FISHERIES *REFUGIA* PROFILE in Cambodia

ESTABLSIHMENT AND OPERATION OF A REGIONAL SYSTEM OF FISHERIES REFUGIA IN THE SOUTH CHINA SEA AND GULF OF THAILAND

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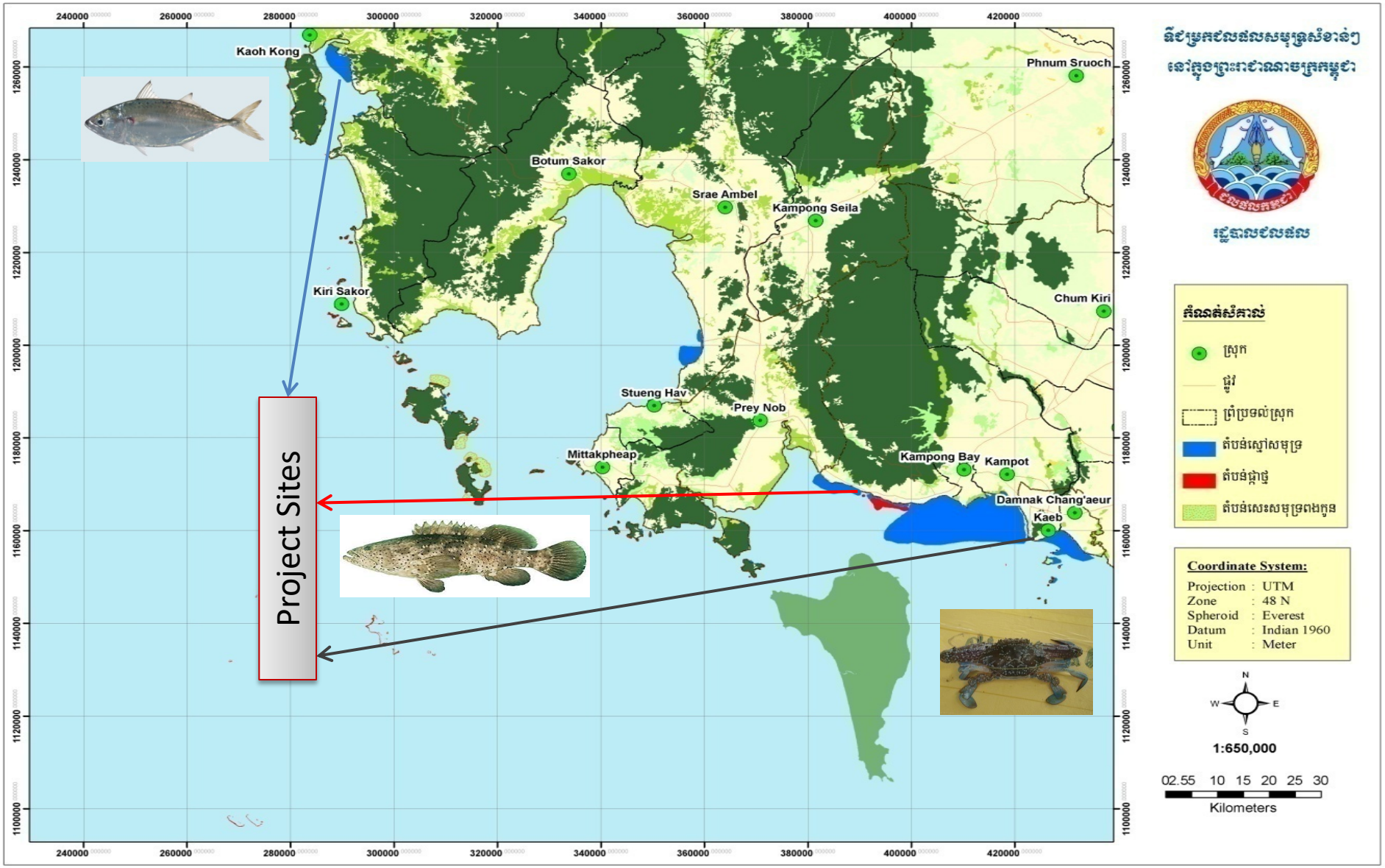
Classic Hoang Long Hotel, Hai Phong, Vietnam

1. PROJECT SITES



2. Geographic location:

Coordinate System by DATUM WGS 84

No.	Fisheries Refuguia Stie in Kep		Fisheries Refuguia Stie in Koh Kong		Fisheries Refuguia Stie in Kampot	
	Axis X	Axis Y	Axis X	Axis Y	Axis X	Axis Y
1	423116	1156590	282377	1268254	382441	1172512
2	425465	1156590	281280	1269992	383684	1171138
3	427983	1156590	279690	1272269	386075	1170367
4	430221	1155250	277268	1271174	387735	1169982
5	432582	1153840	277813	1270344	389382	1169150
6	431881	1151280	278294	1269592	391199	1168256
7	431242	1148940	278746	1268905	393229	1167326
8	430568	1146470	279161	1268570	395965	1166288
9	429338	1145600	280372	1267030	398716	1165876
10	427830	1144520			399789	1165970
11	422645	1144520			398789	1161564
12	419470	1144520			390925	1163877
13	420403	1147600			386383	1165318
14	421340	1150700			382784	1166554
15	422317	1153940			379214	1168819
16					382441	1172512

3. Site Information

3.1 Geography and Population

Province	Location	Land Area	Total Population
Kep	in southern Cambodia and is bordering to north with Kampot and South with Gulf of Thailand and Vietnam	187.25 km²	41,798
Koh Kong	in the West of the country and is bordering to the North with Pursat, to West with the Gulf of Thailand and to the South with Sihanouk ville.	10,045 km²	123,618
Kampot	in south-west part of the country and is joined boundary by Kampong Speu to the north, Takeo to the east, Kep and Vietnam as well as a long coastline on the Gulf of Thailand to the south and Preah Sihanouk to the west	4,873 km²	592,845

MoP, Report of Population Census of Cambodia in 2019

3.2 Socio Economy Status

Province	Socio economic status
Kep	Main occupation of people in Kep is depending on natural resources such as natural tourism field, fishing, salt farm, and rice field farming. So tourism and fishing activities have contributed very much to the enhancement of livelihood of people in Kep.
Koh Kong	Main income of people in Koh Kong is depending on agriculture and tourism field contributing very much to people economic development in Koh Kong, especially fishing activities.
Kampo	Main income of people in Kampot is depending on agriculture and tourism field contributing very much to the enhancement of livelihood of people in Kampot. Agricultural field consist of back pepper, durian, rubber, and salty farms. Tourism part are Historical/cultural areas, Wildlife sanctuaries and protected areas, and Preah Monivong National Park at 140,000 hectares in Bokor mountain

3.3. Important Coastal Habitat

Provinces	Mangroves (ha)	Coral Reef (ha)	Sea grass (ha)
Kep	1005	52	2,790
Koh Kong	62,000	602	3,993
Kampot	1,900	953	25,000
Total	64905	1607	31783

Source: DFC/FiA 2014

These habitats provide benefit to marine fisheries resource for feed, spawning habitat, nursery area, and hiding place.

3.4 Types of Fishing Vessel Operating in FR Sites

Province	Type of Fishing Vessel
Kep	-Length of fishing vessel = 7-9.5 m - Boat capacity= 5-13hp
Koh kong	-Length of fishing vessel= 6.5-9.5 -Boat capacity from 6-12hp
Kampot	-Length of fishing vessel = 7-9.5m - Boat capacity= 6.5-13hp

3.5 Species and size selectivity of principle fishing gear used

Province	Target species	Type of fishing gear used
Kep	Crab, shrimp, and fish	Crab gillnet, crab trap, fish gillnet, and trawl
Koh kong	Fish , shrimp, crab, and squid	Trawl, fish gillnet, crab gillnet, and crab trap
Kampot	Fish, blood cockle, shrimp, and crab	Fish gillnet, crab gillnet, crab trap, and trawl

3.6 Role of fisheries *refugia* in fish production

✓ Contributing to ensuring fish and crab stock in nature
✓ Reducing illegal fishing, and
✓Increasing in catching rate

3.7 Number of fisheries community in FR Site

Province	Number of Fisheries Community
Kep	Kep Cfi = 103 member and Dorng Klol Cfi=150 member
Koh Kong	1 CFi (Peam Krasob Community Fisheries) There are 340 members in CF
Kampot	Tropaing Ropaov Cfi= 548 members Prek Thnaon Cfi= 244 members

3.8 Existing fisheries management measure in FR Area

Province	Existing fisheries management Measure
Kep	Establishing two management committee for management for fisheries refugia at provincial level including FiA, FiAC, DoA, provincial line departments, and private sector: 1- Management Committee for Marine Fisheries Management Area chaired by Provincial Governor 2- Technical Working Group for Marine Fisheries Management Area chaired by Deputy Governor
Koh Kong	Planed to establishment one management committee for mackerel fisheries refugia will be approved officially this quarter 2020
Kampot	Not yet, still discuss with provincial authorities

3.9 Usage of refugia by threatened and endangered marine species

Contributing to protecting and restoring marine endangered species. For example dolphin now is increasing in fisheries refugia site in Koh Kong and Kep

4. Priority species information

Species	Local Name	Common Name
Rastrelliger Brachysoma	Trey Kamom Kan Tuy Kley	Short mackerel
Portunus pelagicus	Kdam Ses	Blue swimming crab
Epinephelus coioides	Trey Toke Kao	Oranges spotted

4.1 Morphology and Distribution

Species	Morphology character	Distribution
Rastrelliger Brachysoma	•Spinous dorsal fin yellowish with a black edge • Pectoral and pelvic fin dusky , other fins yellowish • Body very deep, its dept at posterior margin of opericle 3.7 to 4.3 times	It is found in Central Indo-West Pacific from the Andaman Sea east to Thailand, Indonesia, Papua New Guinea, Philippines, Solomon Islands and Fiji
Portunus pelagicus	• Body color is light blue and white spot pattern on full carapace	It is found in West Pacific Oceans including Japan, and Philippines troughout Southeast and East Asia, to Indonesia, the East of Australia, and Fidji Islands, and westward to the Red Sea and East Africa.
Epinephelus coioides	Head and body is full color with brownish orange spot in head to caudal fin	It is found in Indo-West Pacific including a Africa, Asia , Solomon Islands and Fiji, and Australia

4.2 Life cycle of Species and Mating behavior

Species	Life cycle of Species and Mating behavior
Rastrelliger Brachysoma	✓The larval stage ✓Juvenile stage, ✓Adults can reach 15 cm ✓Spawning period from November to May
Portunus pelagicus (*Sophana Chap et all, 2012*)	The blue swimming crab's lifecycle is divided into 3 main stages: the larval, juvenile and adult stages. ✓The larval stage includes the zoea and megalopa stages. The development from zoea to megalopa takes 12 days . ✓Juvenile stage, crabs can reach a size of 4 to 6 mm ✓Adults can reach a maximum size of 14 to 15cm ✓Spawning period from May to September
Epinephelus coioides	✓The larval stage takes 7-10days. ✓Juvenile stage can reach 45-50days ✓Adults can reach weight of 300 to 400g after 8 to 12 month of growth . ✓Spawning period from Mar to June

4.3 Length at First maturity /Size/Weight /Age

Species	Length at First maturity /Size/Weight /Age
Rastrelliger Brachysoma	Length at First Maturity= total length of 16.83 for male and 17.18cm for female Size= maximize size of 17.15cm for male and 17.70 cm for female Weight= 55.05g for male and 58.01 for female Age= ??
Portunus pelagicus	Length at First Maturity= carapace size of 10.5 cm for females and 9.6 cm for males Size= maximum size of 14 to 15 cm Weight= ?? Age= ??
Epinephelus coioides	Length at First Maturity= 25-30 cm Size= 55-75 Weight= 15kg Age= 2-3years

4.4 Gonadosomatic index and size frequency

- Short Mackerel (*Rastrelliger Brachysoma*)

Gonad stage	GSI Value for Male	GSI Value for Female
Immature (I)	0.35	0.29
Mature (II)	0.6	0.72
Ripening (III)	1.02	1.28
Ripe (IV)	1.72	2.07
Spent (V)	0.9	0.94

Field Research, 2019 on baseline survey of short mackerel in Koh Kong

4.4 Gonadosomatic index and size frequency

- Blue swimming crab (*Portunus pelagicus)*

Gonad stage	GSI Value for Male	GSI Value for Female
Immature (I)		
Mature (II)		
Ripening (III)		
Ripe (IV)		
Spent (V)		

4.4 Gonadosomatic index and size frequency
- Oranges spotted(*Epinephelus coioides)*

Gonad stage	GSI Value for Male	GSI Value for Female
Immature (I)		
Mature (II)		
Ripening (III)		
Ripe (IV)		
Spent (V)		

4.4 Gonadosomatic index and size frequency

- *Epinephelus coioides*

GSI Value	Gonad stage	Size frequency
<1	Immature (I)	
1-5	Maturing (II)	
5-10	Ripening (III)	
10-20	Ripe (IV)	
>20	Spent (V)	

Dawi et al, 2019: The gonad maturity development and spawning season of orange-spotted grouper (Epinephelus coioides) at Kwandang Bay, Gorontalo Province, Indonesia

4.5 Area of Habitat in each stage/migration pattern

- *Rastrelliger Brachysoma*

Gonad stage	Habitat for each stage	Migration pattern
Immature (I)		
Maturing (II)		
Ripening (III)		
Ripe (IV)		
Spent (V)		

4.5 Area of Habitat in each stage/migration pattern

- Portunus pelagicus (Blue swimming crab)

Gonad stage	Habitat for each stage	Migration pattern
Immature (I)		
Maturing (II)		
Ripening (III)		
Ripe (IV)		
Spent (V)		

4.5 Area of Habitat in each stage/migration pattern

- *Epinephelus coioides*

Gonad stage	Habitat for each stage	Migration pattern
Immature (I)		
Maturing (II)		
Ripening (III)		
Ripe (IV)		
Spent (V)		

4.6 Importance of site to life cycle of fish species as nursery/spawning/feed

- Fisheries Refugua site in Kep is rich of sea grass and fine sand, which provide feed, spawning, and nursery habitat of blue swimming during May to July.

- Fisheries Refugia site in Koh Kong is rich of feed for spawning and growth of mackerel

  Especially, that site is shallow water, providing suitable condiction for spawning and nursery habitat of mackerel November to January at Koh Kapi, Prek 3& 2, Boeung Kachang, Koh Yor, and Koh Nou

- Fisheries Refugia Site in Kampot is rich of sea grass, coral reef, mangroves which provide feed, spawning , and nursery habitat of grouper.

4.7 CPUE/Stock Size/MSY

*(**Sam Arth, 2014 : Status of Fisheries Resource along Coastal Cambodia:** A case study in trans-boundary area between Cambodia (Kep, Kampot and Preah Sihanouk provinces) and Vietnam (Kien Giang province, Phu Quoc island) in Gulf of Thailand)*

- CPUE for Crab gillnet in Kep

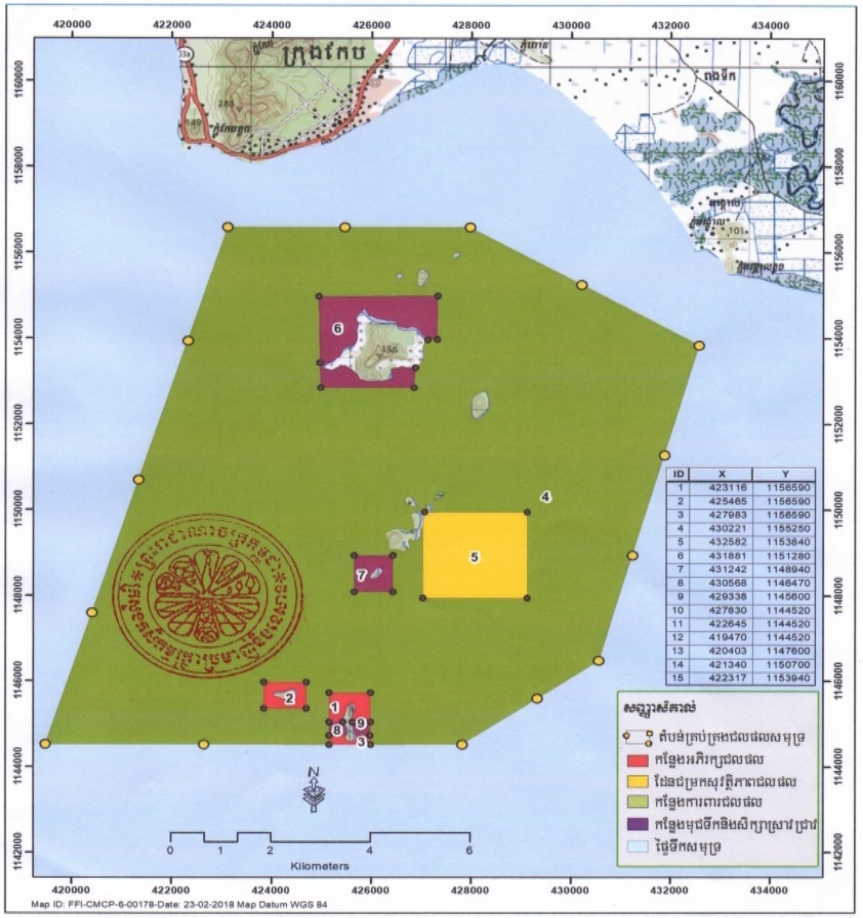
- Using engine boat in power from 13hp
- Using the crab gillnet length from 14500m
- Operating at nightime for three days
- Spending 10 hours /night
- Catching 15kg/day/boat

- CPUE for Crab Trap in Kep

- Crab trap size is, its width is about 20 cm, length is 40 cm, height is 15 cm and mesh size of net cover is 3-4 cm.
- Using engine boat in power from 6.5 - 13hp
- Using 1400 crab traps
- Operating at nigh time from 2 days
- Spending 9-10 hours /night
- Catching 23kg/day/boat

5. Information for GIS mapping

5.1 Fisheries Refugia Boundary



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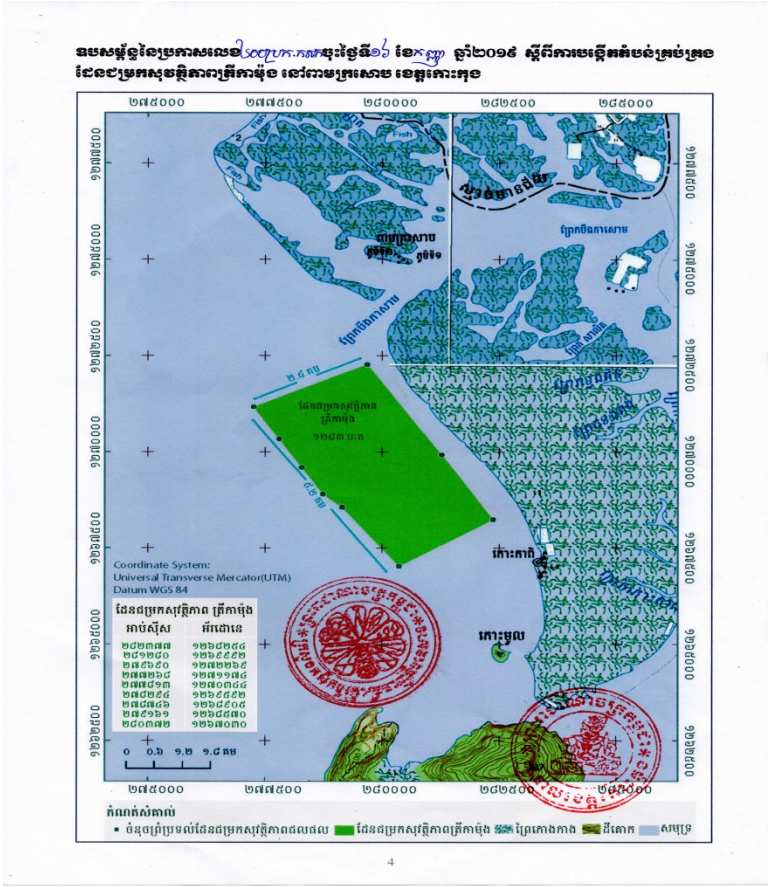

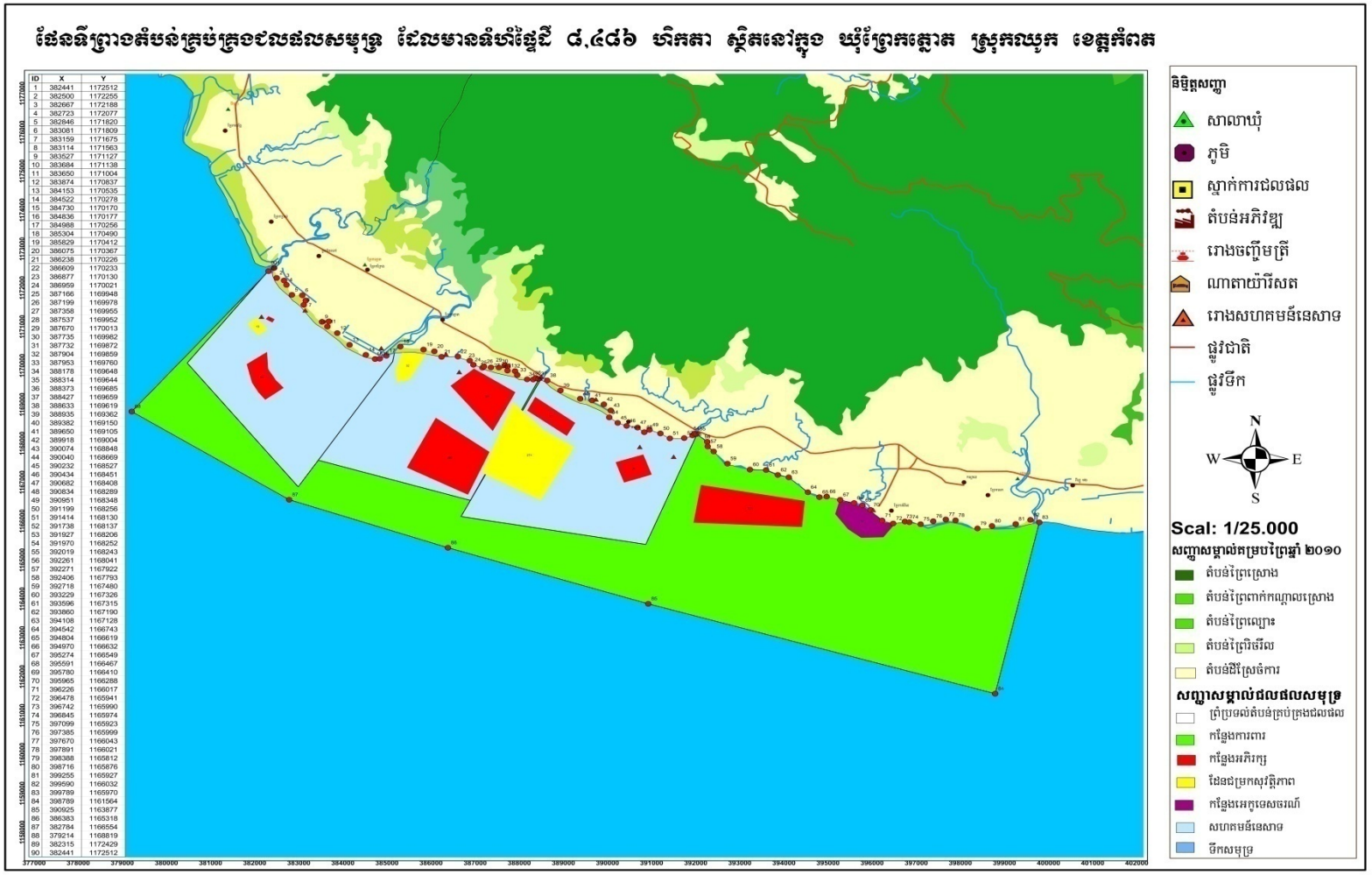

In principal, it has been approved by CFis, local authorities, DoA, and FiAC, but still discuss with provincial governor. It expect to be approved on next quarter

5.2 Fishing Area by each fishing gear

Provinces	Fishing Area by using each fishing gear
FR in Kep	Crab gillnet and trap from Koh Tbal, Mam Prang to Kh Ses in Dam Nak Chorng Oer district and Kep city, Kep province
FR in Koh Kong	Mackerel gillnet in Peam Krasob, Koh Kao, Koh Kapi, Bak Klorng, and Chroy Pors
FR in Kampot	Fish, crab, shrimp gillnet and trap in Tra Paing Ropoav and Prek Thnaot in Prek Thnaot commune, Tek Chhou district, Kampot province

5.3 Important coastal habitat

- It is feed, spawning , and nursery habitat and growth for marine animal species
- It provides benefit to CFi depending on fisheries resource through fishing to enhance their daily livelihood.


Thank you very much for your attention