



# COLLABORATIVE RESEARCH SURVEY ON MARINE FISHERIES RESOURCES AND ENVIRONMENT IN THE GULF OF THAILAND 2018

## Sustained Utilization of SEAFDEC Vessel through

## Collaborative Research Surveys: Marine Resources Survey of the Gulf of Thailand using M.V. SEAFDEC 2

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RESEARCH AND DEVELOPMENT DIVISION

TRAINING DEPARTMENT

SEAFDEC



Supported by Southeast Asian Fisheries Development Center  
Training Department, Samut Prakan, Thailand



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# Introduction

## Agreement

### Establishing the Southeast Asian Development Center (1967)

To promote the fisheries development in this region, further efforts should be made in the fields of training of fisheries technicians, research on fisheries techniques and investigation of fisheries resources and in other relevant field:



## SEAFDEC vision in 2020

*"Sustainable management and development of fisheries and aquaculture to contribute to food security, poverty alleviation and livelihood of people in the Southeast Asian region"*





# Introduction

**SEAFDEC Training Department** works in close collaboration with the Member Countries and other relevant partners at national, sub-regional, and regional levels to conduct Marine research and training activities with three major specific areas, *i.e.*

1. Fisheries research survey;
2. Oceanographic survey; and
3. Human resource development on fisheries, oceanographic, navigation, and marine engineering



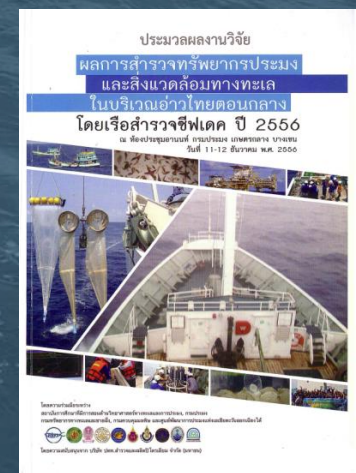
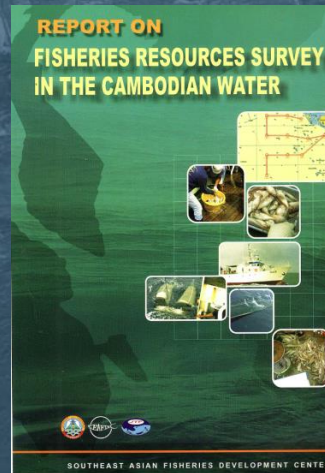
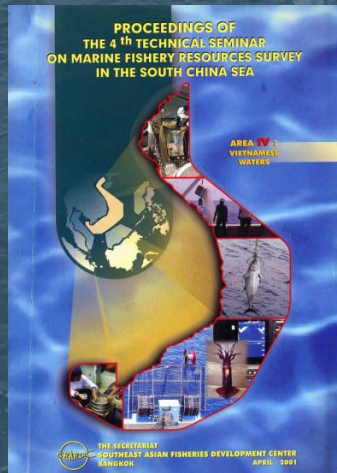
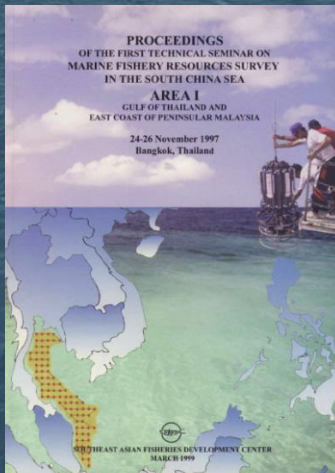


# Introduction

**SEAFDEC Training Department** in collaboration with Member Countries, fisheries agencies, universities and institutes carried out the Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand.

Update situation of marine fisheries resources in the Gulf of Thailand with the previous result;

- Marine Fisheries Resources Survey in the South China Sea 1997-1999
- The National Demersal Fisheries Resource Research in Thai EEZ in 2004-2005 conducted by M.V.SEAFFDEC 2;
- National Demersal Fisheries Resource Research in Cambodia EEZ in 2008 and 2017; and
- National Demersal Fisheries Resource Research in Vietnam EEZ in 2011 and 2017
- Marine Fisheries Resources and Environmental Research Survey in the Central Gulf of Thailand in 2013





# Introduction

Follow up action on the recommendation in the Result of Marine Fisheries Resources and Environmental Research Survey in the Central Gulf of Thailand in 2013

Result of survey showed that intruded water mass from South China Sea are highly influence to water quality and living organism in the Gulf of Thailand. **Degree of influence from water mass of South China Sea are depending on seasonal variation.** However, this survey area was limited only in Thai's waters with cover only half area of Gulf of Thailand. In order to understand on the whole process of water mass flow and environmental condition in the Gulf of Thailand, then, the future survey area **cover should be including Cambodia and Viet Nam's waters in the Gulf of Thailand.** The survey should also **conduct during both Northeast and Southwest monsoon season.** The survey was recommended to **conduct for every 3-5 years** for monitor on the changing environment situation in the Gulf of Thailand.



# Cruise Survey

## The Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand 2018

### Cruise Objective

- 1) Update situation of marine fisheries resources, oceanography and marine environment in the Gulf of Thailand
- 2) Technical supports on the human resources capacity building programs
  - Collaborative marine research survey among researchers from difference research agencies
  - Capacity building programs for the junior scientist and university students to conduct and practices onboard marine research





# Cruise Survey

## The Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand 2018

### Cruise Objective

- 3) Strengthen fisheries and oceanography scientist/researcher network in Gulf of Thailand Sub-region.
- 4) Promote on utilization of research equipment and SEAFDEC research vessel for maximizing its efficiencies and benefit





# Cruise Survey

## The Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand 2018



### Expect Output

1. Baseline data on marine fisheries resources and marine environmental situation for scientific reference
2. Promote and develop the marine science study of Cambodia, Thailand and Viet Nam
3. Human resources development for junior researcher and marine scientist in Southeast Asia
4. Network on the marine fisheries resources and marine environmental scientist
5. Promote on utilization of research equipment and human resources for maximizing it efficiencies and benefit





# Cruise Survey

## The Collaborative Research Survey on Marine Fisheries Resources and Marine Environment in the Gulf of Thailand 2018



**SEAFDEC** Training Department

## Collaborative Agencies

### Cambodia:

- Fisheries Administration (FiA)

### Viet Nam:

- Directorate of Fisheries (DFISH),
- Research Institute for Marine Fisheries (RIMF)

### Thailand:

- Department of Fisheries (DoF-Thailand),
- Department of Marine and Coastal Resources (DMCR-Thailand),
- Office of Atoms for Peace (OAP)
- Burapha University (BUU),
- Chulalongkorn University (CU),
- Kasetsart University (KU)



# Survey Activities: **Research Vessels**



1. *Fishing Research and Training*
2. *Oceanographic Survey*
3. *On-board Navigation and Engine Training*

Ship Particular	Specification
Length Overall	33.24 m
Breadth, Molded	7.2 m
Design draft, Molded (D)	2.7 m
Gross tonnage	211 t (international)
Machinery	
Main Engine Output 1000 Ps	1 Unit
Electric Generator 120 KVA	2 Unit
Speed and endurance	
Maximum speed at sea trial	12.5 knot
Service speed	12.0 knot
Fuel oil consumption (24 hour)	3.83 ton/day
Complement	
Crew	15 persons
Instructor/scientist/participants	22 persons
Total	37 persons

## M.V. SEAFDEC 2



### **Oceanographic Equipment:**

Conductivity Temperature and Depth System, Thermosalinograph and Fluormeter, Expandable Bathythermograph, Profiling Reflectance Radiometer System. Temperature and Depth Recorder, Water Sampler, Core sampler, Bottom Sediment Sampler, and Plankton Net System

### **Fishing Equipment:**

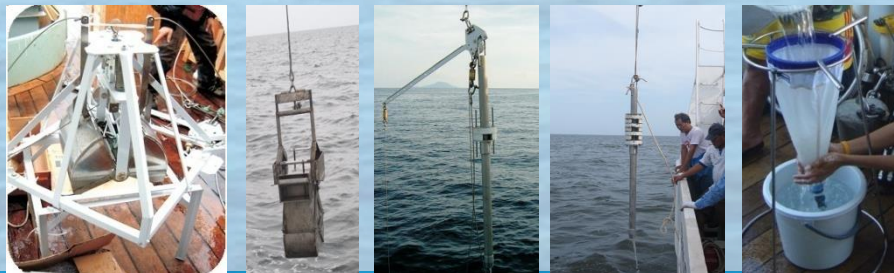
Direction finder, Color fish finder, Scanning sonar, Trawl monitor, Underwater television, Fishing gear: Bottom trawl, Midwater trawl, Pelagic longline, Bottom longline, Drifting gillnet, and Automatic squid jigging



# Survey Activities: Oceanographic Instrument

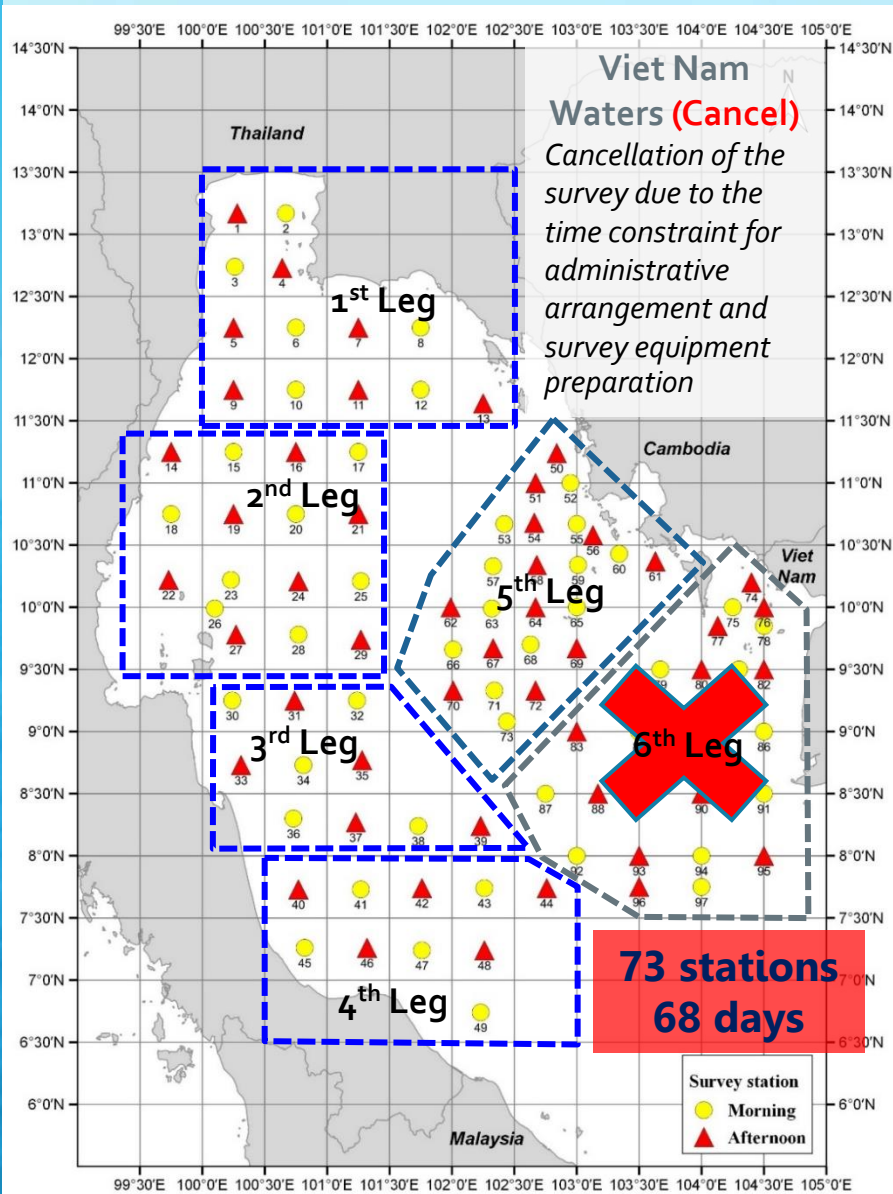


- 1) Bottom trawl nets and accessories
- 2) Scientific Echo sounder SIMRAD EK-60
- 3) CTD
- 4) Temperature and Depth Recorder (TDR)
- 5) Weather information
- 6) Current Indicator
- 7) Thermo Salino Graph (TSG) system
- 8) Bongo net
- 9) Larvae net and Nueston net
- 10) Phytoplankton and zooplankton net
- 11) Sediment sampler (Core and grab)
- 12) Benthos (Grab)





# Survey Activities: Cruise Plan and Survey Area



- **Survey period**

17 August - 11 November 2018 (87 days)

- **Survey area**

Gulf of Thailand (Thailand, Cambodia and Viet Nam waters)

- **Survey stations: 97 stations**

**Trip 1 - 4: Thailand Waters**

(17 Aug – 27 Sep 2018)

49 stations (St.1 – St.49)

**Trip 5: Cambodia Waters**

(1 – 17 Oct 2018)

24 stations (St.50 – St.73)

**Trip 6: Viet Nam Waters**

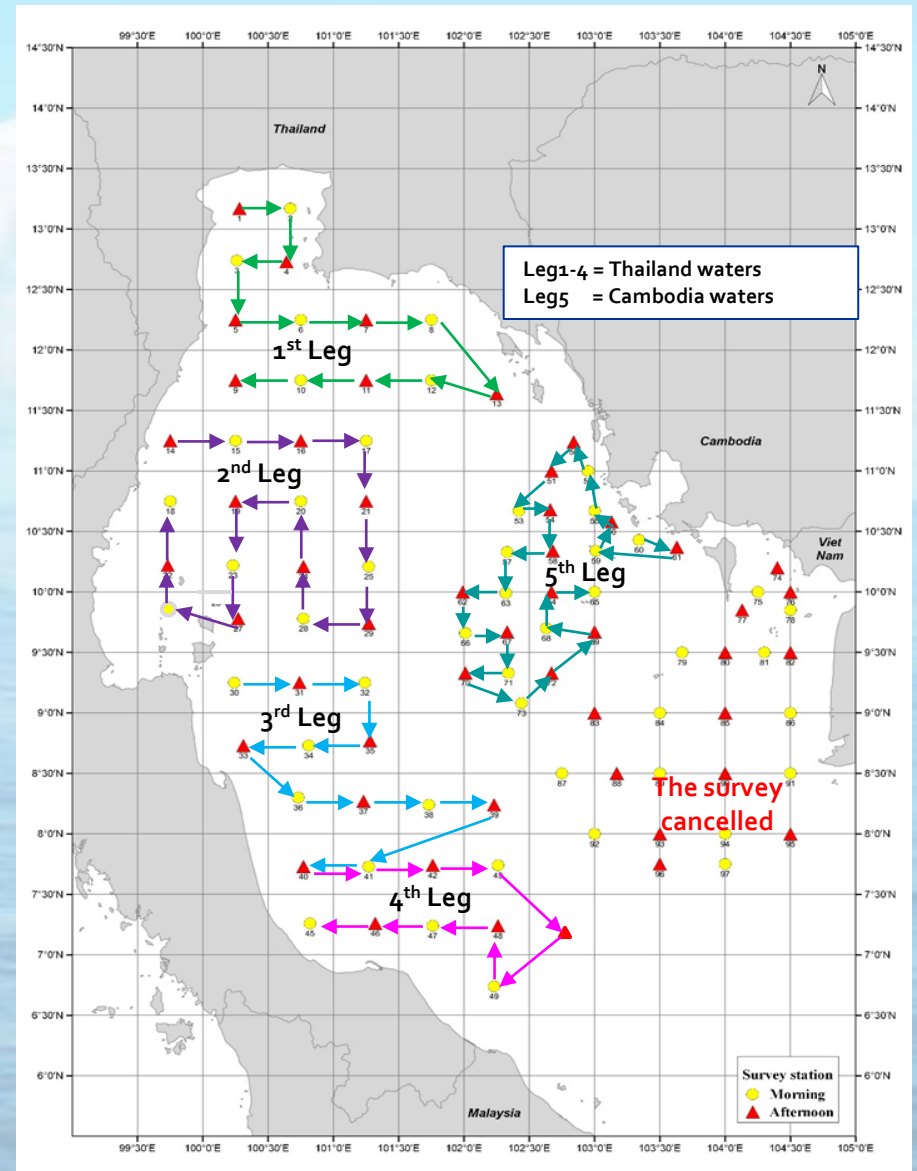
(24 Oct – 5 Nov 2018)

24 Stations (St.74 – St.97)



# Survey Activities: Ship Route

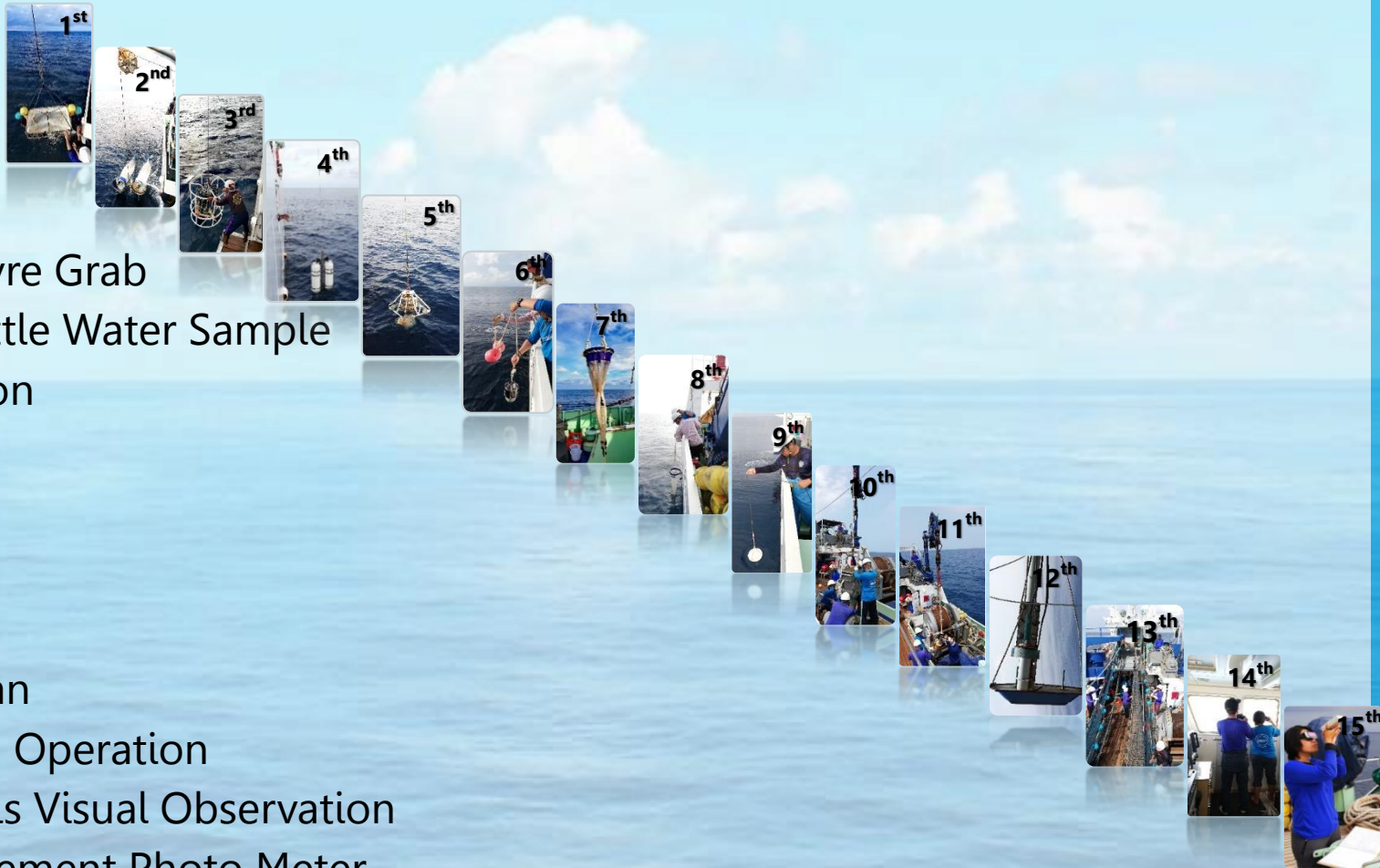
- **Survey period**  
17 August - 11 November 2018 (87 days)
- **Survey area**  
Gulf of Thailand (Thailand, Cambodia and Viet Nam waters)
- **Survey stations: 97 stations**
  - Leg 1 - 4: Thailand Waters**  
(17 Aug – 27 Sep 2018)  
49 stations (St.1 – St.49)
  - Leg 5: Cambodia Waters**  
(1 – 17 Oct 2018)  
24 stations (St.50 – St.73)
  - Leg 6: Viet Nam Waters**  
(24 Oct – 5 Nov 2018)  
24 Stations (St.74 – St.97)





# Survey Activities: Oceanography and Sampling Gears

1. Neuston Net
2. Bongo Net
3. CTD
4. Van Dorn
5. Smith McIntyre Grab
6. Dropped Bottle Water Sample
7. Phytoplankton
8. Zooplankton
9. Secchi Disk
- 10.Box Core
- 11.Gravity Core
- 12.Structure Scan
- 13.Trawl Fishing Operation
- 14.Marine Debris Visual Observation
- 15.Dust Measurement Photo Meter





# Survey Activities:

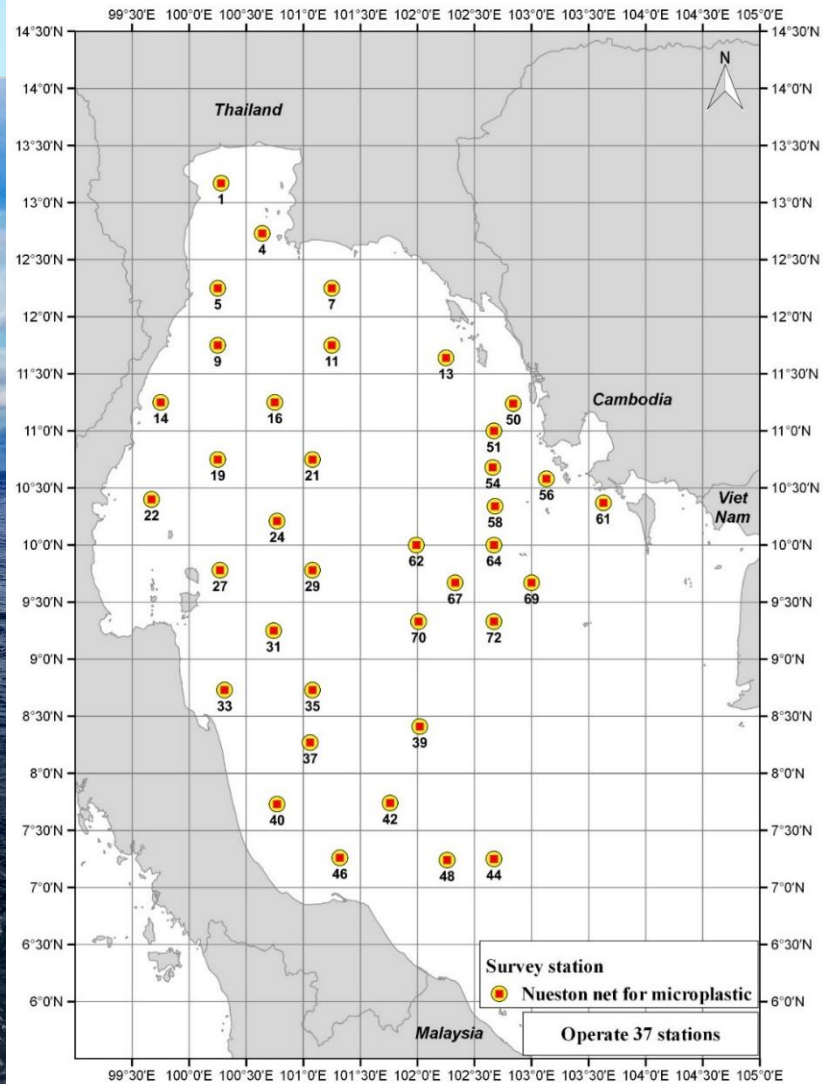
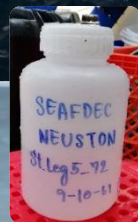
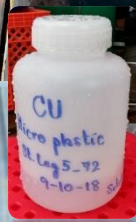
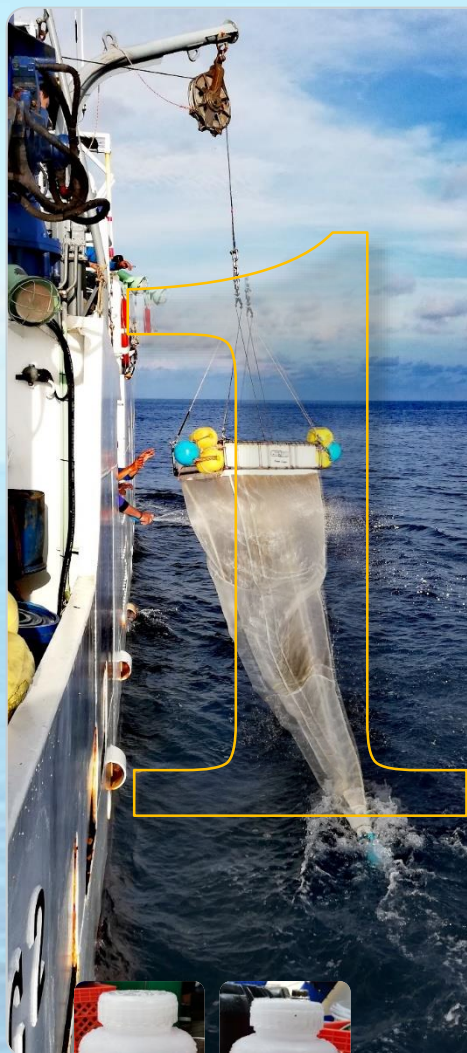
## Working Locations on M.V. SEAFDEC 2

1. Neuston Net
2. Bongo Net
3. CTD
4. Van Dorn
5. Smith McIntyre Grab
6. Dropped Bottle Water Sample
7. Phytoplankton
8. Zooplankton
9. Secchi Disk
10. Box Core
11. Gravity Core
12. Structure Scan
13. Trawl Fishing Operation
14. Marine Debris Visual Observation
15. Dust Measurement Photo Meter





# NEUSTON NET



## 37 SAMPLING STATIONS

Neuston Net for Micro-plastic

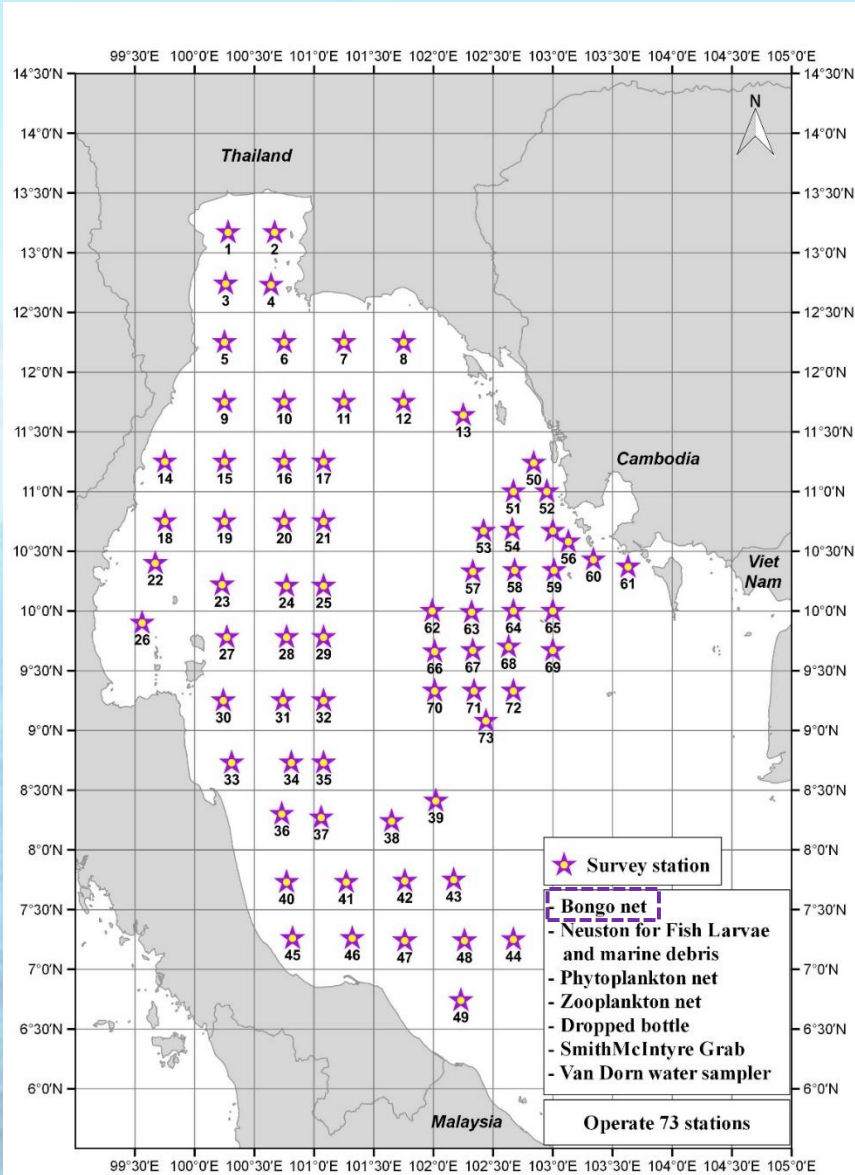
- ✓ Surface
- ✓ Speed 2.5 kts.
- ✓ Distance 40 m.

Neuston Net for Fish Larvae

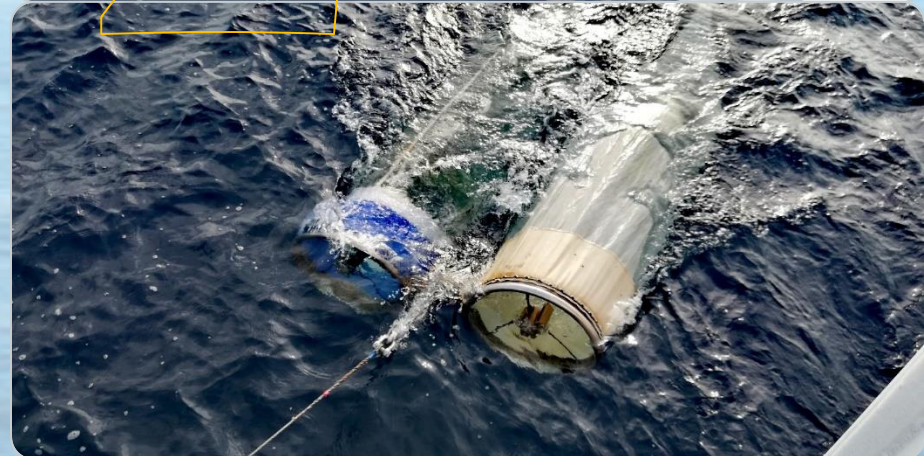
- ✓ Surface
- ✓ Speed 2.5 kts.
- ✓ Distance 75 m.



# BONGO NET



## 73 SAMPLING STATIONS





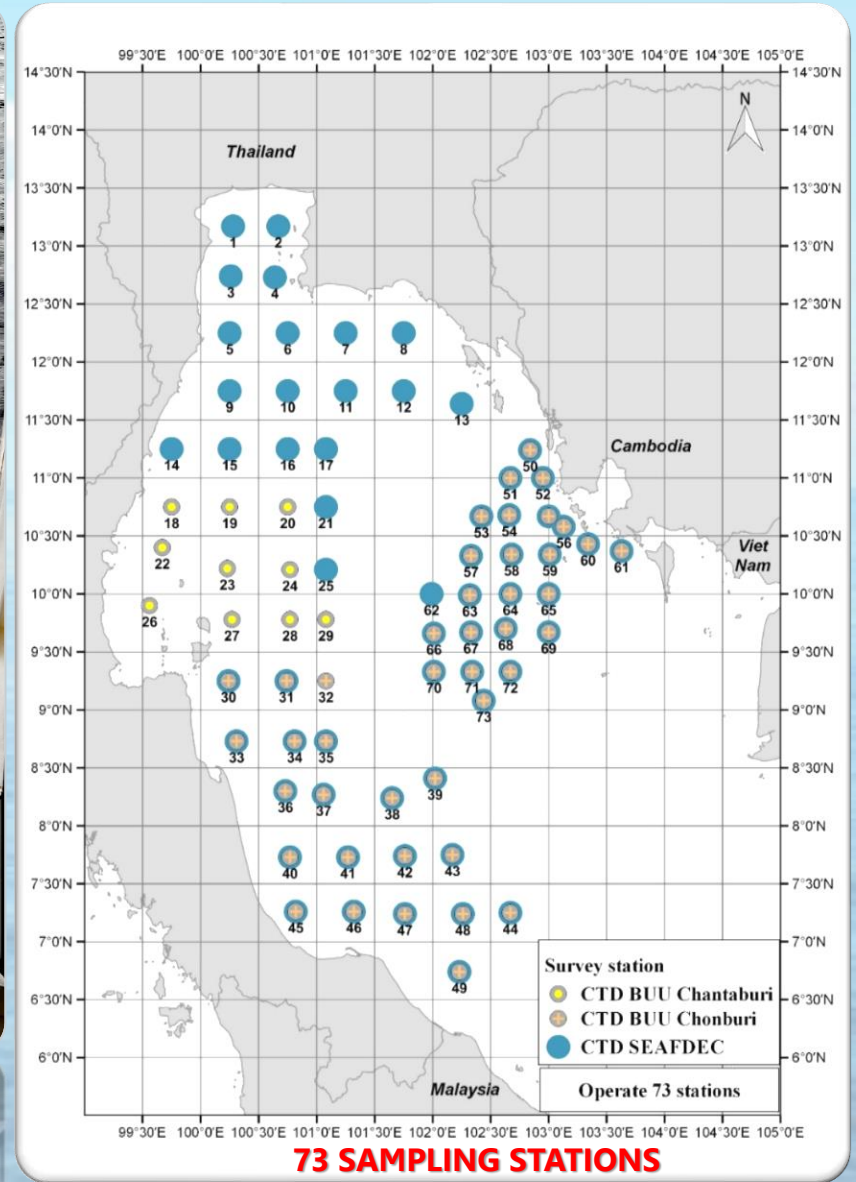
# CONDUCTIVITY, TEMPERATURE AND DEPTH (CTD)



**SEAFDEC**  
✓ **SeaBird SBE-911 +**



**BUU**  
✓ **SD 204**



## STD/CTD - model SD204 with multi-parameter & auto range facilities

- Salinity
- Temperature
- Sound velocity
- Turbidity (auto range)
- Conductivity
- Depth
- Oxygen
- Fluorescence (auto range)



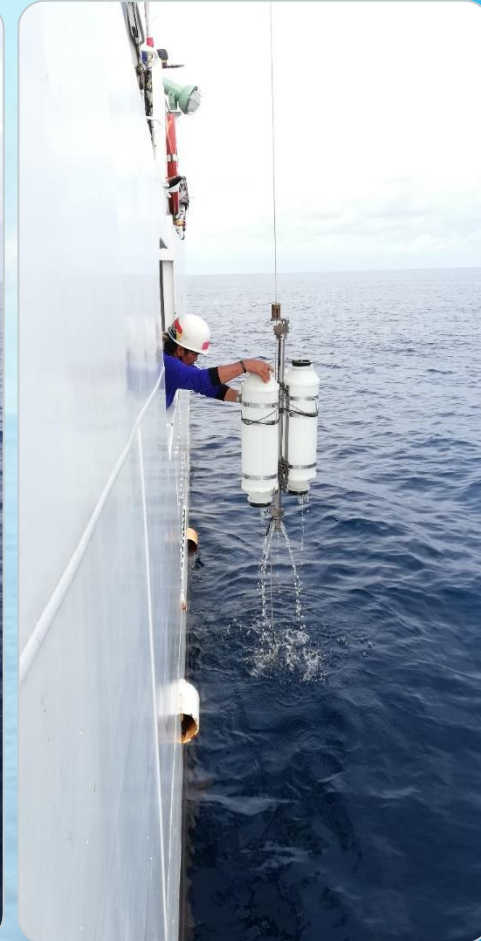
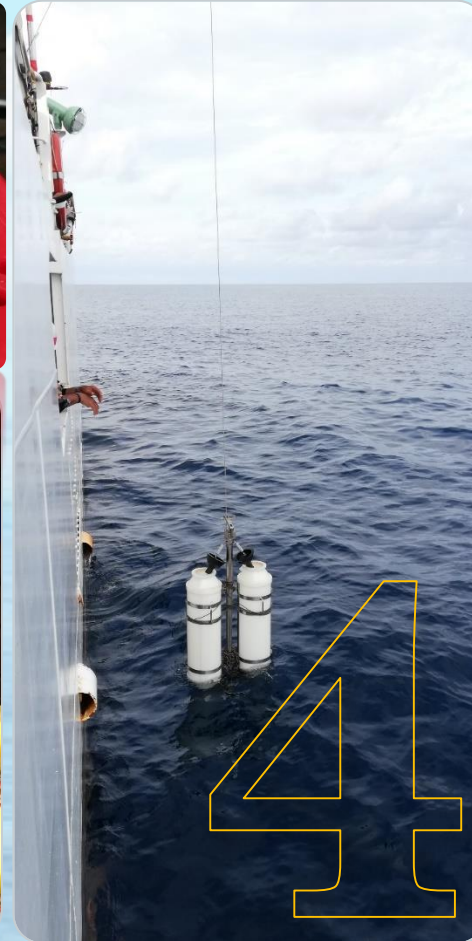
- Features:**
- Compact & lightweight
  - External conductivity sensors
  - High accuracy
  - Solar equipment compatible
  - Large memory capacity
  - Depth up to 6000 meters
  - Handles total pressure
  - Output in physical units
  - On line plotting
  - Auto range for salinity & fluorescence



# VAN DORN BOTTLE SAMPLER

**KU**

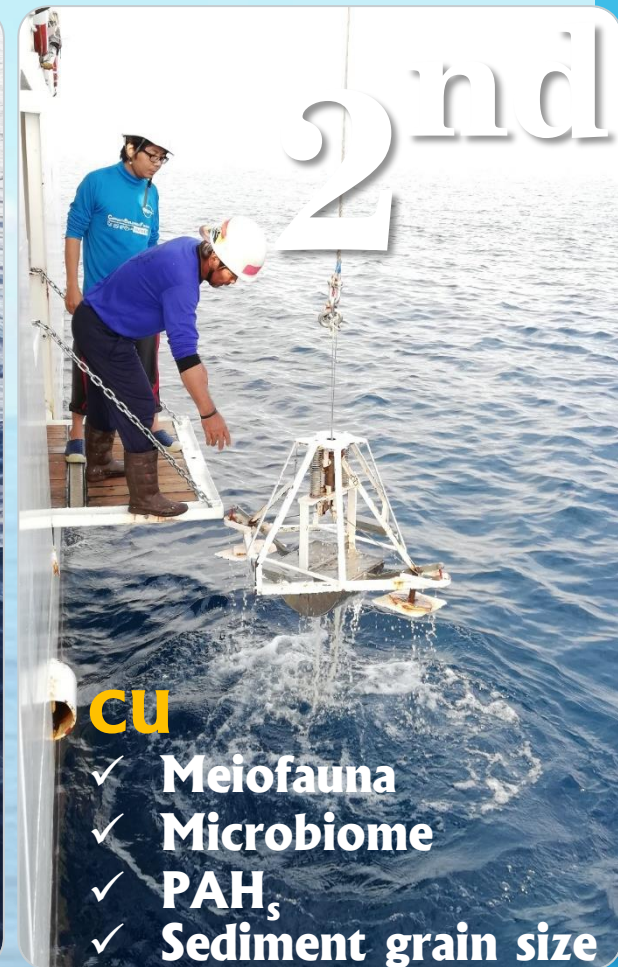
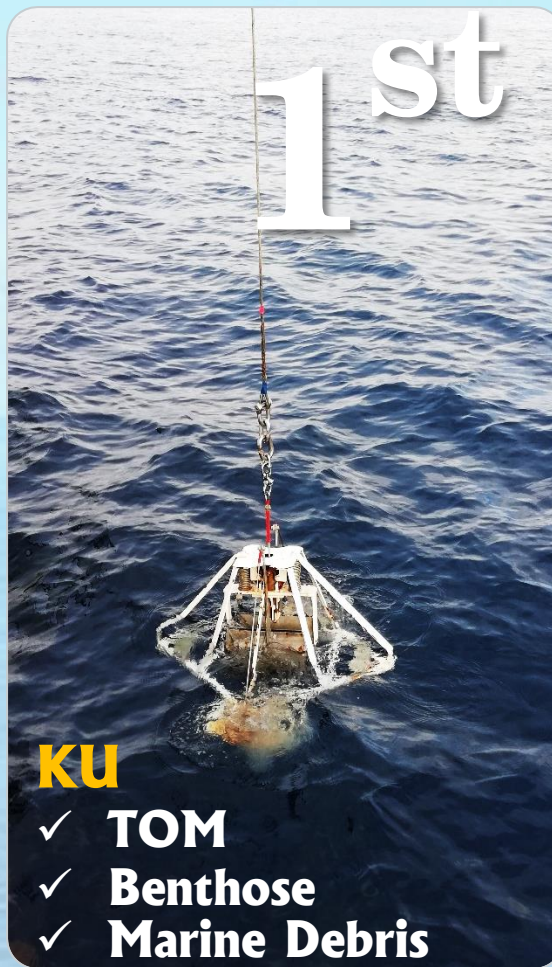
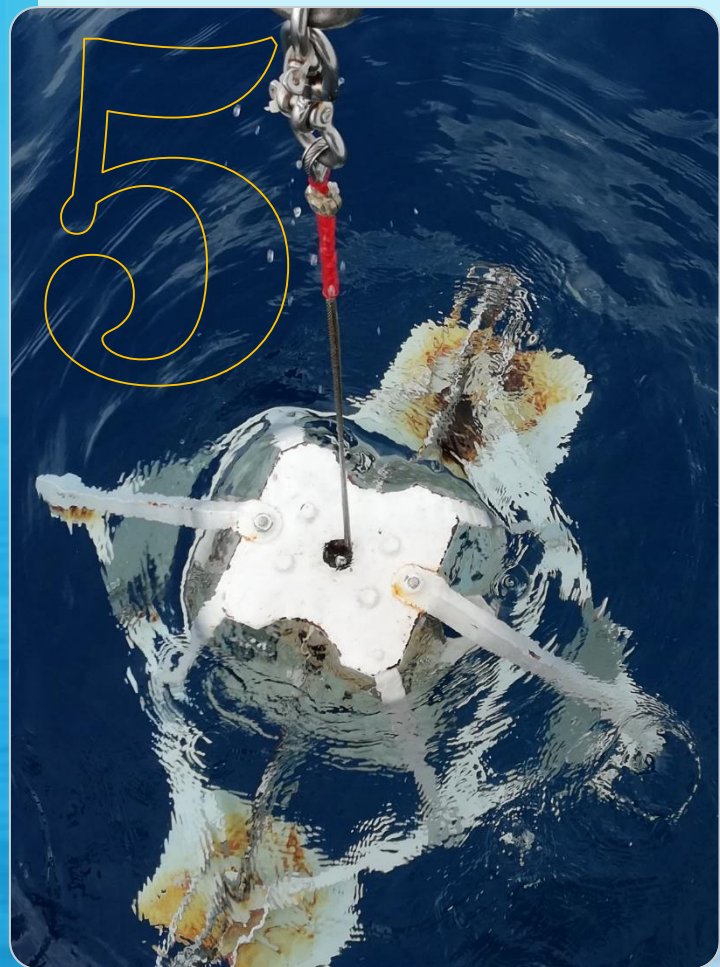
- ✓ Chlorophyll-max Layer
- ✓ CDOM
- ✓ Nutrient



**Phytoplankton**



# SMITH MCINTYRE GRAB





# DROPPED BOTTLE

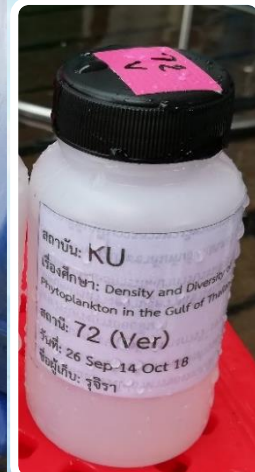


**DMCR**

✓ **TPHs**



# ZOOPLANKTON AND PHYTOPLANKTON (VERTICAL)





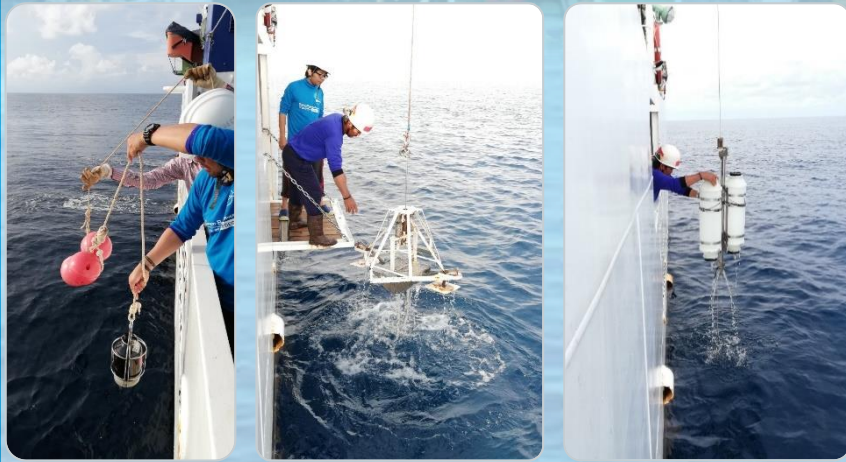
# SECCHI DISC AND FOREL SCALE

9



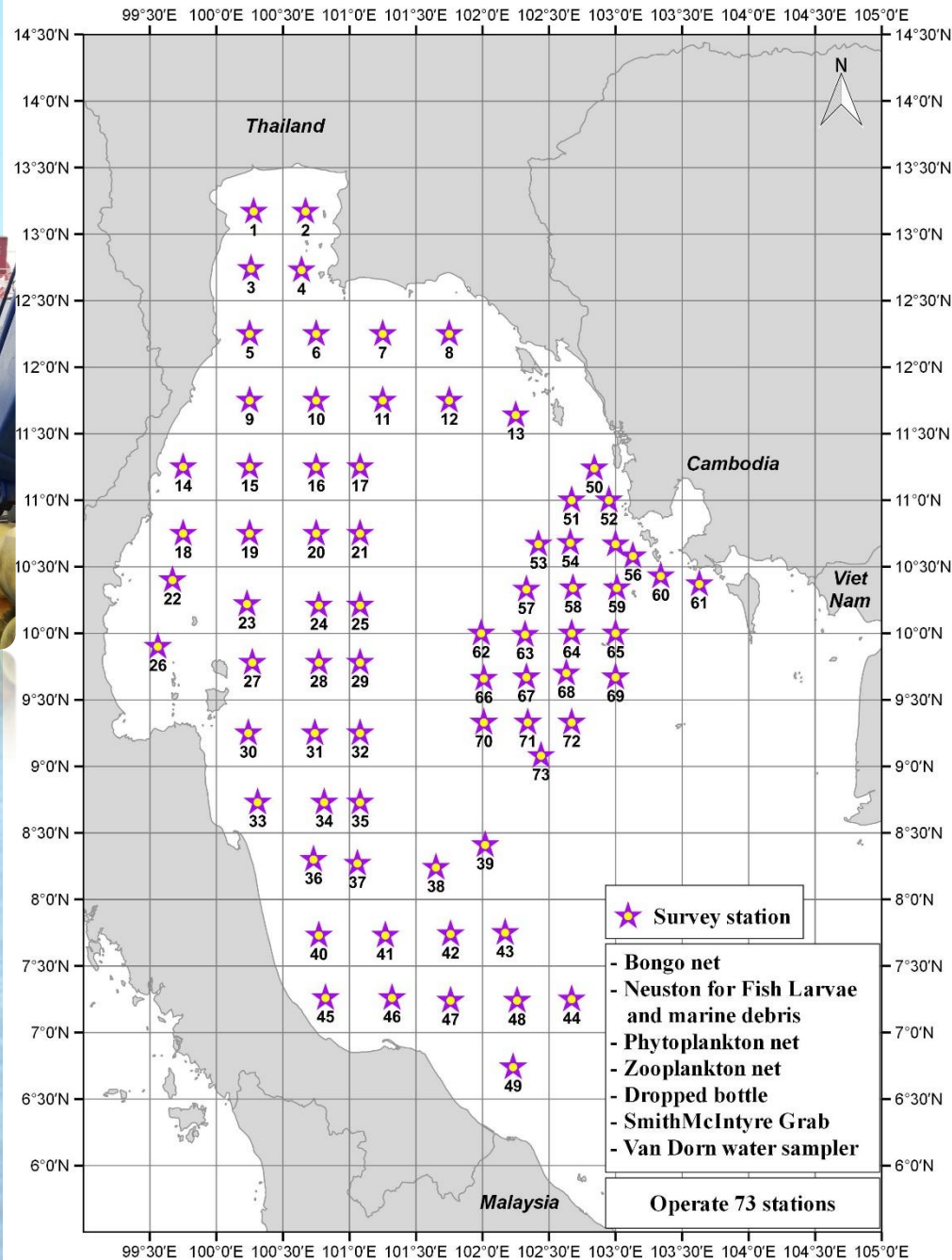


# SAMPLING STATIONS



**73 Station**

Collaborative Research Survey on Marine Fisheries



**73 SAMPLING STATIONS**

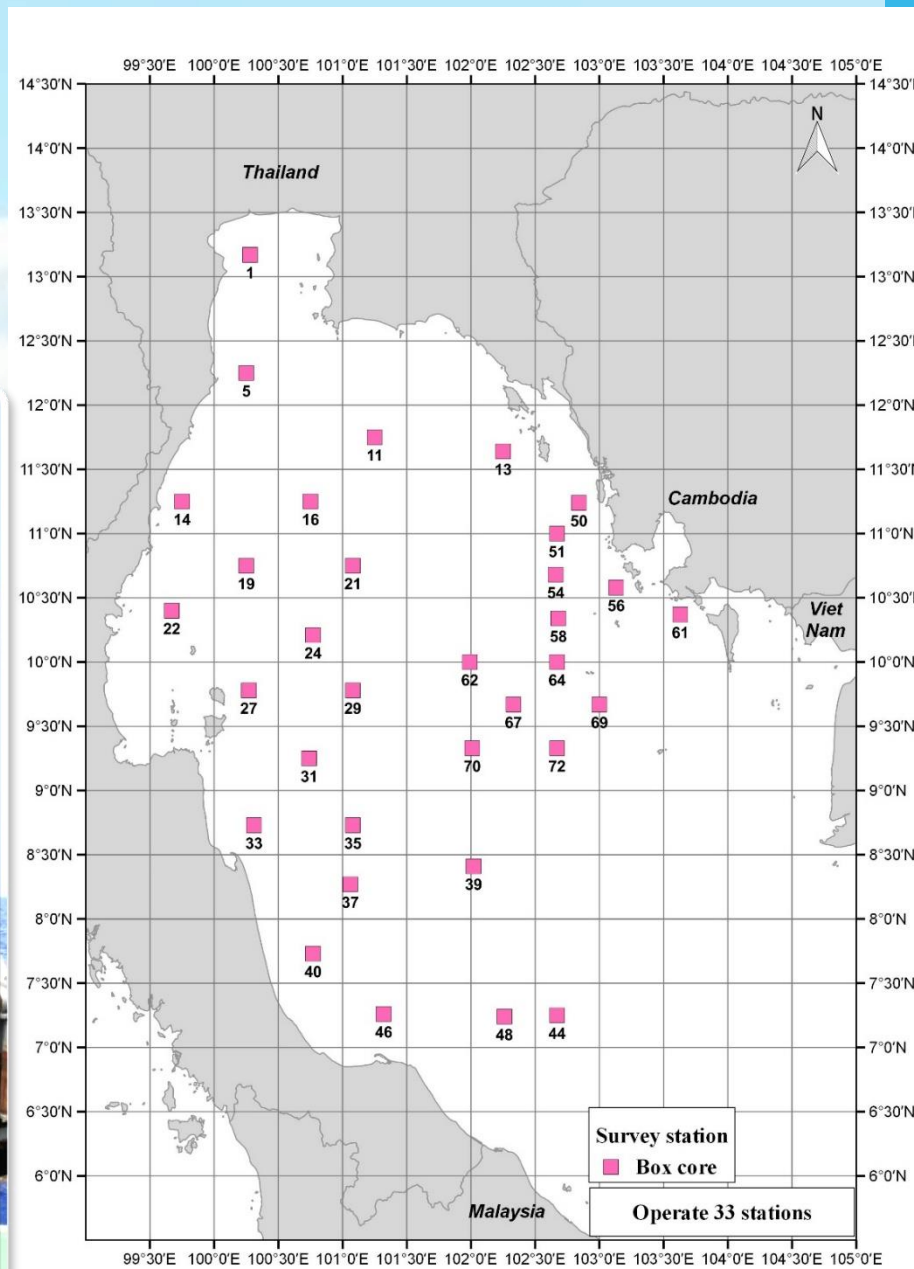




# BOX CORE

**CU**

- ✓ Sediment profile
- ✓ Radiography



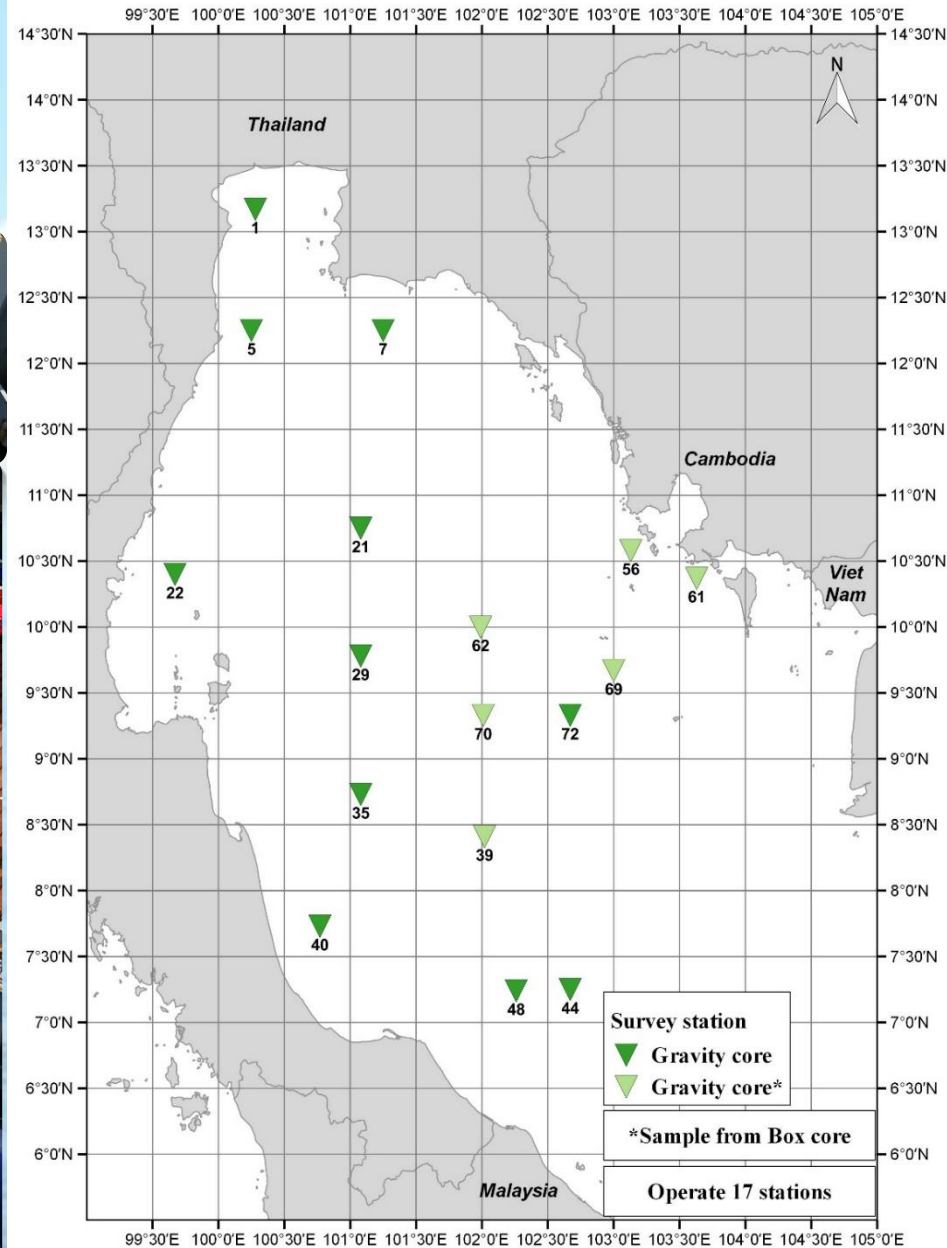
**33 SAMPLING STATIONS**



# GRAVITY CORE

CU

- ✓ Sediment properties
- ✓ Sedimentation rate
- ✓ Mercury and trace metal study



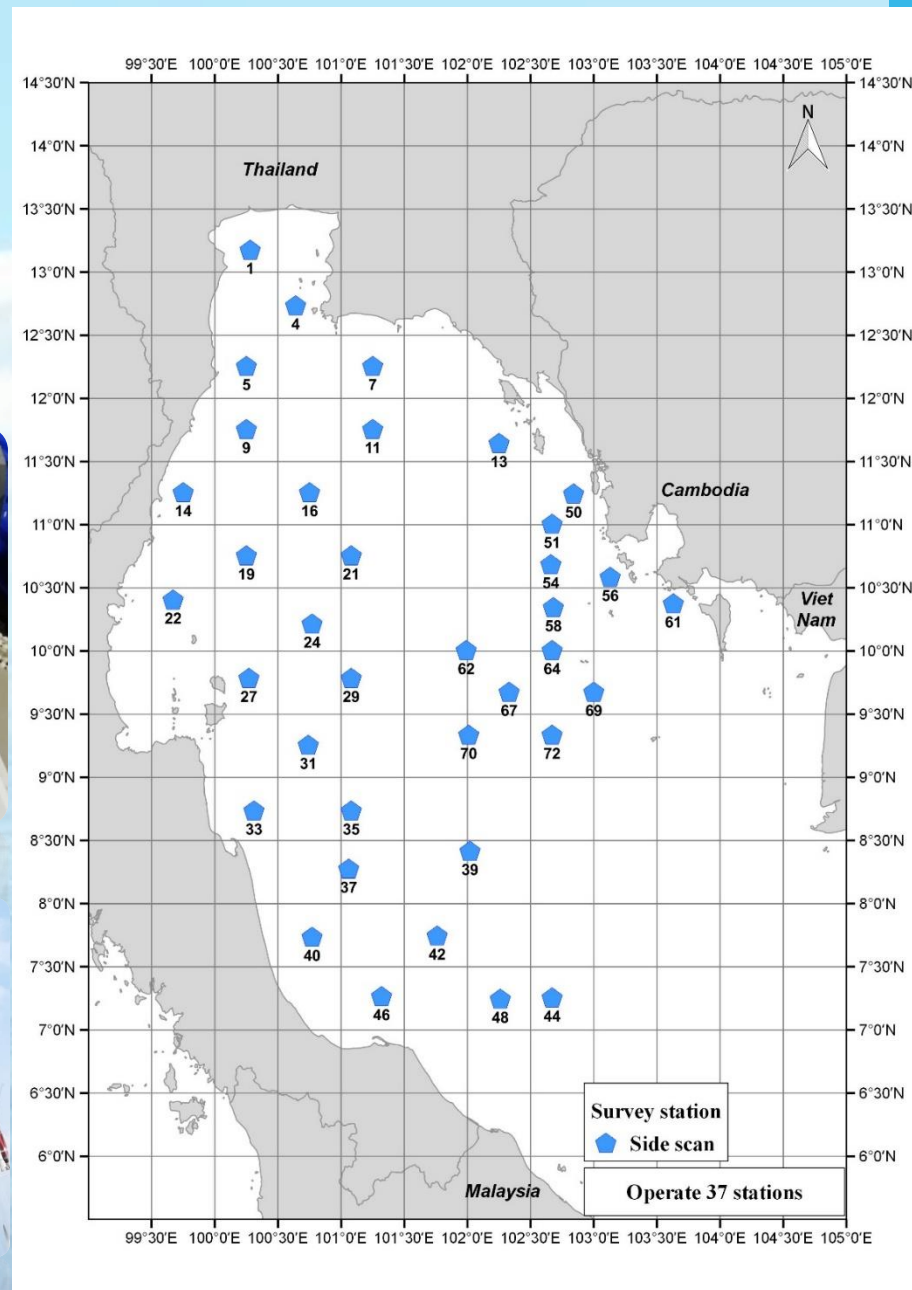
**17 SAMPLING STATIONS**



# STRUCTURE SCAN

## Lowrance Model HDS9 Gen 2 Touch

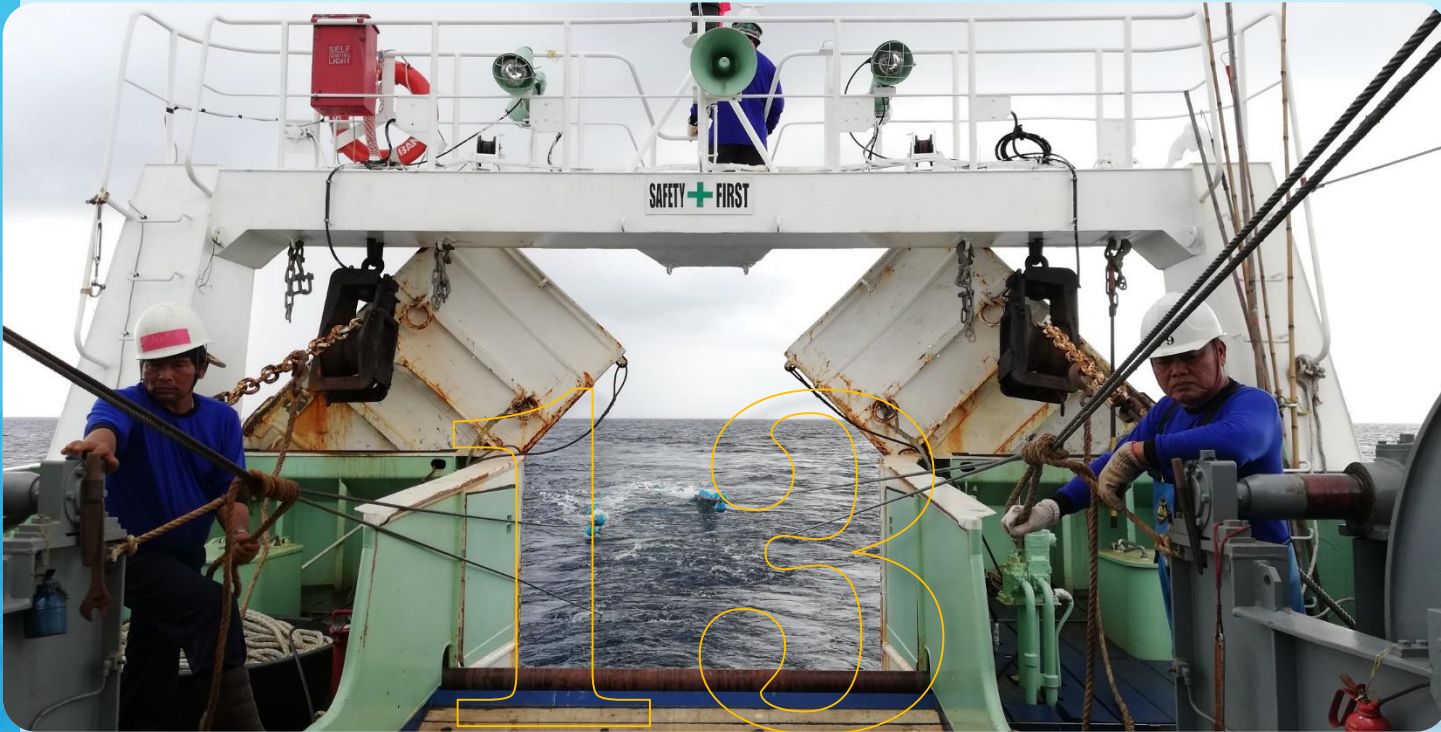
- ✓ 3-4 knots speed of vessel
- ✓ Zigzag track for 15 minutes



**37 SAMPLING STATIONS**

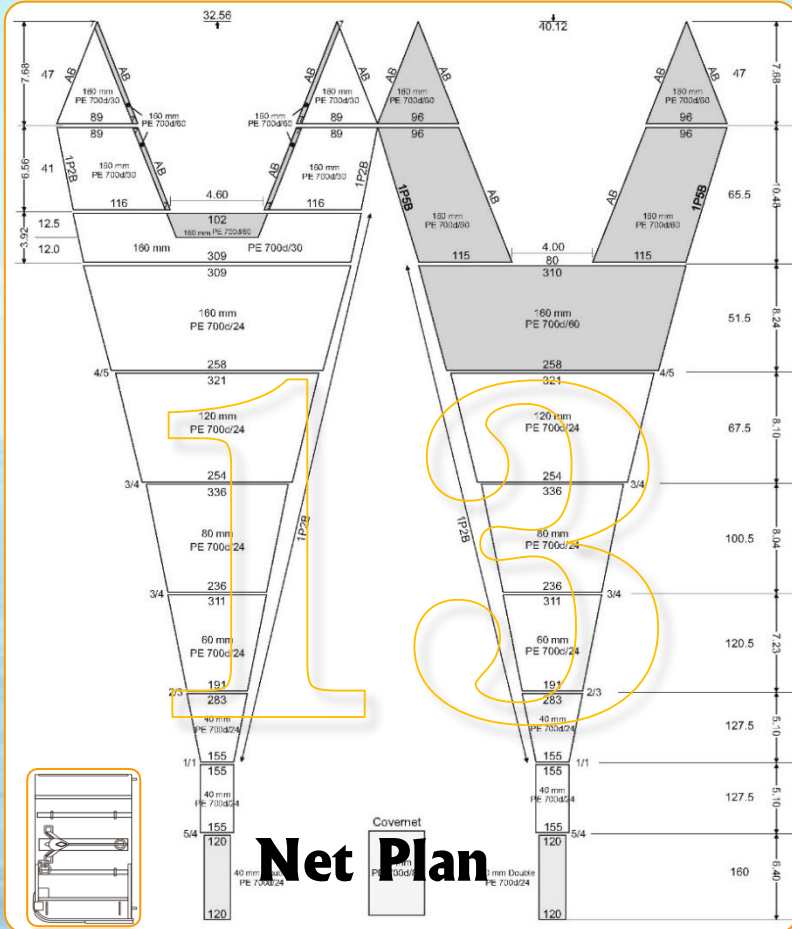


# TRAWL FISHING OPERATION





# TRAWL FISHING OPERATION



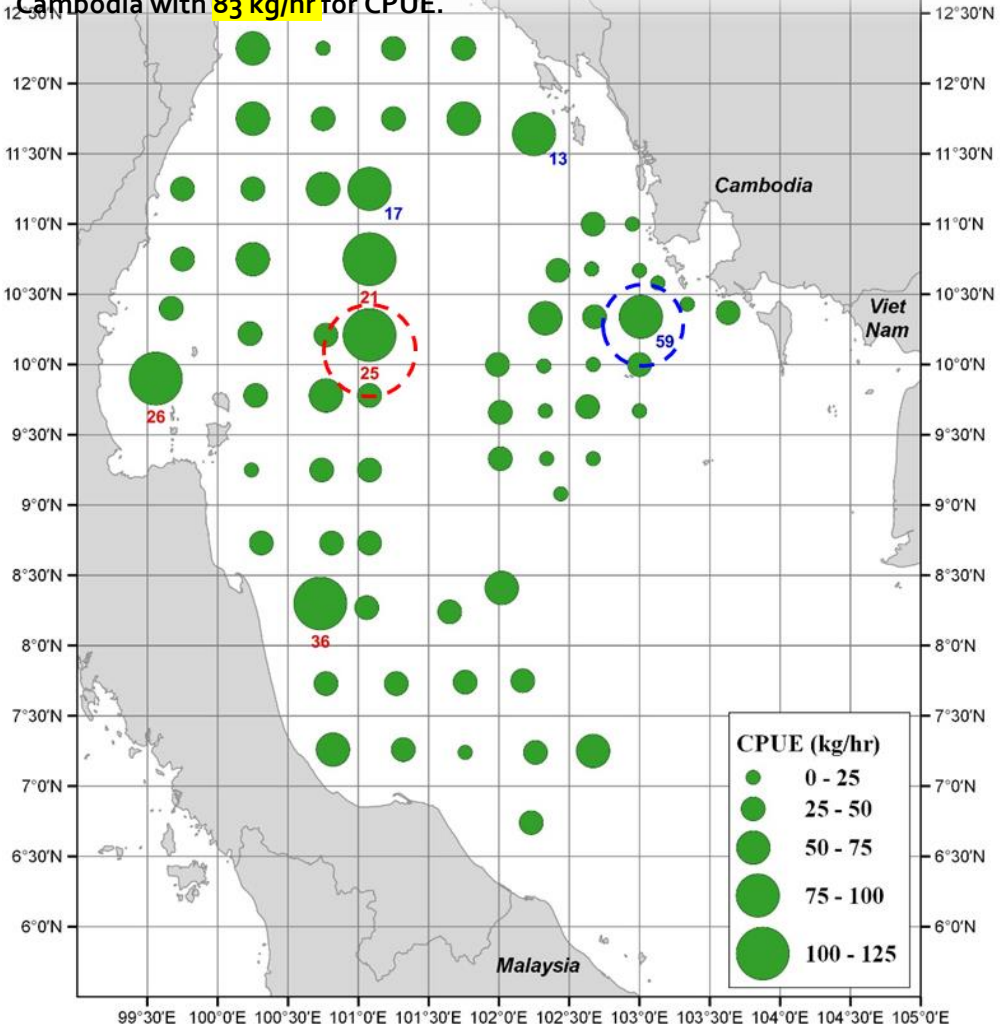
- ✓ Head rope 32.56 m
- ✓ Ground rope 40.12 m
- ✓ Length 66.37 m
- ✓ Codend 40 mm
- ✓ Otter board 1.4x2.2 m

71 operations Avg **41 kg/hr**, 2 stations have been cancelled, **St.No.20** were observed rough bottom condition and **St.No. 50** there are plenty of squid traps were operated in this fishing ground area.

48 operation in Thai water for **48 kg/hr** CPUE

23 operation in Cambodian Water for **26 kg/h** CPUE

4 Stations CPUE over 100 Kg/hr. (Red mark) Max CPUE found Thai water at station No. **25 121 kg/hr**, and Found Good catch at station No.59 in Cambodia with **83 kg/hr** for CPUE.



**71 SAMPLING STATIONS**



# 14

# MARINE DEBRIS VISUAL OBSERVATION



9:38

ファイル ツール おすすめ マイクロソフト 漂流ゴミ調査

漂流ゴミ調査支援アプリ

東京海洋大学  
Tokai University of Marine Science and Technology

内外地図株式会社

Play Music メール Chrome カメラ ギャラリー

2018-10-12 09:34:36 loading... loading... 再取得 (LOCATION)

アイテム (Item) (必須 Required) スタート (Start) 終了 (Finish) 備考 (Remarks) カメラ (Camera) クリア (Clear) 登録 (Register)

漁具 (Fishing gear) 天然物 (Natural) その他不明 (Unknown)

漁網 (FGN) ボンテン (FGF) その他漁具 (FGO) 流れ藻 (SW) 流木 (DW) その他天然物 (NO) その他不明 (UK)

人工物 (Artificial)

発泡スチロール (EPS) レジ袋 (PBA) ペットボトル (PBD) その他プラスチック製品 (PC) ガラス製品 (G) 金属製品 (M) 木材 (W) 食品包装材料 (FP) その他人工物 (UO)

サイズ (Size) (cm)

SS ~20 S 20~50 M 50~100 L 100~200 LL 200~

距離 (Distance) (m)

~5 5~10 10~15 15~20 20~25 25~30 30~35 35~40  
40~45 45~50 50~75 75~100 100~150 150~200 200~

数 (Debris number) (必須 Required)

1 2 3 4 5 約10 約20 多数(M)

色 (Color)

白(W) グレー(Gra) 黒(Bla) 青(bl) 緑(Gre) 黄(Y) 橙(O) 赤(R) 茶(Br) 透明(C)

発見者 (Observer) (必須 Required)

1 2 3 4 5 6 7 8

2018-10-12 09:35:02 再取得 (LOCATION)

初期設定情報 (Initial setting information) (航海名、開始日時は必須 Voyage name and Start time are required)

航海名 (Voyage name)	
開始日時 (Start time)	
終了日時 (End time)	

発見者番号 発見者 (Observer No., Observer) (いずれか必須 Any required)

1	amp	5
2	uchida	6
3	sukchi	7
4	othor	8

基本情報 (Fundamental information)

時間帯 (Time zone)	utc+9	-
記録者 (Recorder)		-
記録場所 (Record place)	左舷(port)	-
眼高 (Eye level)	14	-
コース (Course)	0	度 (Degree)
速力 (Speed)	5.0	ノット (Knot)
天候 (Weather)	快晴(B)	-
風向タイプ (Wind direction type)	1:真風向(true wind direction)	-
風向 (Wind direction)	0	度 (Degree)
風速タイプ (Wind velocity type)	1:真風速(true wind velocity)	-
風速 (Wind velocity)	0.0	m/s
海況 (Sea conditions)	0:鏡のようになめらかである。(.)	-
グレア率タイプ (Glare type)	1:グレア率(glare)	-
グレア率 (Glare)	0	%



2018-10-12 09:34:36 loading... loading... 再取得 (LOCATION)

アイテム (Item) (必須/Required)

スタート (Start) 終了 (Finish) 備考 (Remarks) カメラ (Camera) クリア (Clear) 登録 (Register)

漁具 (Fishing gear) 天然物 (Natural) その他不明 (Unknown)

漁網 (FGN) ポンデン浮子 (FGF) その他漁具 (FGO) 流れ藻 (SW) 流木 (DW) その他天然物 (NO) その他不明 (UK)

人工物 (Artificial)

発泡スチロール (EPS) レジ袋 (PBA) ペットボトル (PBO) その他プラスチック製品 (PC) ガラス製品 (G) 金属製品 (M) 木材 (W) 食品包装材料 (FP) その他人工物 (UO)

サイズ (Size) (cm)

SS ~20 S 20~50 M 50~100 L 100~200 LL 200~

距離 (Distance) (m)

~5 5~10 10~15 15~20 20~25 25~30 30~35 35~40  
40~45 45~50 50~75 75~100 100~150 150~200 200~

数 (Debris number) (必須/Required)

1 2 3 4 5 約10 約20 多数(M)

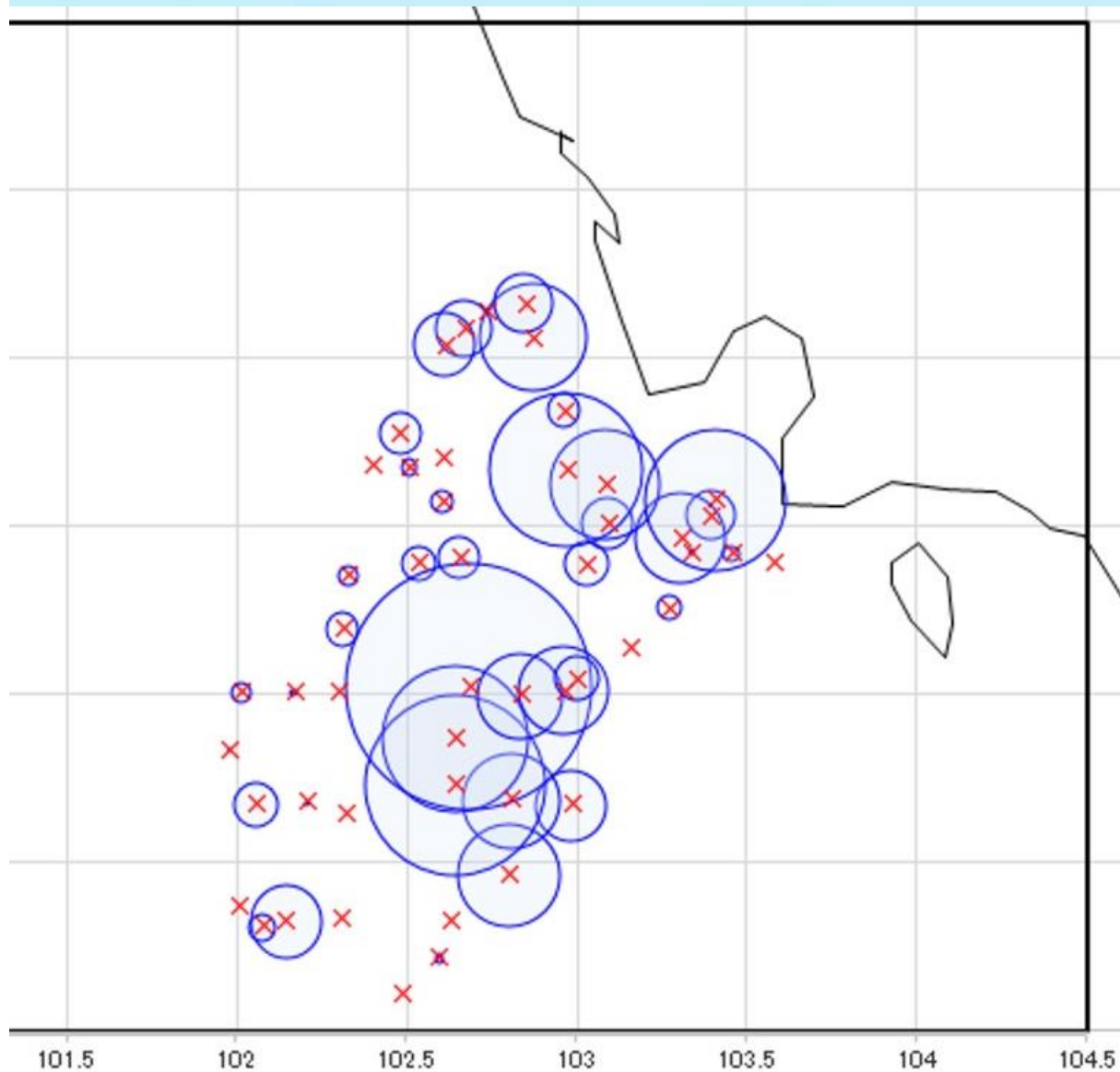
色 (Color)

白(W) グレー (Gra) 黒 (Bla) 青 (blu) 緑 (Gre) 黄 (Y) 橙 (O) 赤 (R) 茶 (Br) 透明 (C)

発見者 (Observer) (必須/Required)

1 2 3 4 5 6 7 8

# PLASTIC BOTTLE HORIZONTAL DISTRIBUTION





# HAND-HELD SUN PHOTOMETER

✓ Dust measurement



# Survey Activities: Summary Activities

Leg survey	Number of survey station	Trawl Fishing	CTD with Rosette	Van dorn	Drop Bottle	Smith McIntyre	Box core	Gravity core	Bongo Net	Neuston Net	Zooplankton net	Structure scan	Bucket surface	Hand-held sun photometer	Marine Debris
1 <sup>st</sup>	13	13	13	13	13	13	6	3	13	13	13	13	13		
2 <sup>nd</sup>	16	15	5	16	16	16	8	3	16	16	16	16	16		
3 <sup>rd</sup>	12	12	11	12	12	12	6	3	12	12	12	12	12		
4 <sup>th</sup>	8	8	8	8	8	8	3	3	8	8	8	4	8		
5 <sup>th</sup>	24	23	24	24	24	24	12	1	24	24	24	12	24	★	★

★ ; Operated everyone hour during the daytime (8:00 a.m. to 5 p.m.)

★ ; The observation conducted when the ship sailing during the daytime



# Expected Research Studies

## Fisheries Resources

1. Fisheries Resource Survey in the Gulf of Thailand off Thailand and Cambodia by Using Bottom Trawl ([Prasit Kongpornprattana](#), [Weerapol Thitipongtrakul](#), [Sakol Pheaphabrattana](#), and [Pavarot Noranartragoon](#))

## Primary Productivity

2. Macronutrient distribution in the Gulf of Thailand during the 2018 southwest monsoon ([Chawalit Charoenpong](#), [Penjai Sompongchaiyakul](#), [Sujaree Bureekul](#), [Supranee Wattanapongsakul](#), [Suparat Srisaard](#), [Tanakorn Ubonyaem](#), [Jariya Kayee](#), and [Isara Chanrachkij](#))
3. Carbon dioxide fluxes and chlorophyll-a distribution in the Gulf of Thailand during 2018 Southwest Monsoon ([Sujaree Bureekul](#), [Sompongchaiyakul](#), [Chawalit Charoenpong](#), [Supranee Wattanapongsakul](#), [Suparat Srisaard](#), [Tanakorn Ubonyaem](#), [Jariya Kayee](#), and [Isara Chanrachkij](#))
4. Distribution of Phytoplankton in the Gulf of Thailand ([Phornphisut Senpradit](#), [Shettapong Maksumpun](#), [Nissara Thavonsod](#), [Oning Veschasit](#), [Chakhrit Ruengsorn](#), and [Songpao Samuchchanon](#))

# Expected Research Studies

## Fisheries Oceanography

5. Sediment texture and organic carbon in surface sediment of the Gulf of Thailand ([Penjai Sompongchaiyakul](#), Tanakorn Ubonyaem, Sujaree Bureekul and Isara Chanrachkij)
6. Water column conditions: Their roles to the environment in the Gulf of Thailand ([Anukul Buranapratheprat](#), Siraporn Tong-U-Dom, Pontipa Luadnakrob, and Sukchai Arnupapboon)
7. Three-dimensional water circulation in the Gulf of Thailand during southwest monsoon ([Pacharamon Sripoonpan](#), Patama Singhruck, Pontipa Luadnakrob and [Suriyan Saramul](#))
8. Vertical texture and organic carbon in four short core sediments of the Gulf of Thailand ([Penjai Sompongchaiyakul](#), Pilartrut Sing-in, Sujaree Bureekul, Tanakorn Ubonyaem, and Sukchai Arnupapboon)
9. Vertical variation of mercury contamination in four short core sediments of the Gulf of Thailand ([Penjai Sompongchaiyakul](#), Chanakarn Suphanthong, Sujaree Bureekul, Tanakorn Ubonyaem, and Sukchai Arnupapboon)
10. Distribution of CDOM in Surface Water and Sub-surface Chlorophyll Maxima Depth around the Gulf of Thailand ([Jitraporn Phaksopa](#), Joji Ishizaka, Pontipa Luadnakrob, and Jutarak Luang-on)
11. Seasonal Change of Water Exchange System between the Gulf of Thailand and South China Sea ([Jitraporn Phaksopa](#), Pontipa Luadnakrob, and Hiroji Onishi)



# Expected Research Studies

## Environment Study

12. The Study of Sediment Distribution Coefficients ( $K_d$ ) for Radionuclides in the Gulf of Thailand ([Darunwan Chuenbubpar](#), Chitsanupong Khrautongkieo, Nattchakarn Nakkaew, Rungsuk Suwanklang, Yutthana Tumnoi, and Isara Chanrachkij)
13. Natural and Artificial Radionuclides in Sediment and Seawater from the Gulf of Thailand ([Yutthana Tumnoi](#), Chitsanupong Khrautongkieo, Nattchakarn Nakkaew, Rungsuk Suwanklang and Isara Chanrachkij)
14. Total Petroleum Hydrocarbons (TPHs) in Surface Seawater in the Gulf of Thailand ([Suthida Kan-atireklap](#), Supawat Kan-atireklap, Cheerasak Butjan, Sadayu Rupraman)
15. Mercury contamination in surface sediment of the Gulf of Thailand ([Tanakorn Ubonyaem](#), Penjai Sompongchaiyakul, Sujaree Bureekul and Isara Chanrachkij)
16. Metal composition of aerosol over the Gulf of Thailand during 2018 Southwest Monsoon ([Jariya Kayee](#), Sujaree Bureekul, Penjai Sompongchaiyakul, Reshmi Das, Xianfeng Wang, and Sukchai Arnupapboon)
17. Vertical variation of mercury contamination in four short core sediments of the Gulf of Thailand (Penjai Sompongchaiyakul, Chanakarn Suphanthong, Sujaree Bureekul, Tanakorn Ubonyaem, and Sukchai Arnupapboon)
18. Mercury level and health risk through the consumption of Threadfin bream (*Nemipterus* spp.) from The Gulf of Thailand ([Irwan Ramadhan Ritonga](#), Penjai Sompongchaiyakul, Sujaree Bureekul, Tanakorn Ubonyaem)
19. Accumulation of Microplastics in waters and sediments in the Gulf of Thailand ([Suchana Chavanich](#), [Niranjana Divakaran](#), Pontipa Luadnakrob, Sukchai Arnupapboon)
20. Distribution of bottom debris in the Gulf of Thailand (Penchan Laongmanee, Wirote Laongmanee, Nakaret Yasook and Chalerm Phusririt)

# Expected Research Studies

## Fisheries Biology

21. Species and Distribution of Cephalopod in the Gulf of Thailand surveyed by M.V.SEAFFDEC 2 ([Charuay Sukhsangchan](#), [Sonthaya Phuynoi](#), [Yaowaluk MonThum](#), and [Nipa Kulanujaree](#))
22. Species and Distribution of Cephalopod Paralarvae in the Gulf of Thailand surveyed by M.V. SEAFFDEC 2 ([Yaowaluk MonThum](#), [Sonthaya Phuynoi](#), [Nipa Kulanujaree](#), and [Charuay Sukhsangchan](#))
23. Fish Larvae Distribution and Abundance of Families Scombridae and Engraulidae in the Gulf of Thailand ([Rakkiet Punsri](#), [Niracha Songkaew](#), [Piyawan Hussadee](#), [Siwasak Khongchim](#), [Patinya Srisumran](#), [Teerapong Duangdee](#), [Kornrawee Aiemsomboon](#), and [Kong Kimyan](#))
24. Brownbanded bambooshark (*Chiloscyllium punctatum*) in the Gulf of Thailand: comparison between hard parts and length frequency data ([Supapong Pattarapongpan](#), [Norawit Wongsawat](#), [Sontaya Koolkalaya](#), [Rakkiet Punsri](#), [Thanitha Darbanandana](#), [Takashi F. Matsuishi](#), and [Tuantong Jutagate](#))
25. Preliminary assessing the impacts of fishing on aquatic animal assemblages in the Gulf of Thailand using the abundance - biomass curves ([Tuantong Jutagate](#), [Sontaya Koolkalaya](#), [Sukchai Arnupapboon](#) and [Thanitha Darbanandana](#))
26. Occurrence of ectoparasite in the brown-banded bamboo shark (*Chiloscyllium punctatum*) from the Gulf of Thailand ([Patcharee Khrukhayan](#), and [Wiriya Chairoj](#))
27. A survey of external parasites in marine fishes from the Gulf of Thailand ([Thanyachanok Bunlungdech](#), [Supanee Leethochawalit](#), [Penchan Laongmanee](#), [Worrawit Maneepitaksanti](#), and [Molruedee Sonthi](#))
28. A preliminary study of species diversity of Amphipods and micromollusks from the Gulf of Thailand ([Pongrat Damrongrojwattana](#), and [Koraon Wongkamhaeng](#))
29. Composition and abundance of zooplankton in the Gulf of Thailand ([Itchika Sivaipram](#), [Porntep Punnarak](#), [Tipawan Bunpent](#), [Kunita Kokubo](#), and [Vichaya Gunbua](#))



# Expected Research Studies

## Other Subject

30. Mapping of underwater habitat from low-cost sonar imagery and Geographic Information System (Suwijak Jirakansakul, Wirote Laongmanee, and Nakaret Yasuk)
31. Sustained Utilization of SEAFDEC Vessel through Collaborative Research Surveys: Marine Resources Survey of the Gulf of Thailand using M.V. SEAFDEC 2 (Sukchai Arnupapboon, Suy Serywath, Pavarot Noranarttragoon, Nguyen Van Minh, Taweebiet Amornpiyakrit, and Isara Chanrachkij)

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**CREW of M.V. SEAFDEC 2 and M.V. SEAFDEC and SHIP and FLEET OPERATION SECTION**  
**Mr. Suchart Kijsumut and Logistic Officers**





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