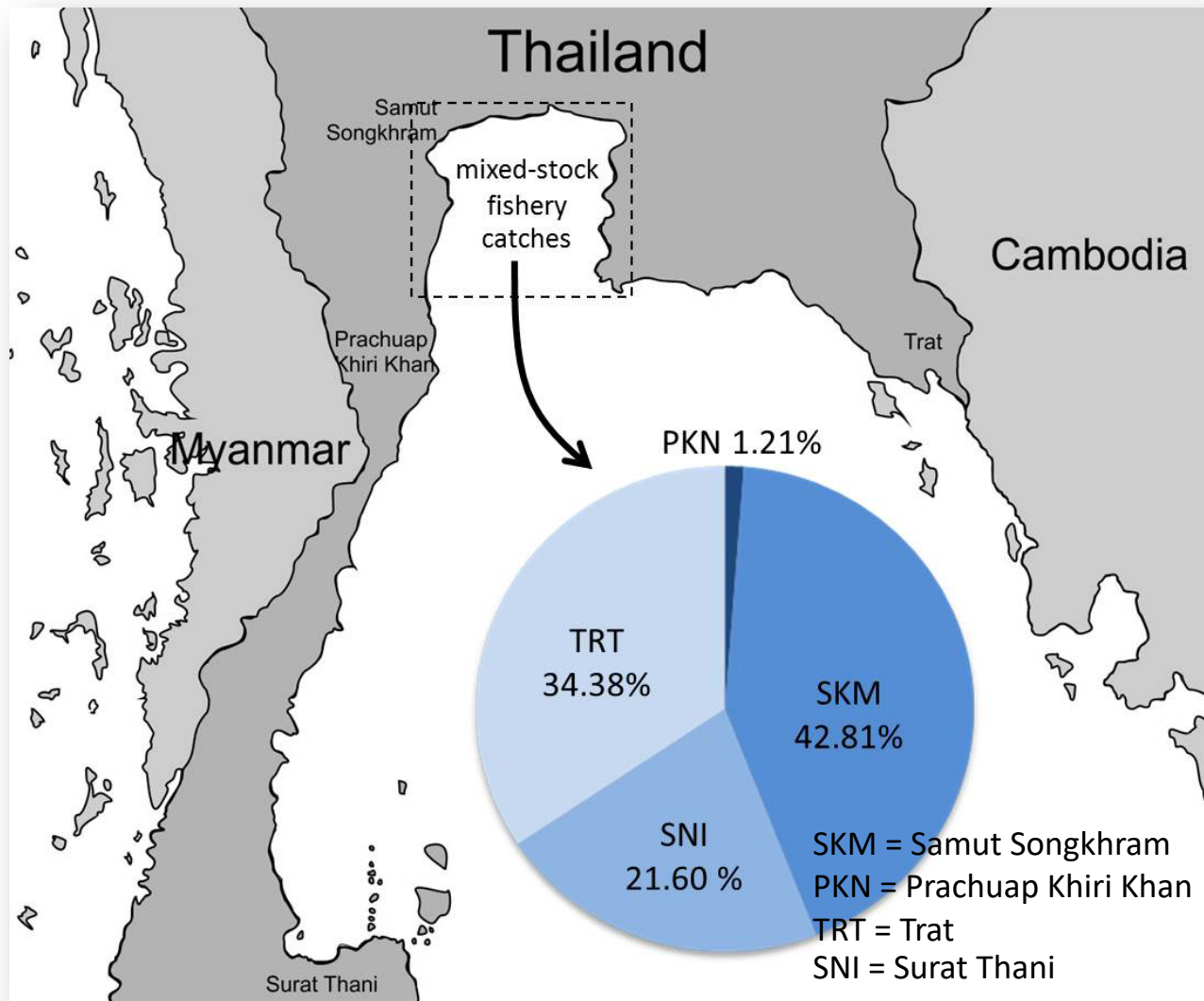
Gene flow  
based on  $F_{ST}$  value

- ↔ High gene flow
- ⇄ Moderately low gene flow

## Mixed-Stock Analysis (MSA)



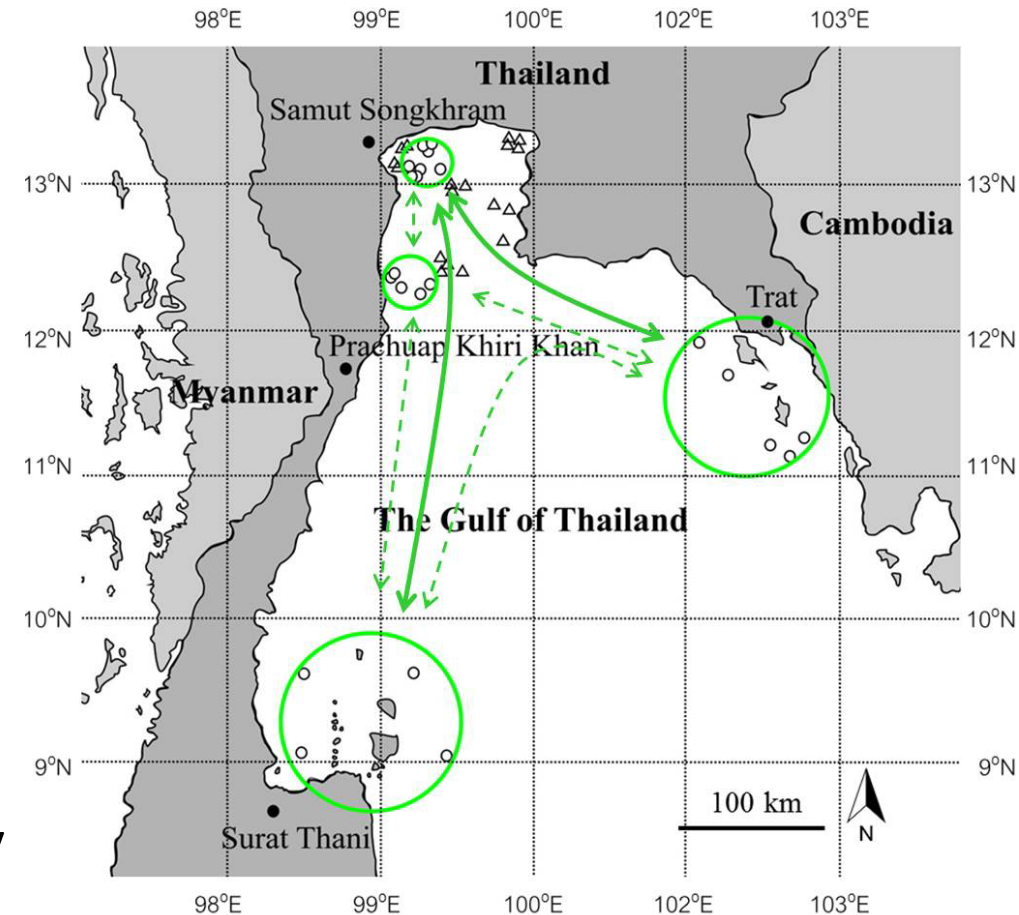
## Results and Discussion





## Conclusion of MSA Study for Indo-Pacific Mackerel in GoT (Thai Waters)

- Four populations are identified according to their spawning grounds.
- Samut Songkhram population is the major contributor to fishery catches in the upper gulf of Thailand.
- Trat and Surat Thani populations are the second and third large contributors and also provide gene flow to Samut Songkhram population.
- Prachuap Khiri Khan population is the smallest contributor and has low gene flow to others.
- These information is envision to assist sustainable fishery management in the upper gulf of Thailand.



# Sample collection

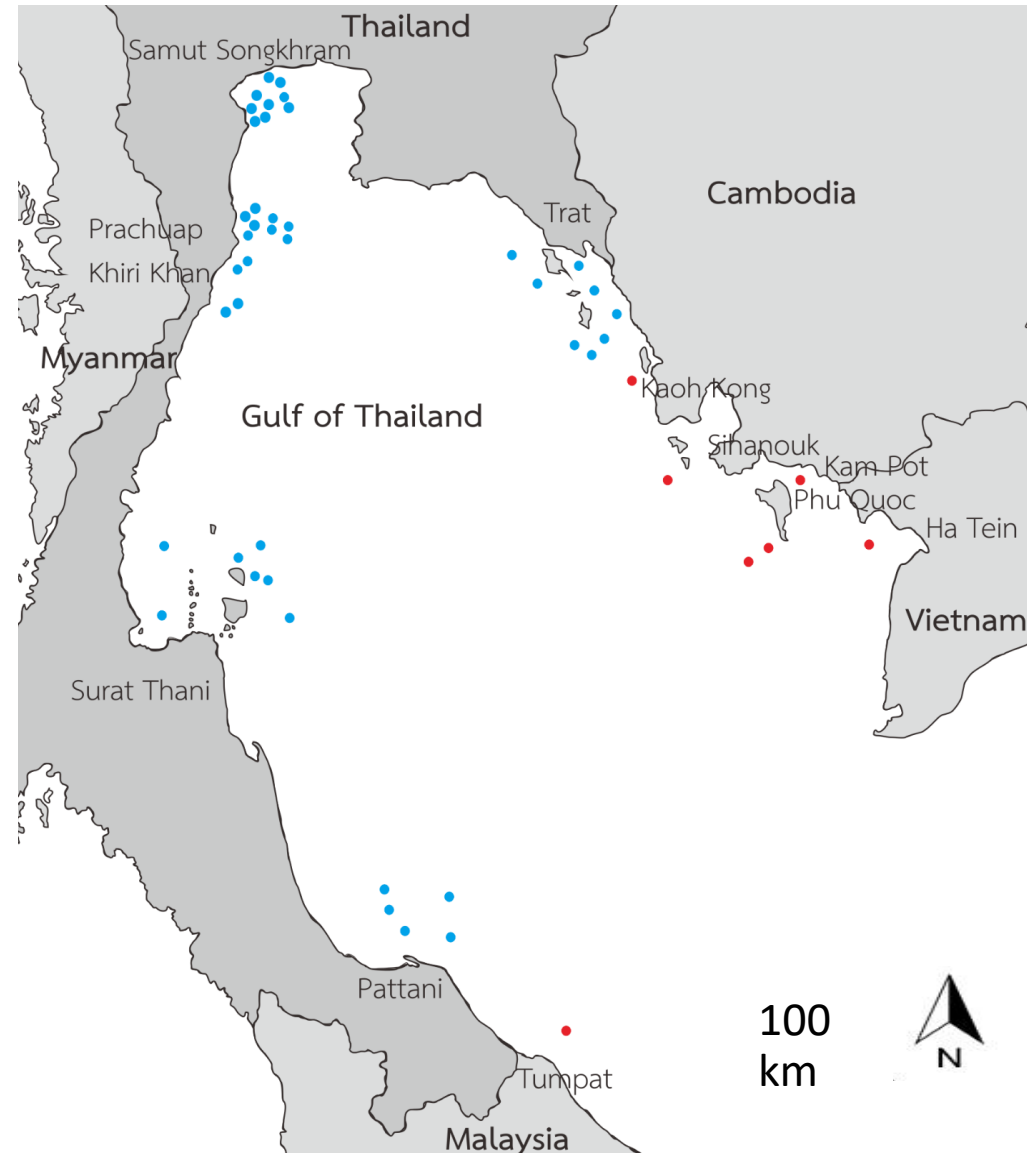
## Baseline populations

Locations	o	n	N
Trat	59	30	89
Samut Songkhram	43	4	47
Prachuap Khiri Khan	59	30	89
Surat Thani	14	16	30
Pattani	27	21	48
Cambodia	-	50	50
Vietnam	-	50	50
Malaysia	-	33	33
	202	234	436

o = old samples (DOF project)

n = new samples (SEAFDEC project)

Fig. 1 Map indicating sampling localities. Samples from neighboring countries and Thailand colored using red and blue dots, respectively.



# Genetic flowchart

**Genomic DNA extraction**



**Microsatellite amplification**



**Genetic analysis**

Fig. 2 Principle component analysis (PCA) representing genetic similarity and differentiation among the short mackerel populations from Thailand (TH) and Malaysia (MY).

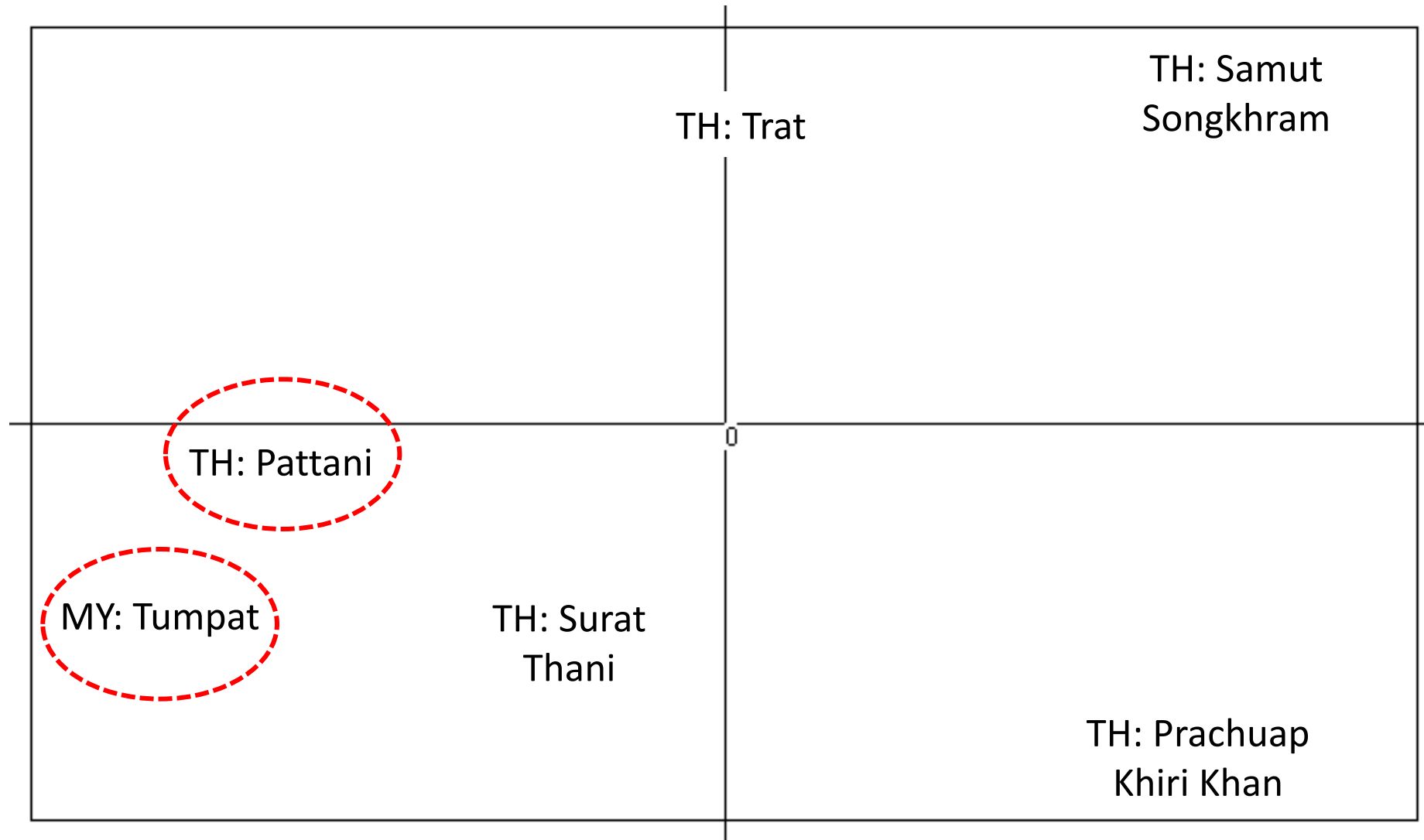




Fig. 3 Principle component analysis (PCA) representing genetic similarity and differentiation among the short mackerel populations from Cambodia (CM) and Vietnam (VN).

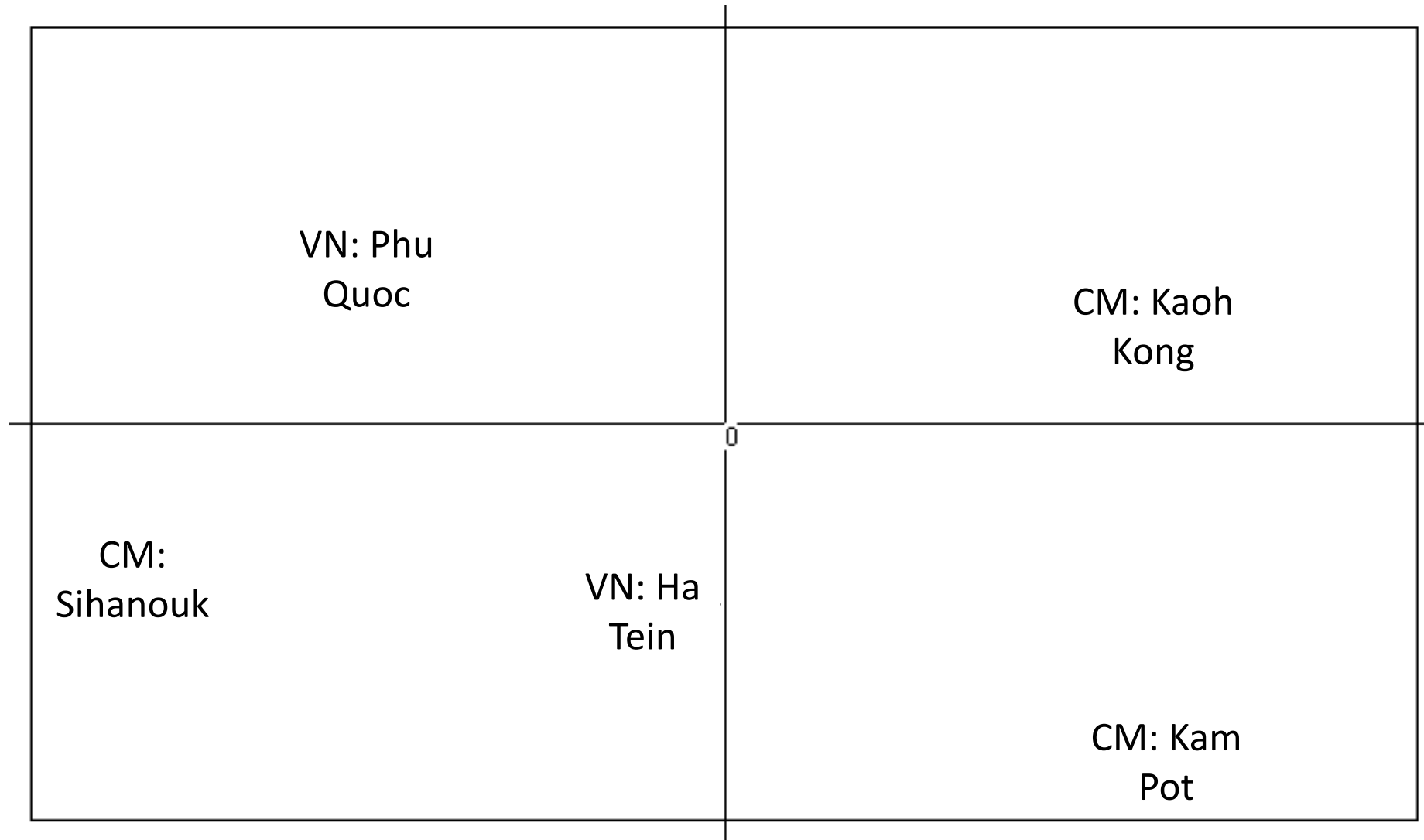


Fig. 4 Principle component analysis (PCA) representing genetic similarity and differentiation among the short mackerel populations from Thailand (TH), Cambodia (CM) and Vietnam (VN).

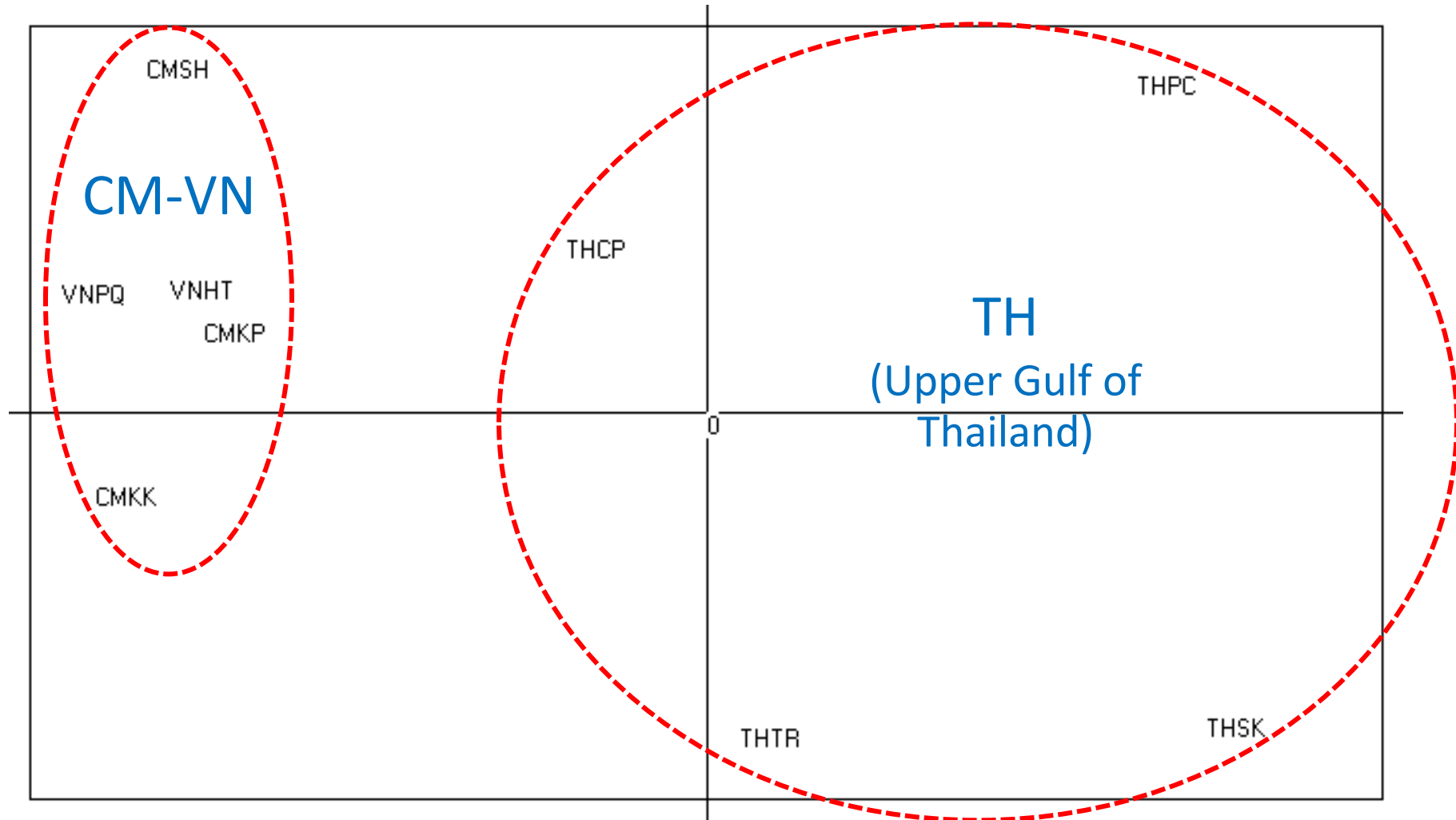


Fig. 5 Principle component analysis (PCA) representing genetic similarity and differentiation among the short mackerel populations from all four countries (TH, CM, VN and MY).

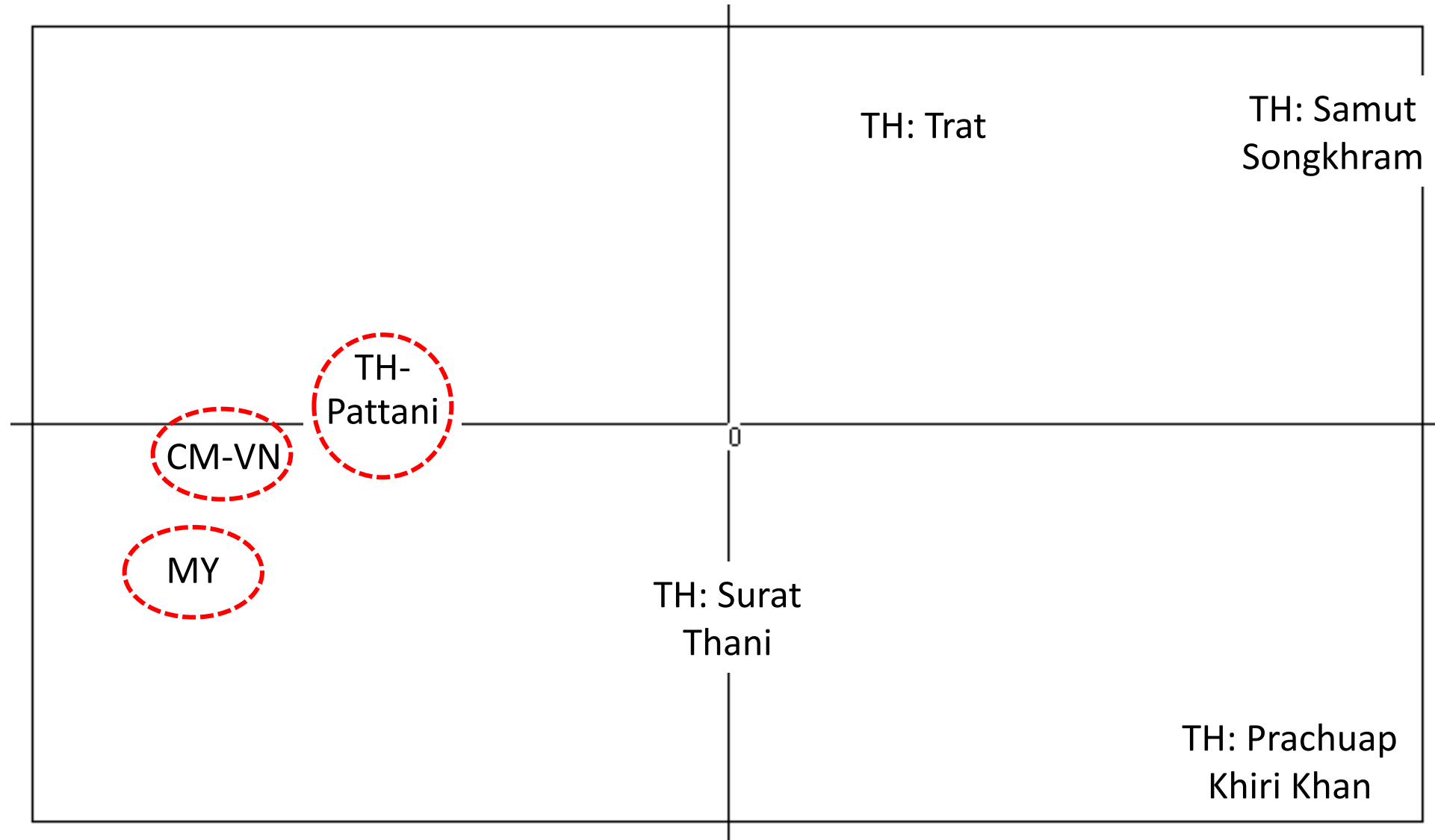


Fig. 6 Map indicating sampling localities with grouping based on PCA result.

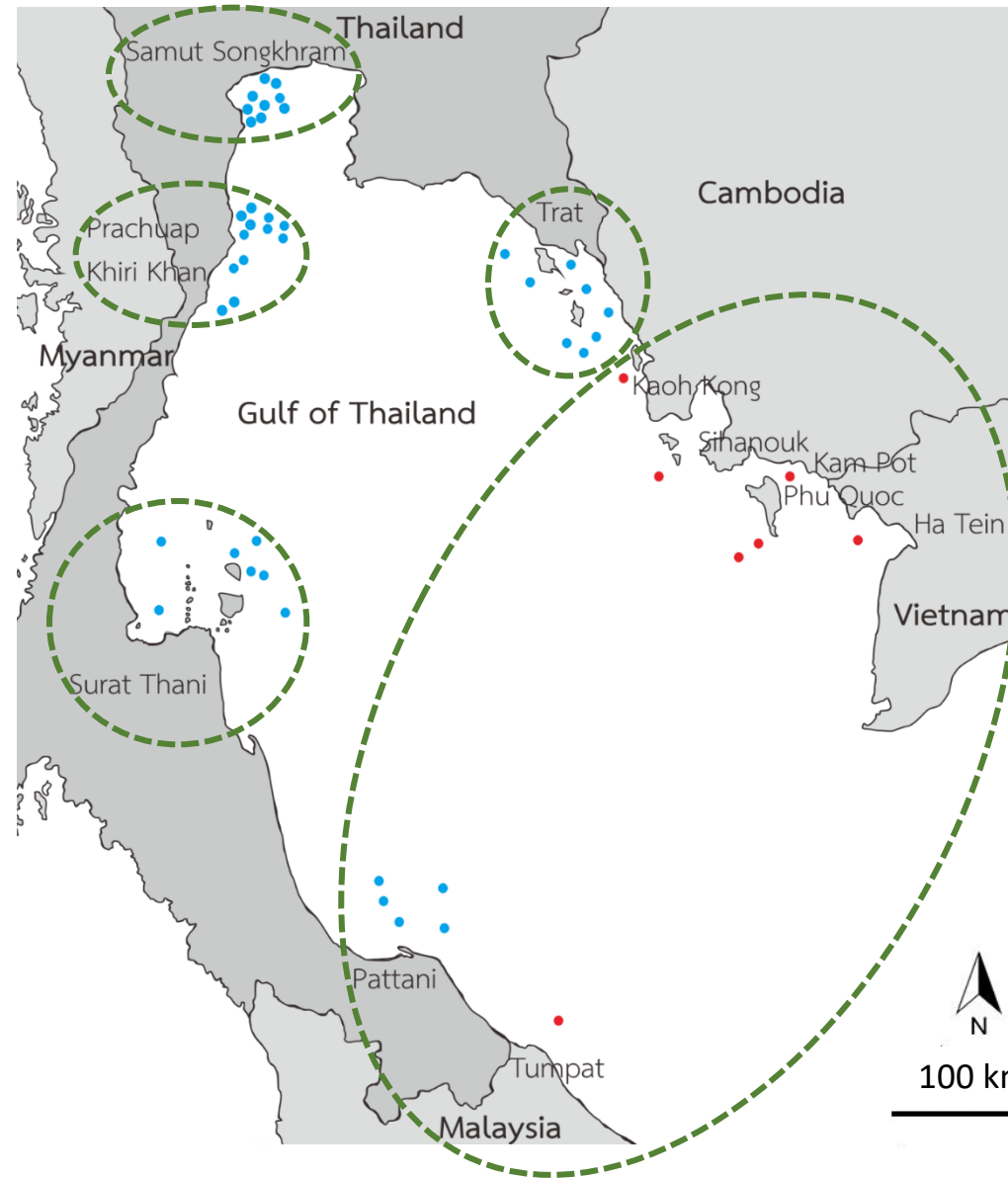
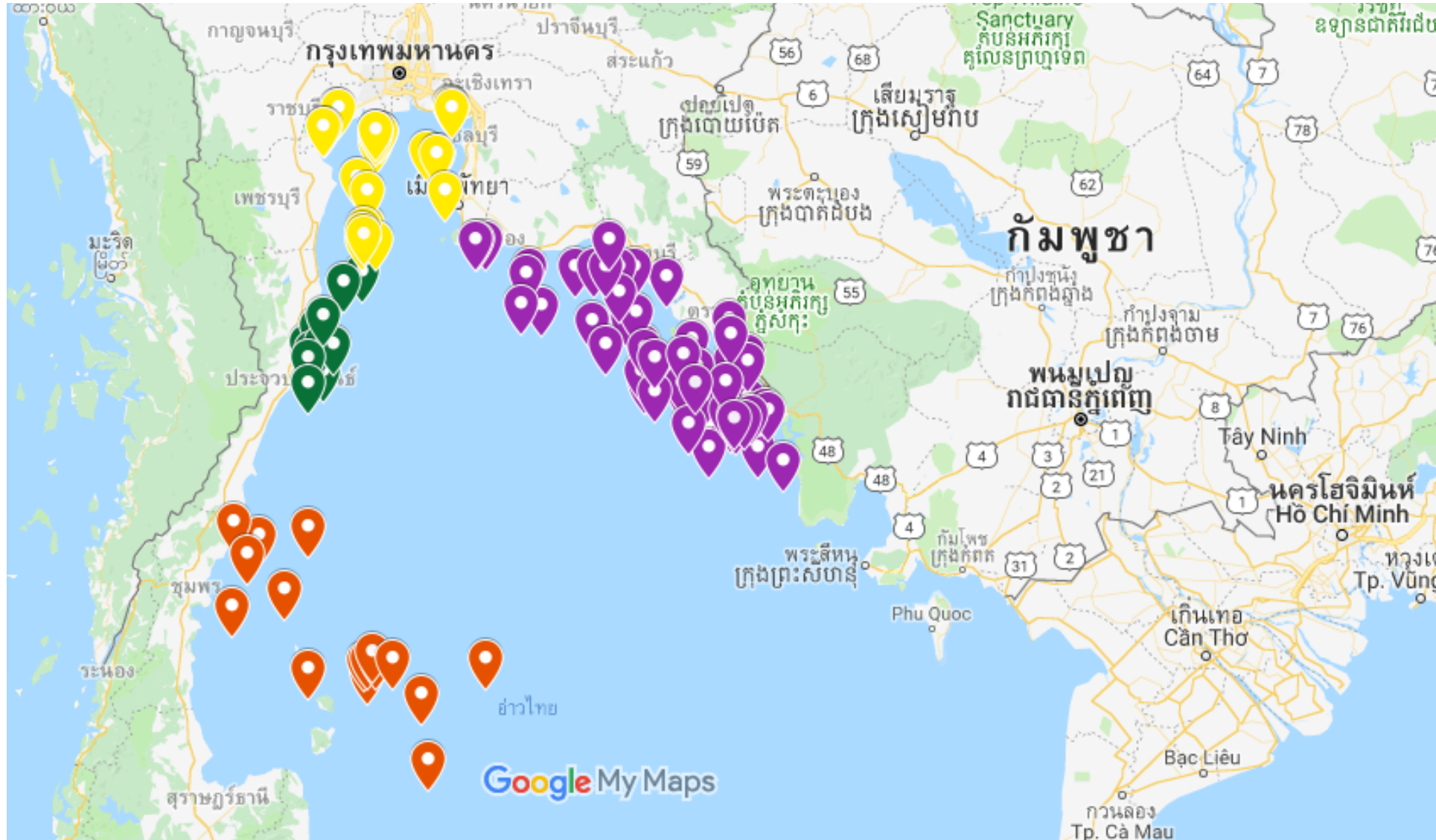
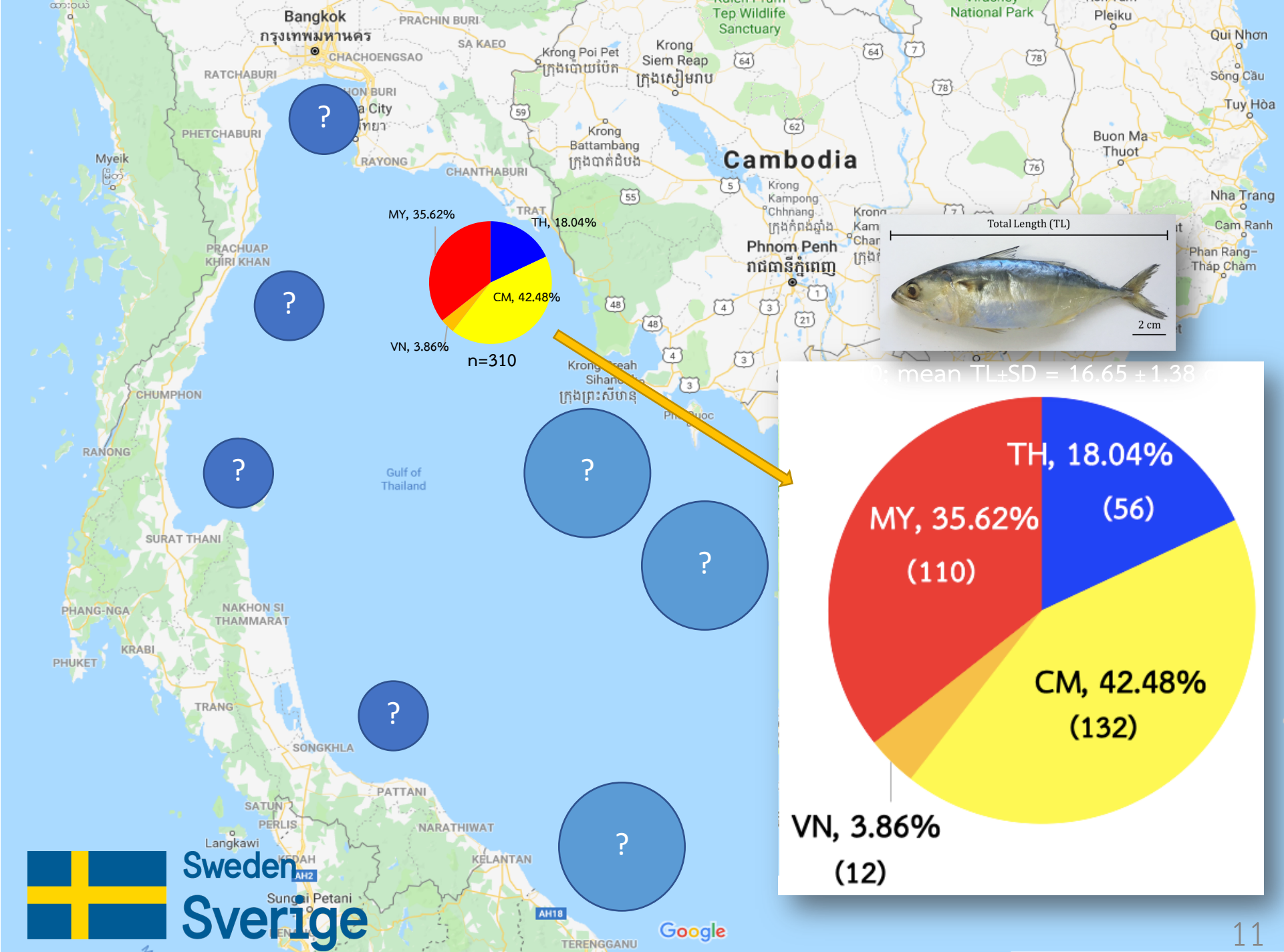
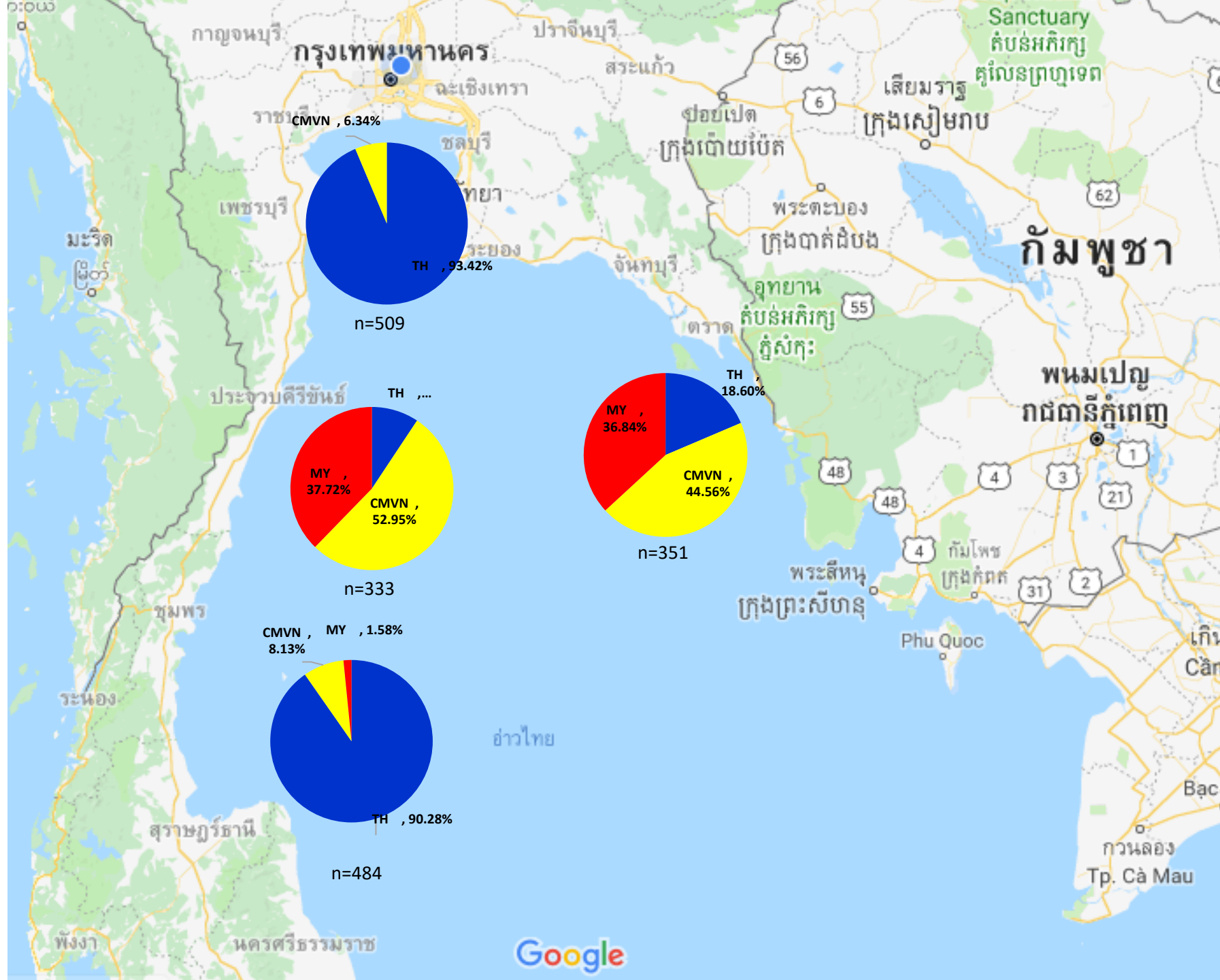


Fig. 7 Map of the Gulf of Thailand represents catching sites of the short mackerel (DOF samples; year 2014; n=1677; mean  $TL \pm SD = 16.97 \pm 1.53$  cm) used for mixed-stock analysis (MSA). The areas covered Lat:  $09^{\circ} 11'$  to  $13^{\circ} 21'$  N Long:  $99^{\circ} 24'$  E to  $102^{\circ} 58'$ .









# Joint Management Plan

## Possible Areas of Cooperation in GoT countries on Platoo Management

- National management measures for transboundary species to be developed and agreed upon the results from the sub-regional collaborative research/activities
- MCS Network Establishment: agree and implement workplan of activities



# Plans, Methodologies, Outputs, and Outcomes...

Activities	Outputs	Outcomes
<b><i>Short-term plan</i></b>		
1. Conduct Genetic Mixed-Stock Analysis (2018, completed)		
<u>Step 1</u> : Identify major fishing ground information by countries	Inputs for designing the genetic study on AIB species	Fishing ground mapping for AIB species in GoT
<u>Step 2</u> : Conduct baseline population studies	Determination of number of AIB stocks in GoT	National and joint management plans for AIB species in GoT
<u>Step 3</u> : Conduct MSA	Determination of amount of contribution from other stocks in particular to area of study	National and joint management plans for AIB species in GoT

# Plans, Methodologies, Outputs, and Outcomes...

Activities	Outputs	Outcomes
<b><i>Short-term plan (continued)</i></b>		
2. Improved Data Collection on AIB Species Using Existing SOP		
<u>Step 1</u> : Name the enumerators for each landing site and study area	Enumerator designated for landing sites in study areas	Harmonized regional data in GoT countries
<u>Step 2</u> : Train the designated enumerators	Enhanced knowledge on biological and environmental data	Improve capacity of enumerators from GoT countries for being trainers in the future
<u>Step 3</u> : Data collection and analysis	Updated information and data on biological and environmental aspects	National and sub-regional management plans for AIB species in GoT
<u>Step 4</u> : Convene meeting to discuss and validate data	Validated data for understanding stocks of AIB species in GoT	National and sub-regional management plans for AIB species in GoT

# Plans, Methodologies, Outputs, and Outcomes...

Activities	Outputs	Outcomes
<b><i>Medium and long-term plan</i></b>		
1. Monitoring change in catch and landing		
Periodic catch and landing survey (depending on the countries)	Updated information on stock status/condition	Effectiveness of the management plans
2. Discussion on development of a joint/collaborative plan/actions		
GoT meeting (s)		

# Level of the Development for Joint Management Plans for the Shared Stocks

- **Primary Level:** cooperation on research program/activity
- **Secondary Level:** the establishment of agreements of coordinated national fisheries management measures



# Conclusion

- A set of information can be used for future joint actions plan development
- Technical capacities (together with SOP, etc.) are already in place
- GoT initiatives on IPB in primary level → development of the joint/collaborative actions/management plan ?
- Future action (s) ?