

Local ecological fisheries knowledge (LEK) in support of decision-making and marine spatial planning



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- 1. SEK and fisheries**
- 2. LEK**
- 3. LECOFISH methodology**
- 4. LECOFISH & MSP**
- 5. LECOFISH conclusion**

1. SEK for fisheries

SEK (Scientific Ecological Knowledge) on fisheries in Belgium has some shortcomings:

1. Data (availability, suitability, extrapolation, ...)
2. Time frame (long – short: demand driven)
3. Communication and translation

2. LEK

LEK (Local Ecological Knowledge) = cumulative body of shared understandings, knowledge, practical skills and wisdom about organisms and their environment (including humans) within a certain **local community** (Sinclair, 1999; Olsson & Folke, 2000; Brook & McLachlan, 2008; Gerhardinger, 2008) e.g. **indigenous people**

LEK = influenced by external factors (economic, social, political,...)

2. Why fisheries LEK ?

Improve knowledge about local ecosystems: collecting new or additional data either to fill in a lack of SEK data or data gaps, to validate SEK data, to question or validate SEK assumptions. Idem for LEK data.

Improve the relationship with stakeholders by using their knowledge on local ecosystems that is/was part of their daily work

Gain knowledge about fishermen's perception of their socio-economic environment

Belgian fisheries is in decline. 1955: 421 vessels; 2011: 88 vessels.

Capture knowledge now before it is too late !

3. LEOCFISH METHODOLOGY

3. LEOCFISH methodology

Where, who and when:

Area: Belgian Part of the North Sea (BPNS = territorial sea and EEZ)

Population: commercial and recreational fishermen (no fisheries data concerning recreational fisheries in the BPNS).

Commercial fisheries: small segment vessels (up to 300 HP, exceptionally up to 900 HP) – **daily fisheries only**

Belgian fishery vessels today: 95% beam trawlers (nevertheless 5 different fishing techniques represented due to timeline)

Time-line: 1950-2010

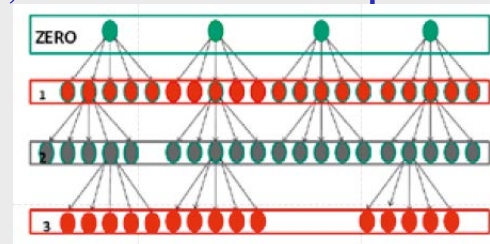
Representation: 32 fishermen (20 commercial; 12 recreational)

3. LEOCFISH Methodology

Assumption: go to fishermen because fishermen do not come to scientist; face to face interaction at home of fishermen. Selection by snowball sampling supported by network analysis to guarantee LEK, distribution in space and time and key-informant sampling strategy

How

1. Questionnaire to capture opinions and perceptions of the socio-economic, legal and cultural environment of fishermen +
2. Semi-structured interviews to capture LEK data +
3. Use of nautical maps as an additional source of LEK information and to help fisherman's memory.



3. LEOCFISH Methodology

In addition, memory support is achieved to split the fishing career according to the type of vessels the fisherman worked on during his career

- Interviews and mapping: between 2 and 3 hours
- Interviews written down and processed by using NVivo software
- Maps drawn in Corel Draw (can later be transferred in GIS)
- Two types of info for maps:
 1. maps with info from mapping by fishermen
 2. maps based on info given in interviews



Nodes

- Free Nodes
- Tree Nodes
- Cases
- Relationships
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Sources

Nodes

Sets

Queries

Models

Links

Classifications

Folders

Look for: Search In: Tree Nodes Find Now Clear

Tree Nodes

	Name	Sources	References	Created On	
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+	FENOMENEN	24	69	27/08/2010 9:03	J
+	GETIJ	7	8	27/08/2010 9:48	J
+	GOLFSLAG	1	1	27/08/2010 9:47	J
+	KLEUR WATER	26	65	27/08/2010 9:54	J
+	STROMING	19	35	27/08/2010 9:51	J
+	TEMPERATUUR	21	43	27/08/2010 9:48	J
+	WIND	18	35	27/08/2010 9:52	J
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+	GARNAAL	22	210	26/08/2010 11:10	J
+	VIS	1	9	26/08/2010 10:17	J
+	VOGELS	3	8	26/08/2010 17:13	J
+	ZOOGDIEREN	3	4	27/08/2010 8:50	J
+	FLORA	7	12	26/08/2010 17:05	J
+	GEBIEDEN	29	101	27/08/2010 9:58	J
+	KENNIS VISSER	11	22	24/11/2010 15:53	J
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	Gehoord van	12	17	27/08/2010 10:26	J
	gelezen of TV	3	3	31/08/2010 13:58	J
	Ik denk het	13	23	27/08/2010 10:24	J
	Ik heb een idee of een document	2	2	26/08/2010 14:30	J

New

Code At

Nodes

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Tree Nodes

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Congeraal	3	4	7/09/2010 8:25	JC
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Doornhaai	4	6	18/10/2010 13:26	JC
Dorade	2	3	22/09/2010 10:21	JC
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Inktvis	2	2	15/10/2010 13:54	JC
Kabeljauw of Gul	31	501	26/08/2010 11:03	JC
Bijvangst	16	35	26/08/2010 14:48	J
Fysiek	22	76	26/08/2010 11:03	J
Gedrag	22	43	26/08/2010 11:03	J
Markt	5	6	26/08/2010 11:03	J
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Ruimte	2	3	8/12/2010 9:24	J
Seizoen	26	84	26/08/2010 11:03	J
Stock	29	104	26/08/2010 11:03	J
Subsoort	5	6	26/08/2010 11:03	J
Vangst	27	81	26/08/2010 11:03	J
Voeding	29	101	26/08/2010 11:03	J
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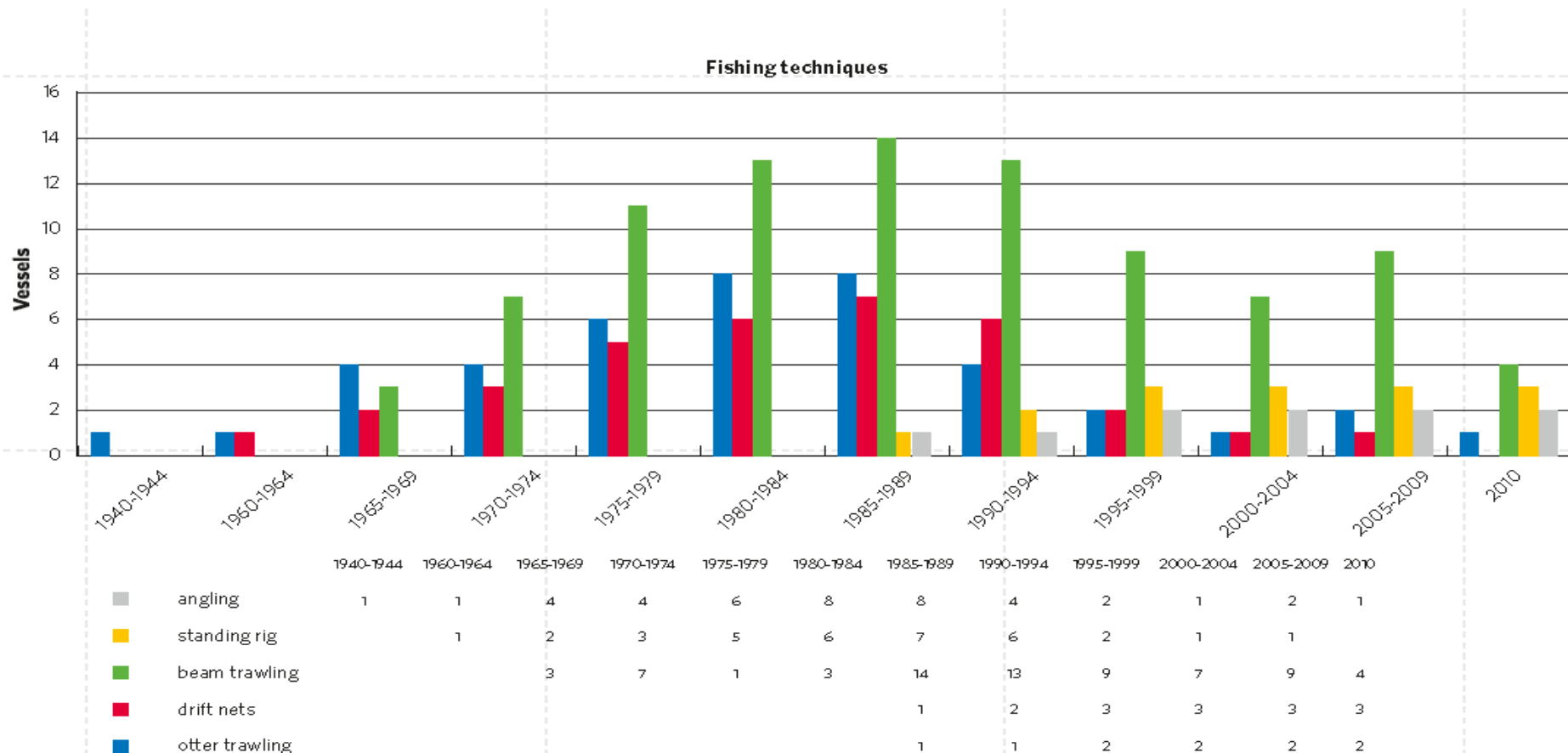
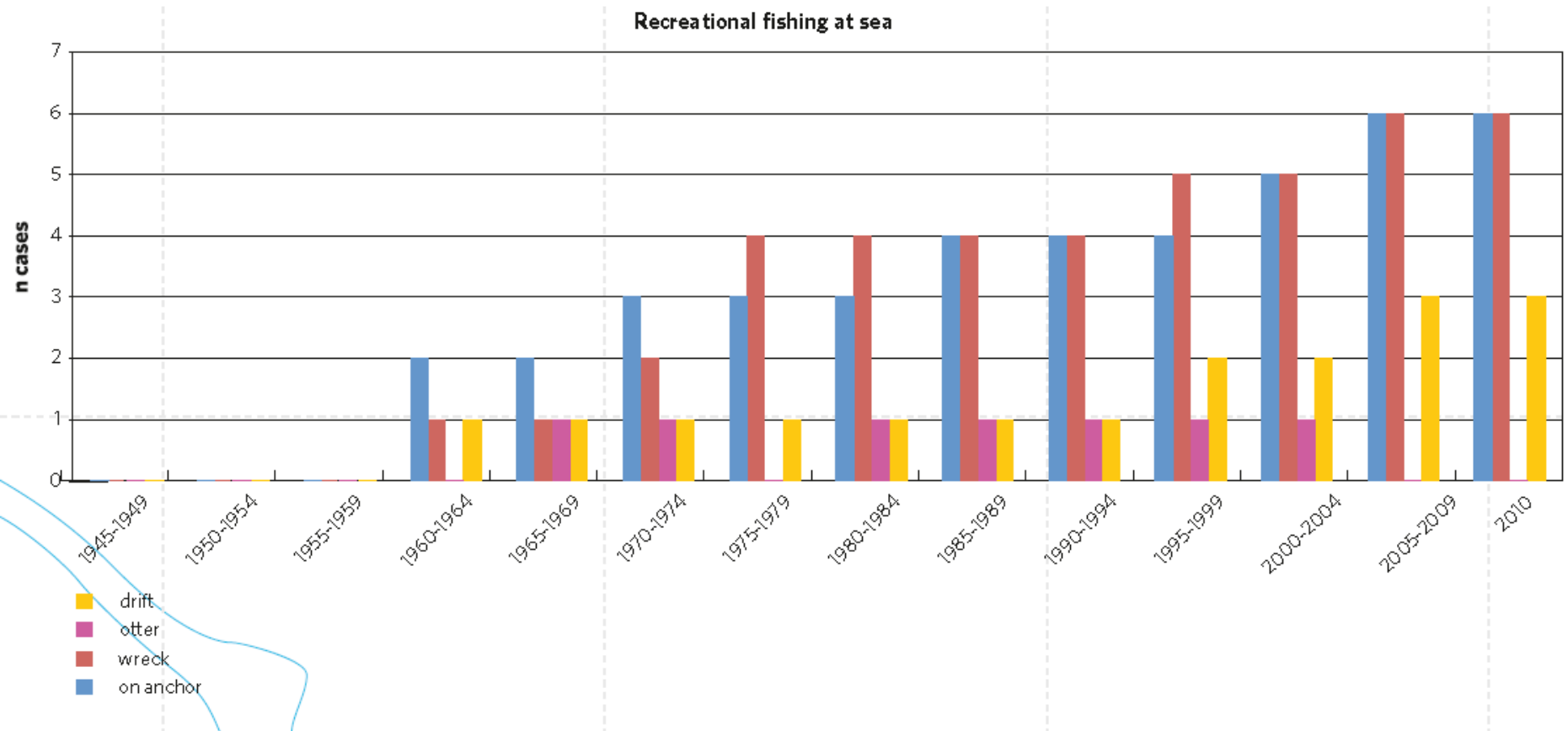


Figure 4: Commercial fishermen and fishing gear



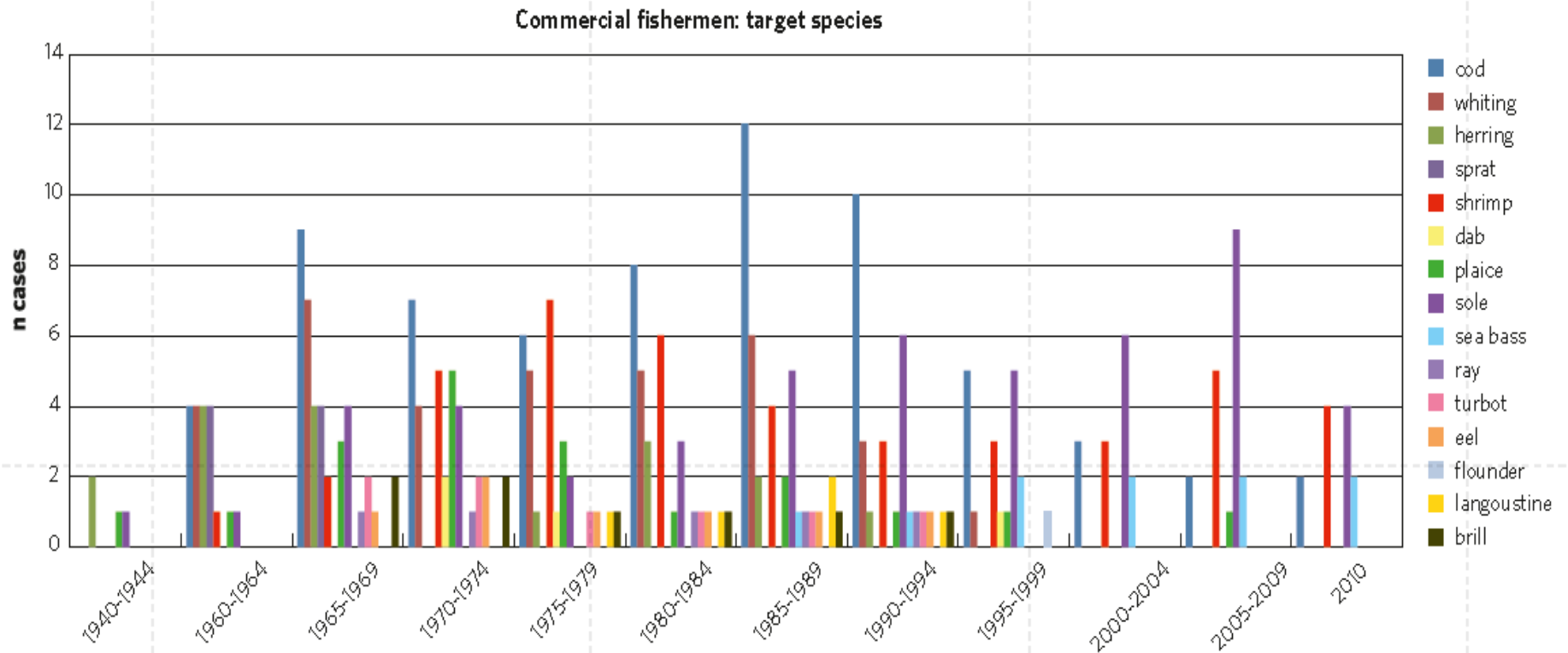
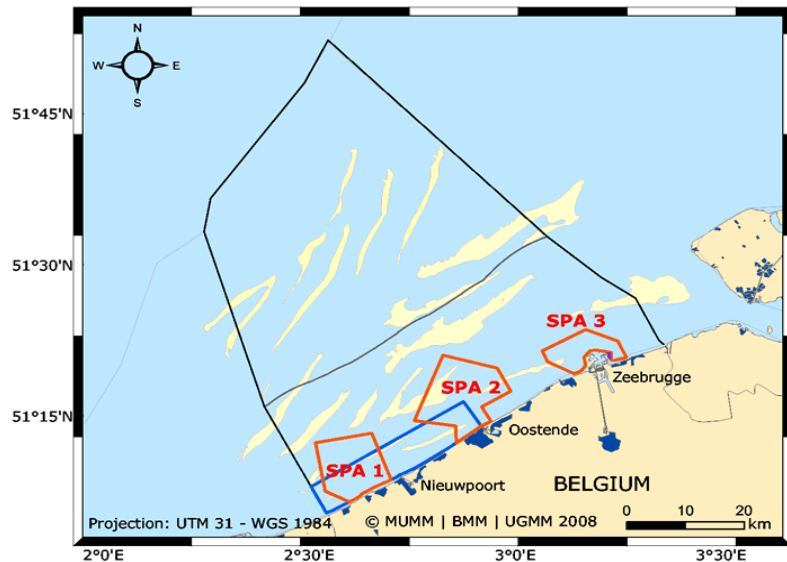
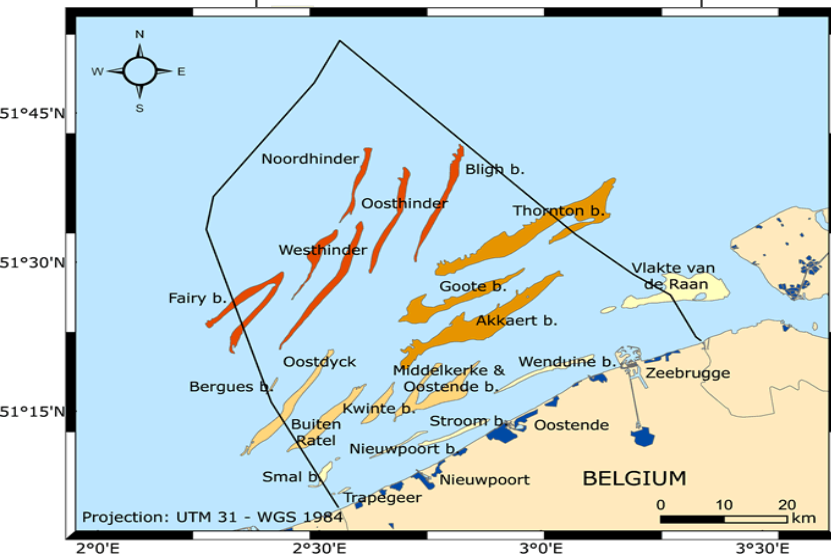


Figure 10: Target species of commercial fishermen interviewed

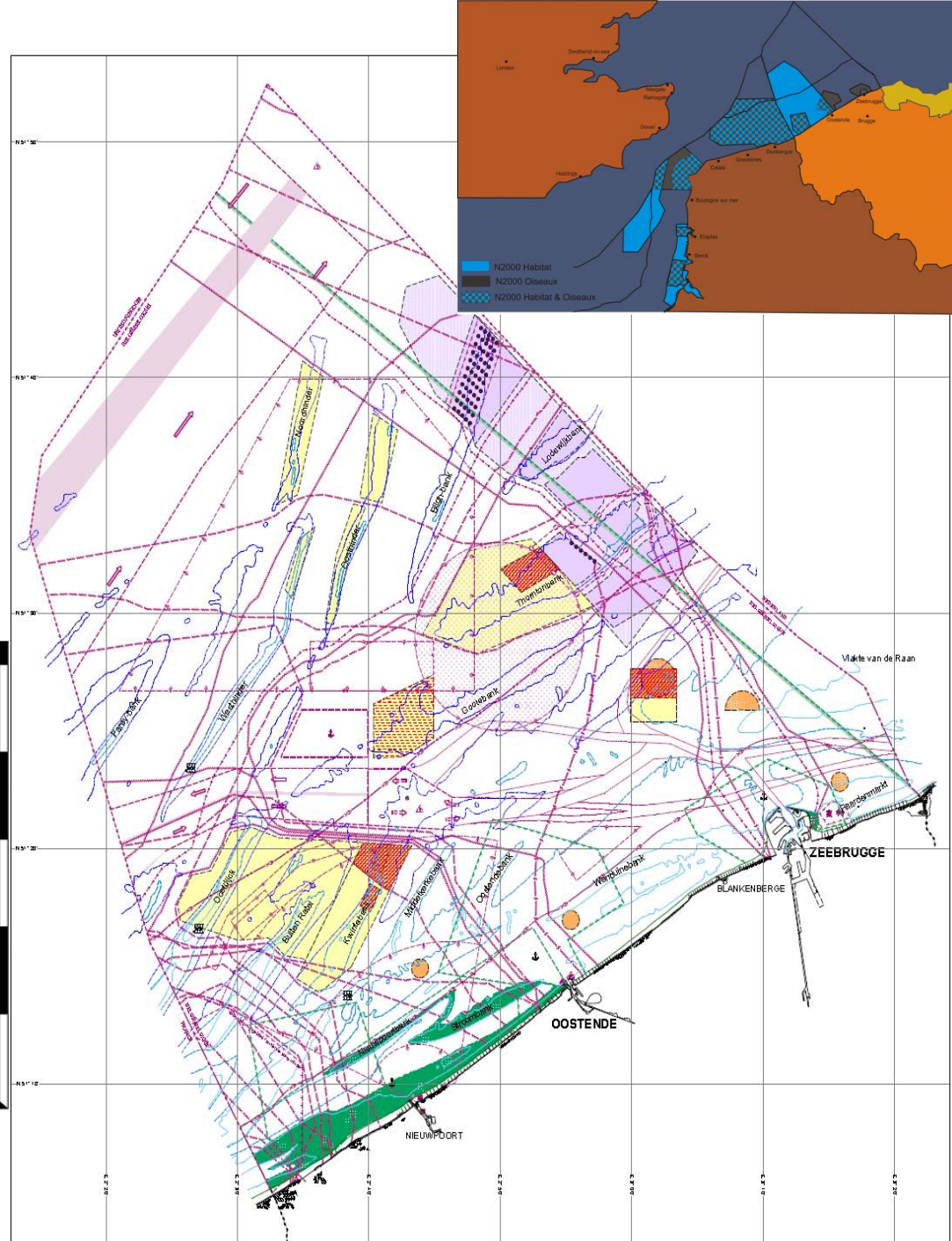
4. LEOCFISH & MSP



- Special Protection Areas (Birds Directive)
- Special Area of Conservation "Trappegeer Stroombank"
- Marine area under Belgian jurisdiction
- 12 nm limit



- Coastal banks
- Flemish banks
- Zeeland banks
- Offshore banks



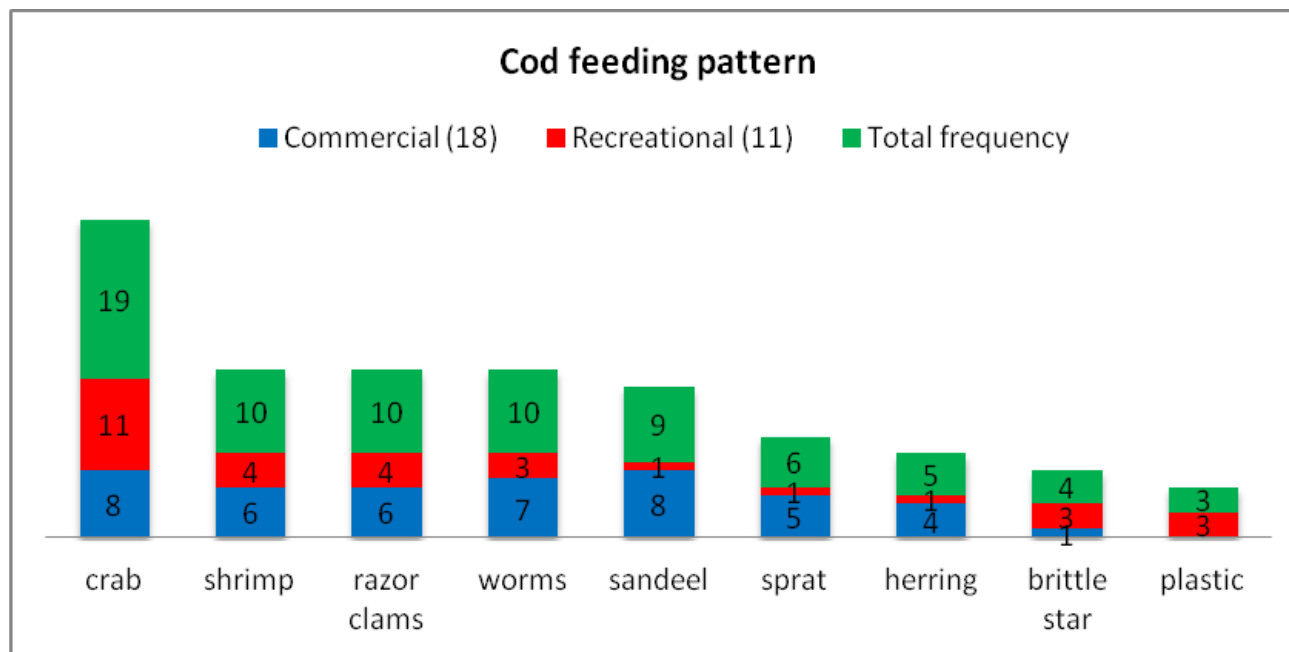
4.1. COD

Appearance of COD is influenced by pray, water temperature and seasons, that are often linked

Fishermen report problems of plastics in stomach of COD

According to fishermen there is still COD, however much smaller than in the past (consensus on decline since 80's). COD caught today is often too young (LEK provides figures of weight evolution in catches)

4.1. COD



commercial & recreational fishermen 1960-1970

Recreational fishermen (4/12)

Commercial fishermen (5/20)

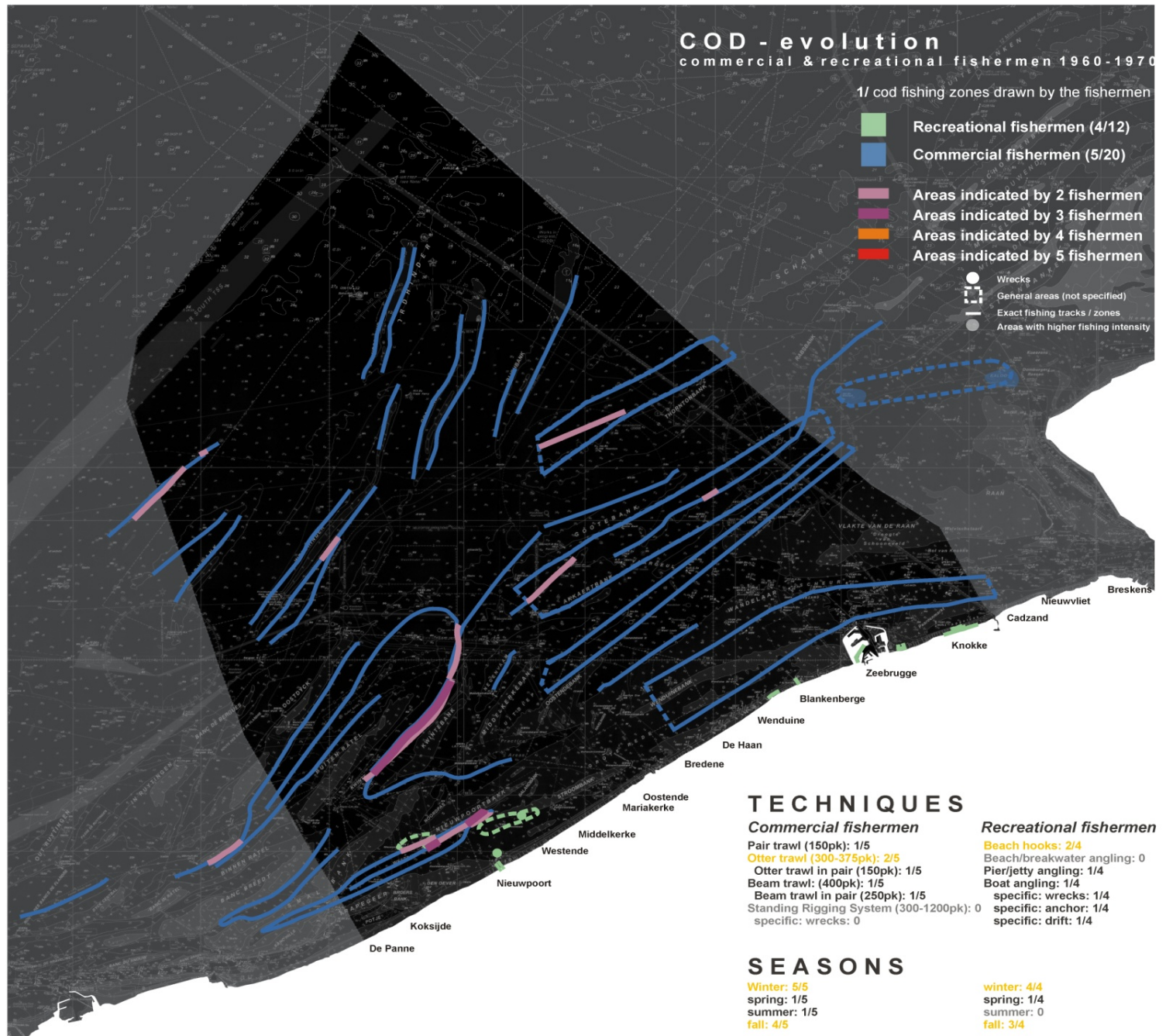
■ Areas indicated by 2 fishermen

Areas indicated by 3 fishermen

Areas indicated by 4 fishermen

Areas indicated by 5 fishermen

- Wrecks
- General areas (not specified)
- Exact fishing tracks / zones
- Areas with higher fishing intensity



TECHNIQUES

Commercial fishermen

Pair trawl (150pk): 1/5

Otter trawl (300-375pk): 2/5
 Otter trawl in pair (150pk):

Otter trawl in pair (150pk): 1/5
 Beam trawl: (400pk): 1/5

Beam trawl in pair (250p

Standing Rigging System (300-1 specific; wrecks: 0

specific: wrecks: 0

Recreational fishermen

Beach hooks: 2/4

Beach/breakwater angling: 0
Pier/jetty angling: 1/4

Pier/jetty angling: 1/4
Boat angling: 1/4

specific: wrecks: 1/4

specific: anchor: 1/4
specific: drift: 1/4

specific: drift: 1/4

SEASONS

Winter: 5/5

spring: 1/5
summer: 1/5

summer: 1/5
fall: 4/5

winter: 4/4

spring: 1/4

summer: 0
fall: 3/4



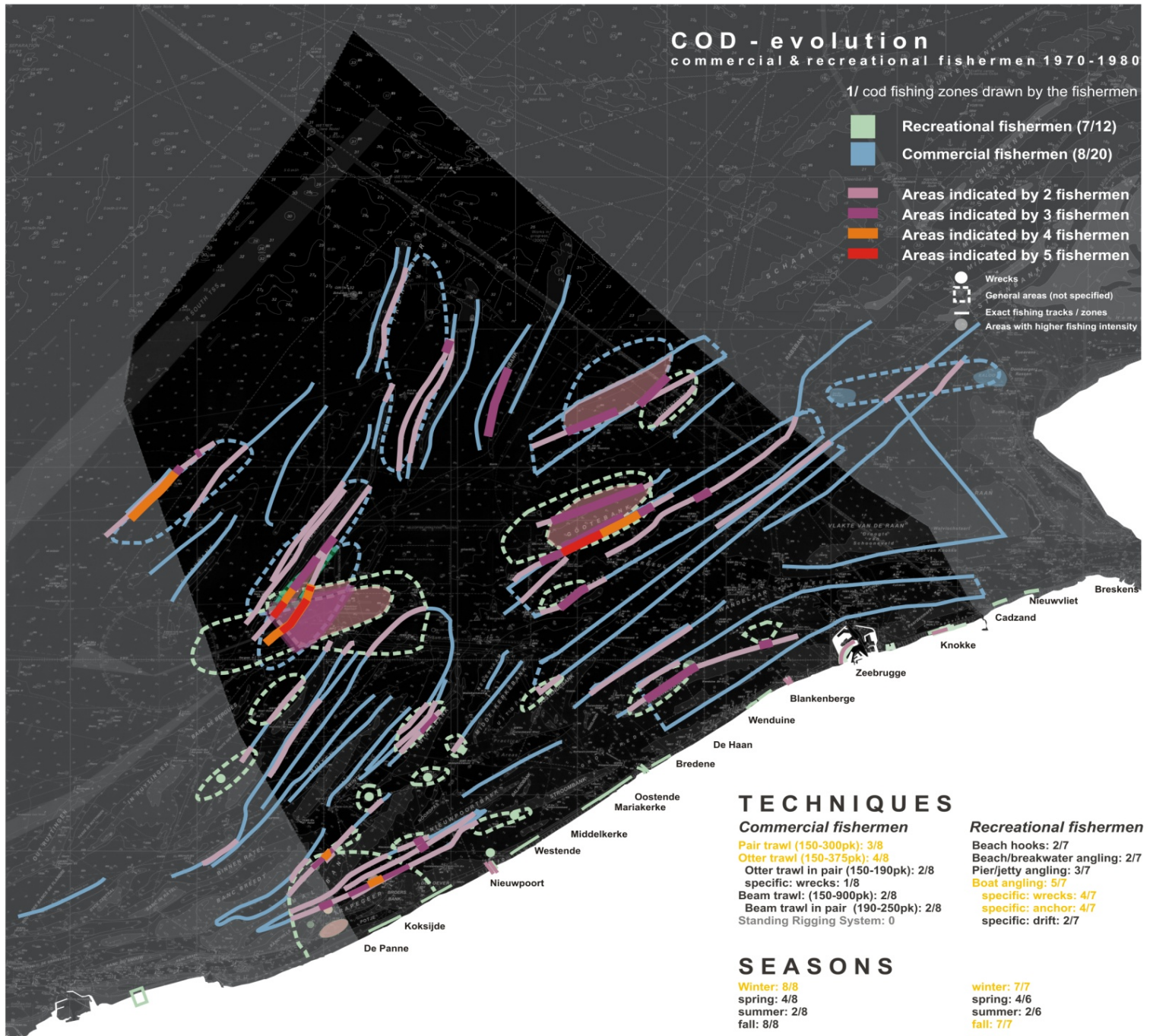
COD - evolution

commercial & recreational fishermen 1970-1980

1/ cod fishing zones drawn by the fishermen

- Recreational fishermen (7/12)
- Commercial fishermen (8/20)
- Areas indicated by 2 fishermen
- Areas indicated by 3 fishermen
- Areas indicated by 4 fishermen
- Areas indicated by 5 fishermen

- Wrecks
- General areas (not specified)
- Exact fishing tracks / zones
- Areas with higher fishing intensity



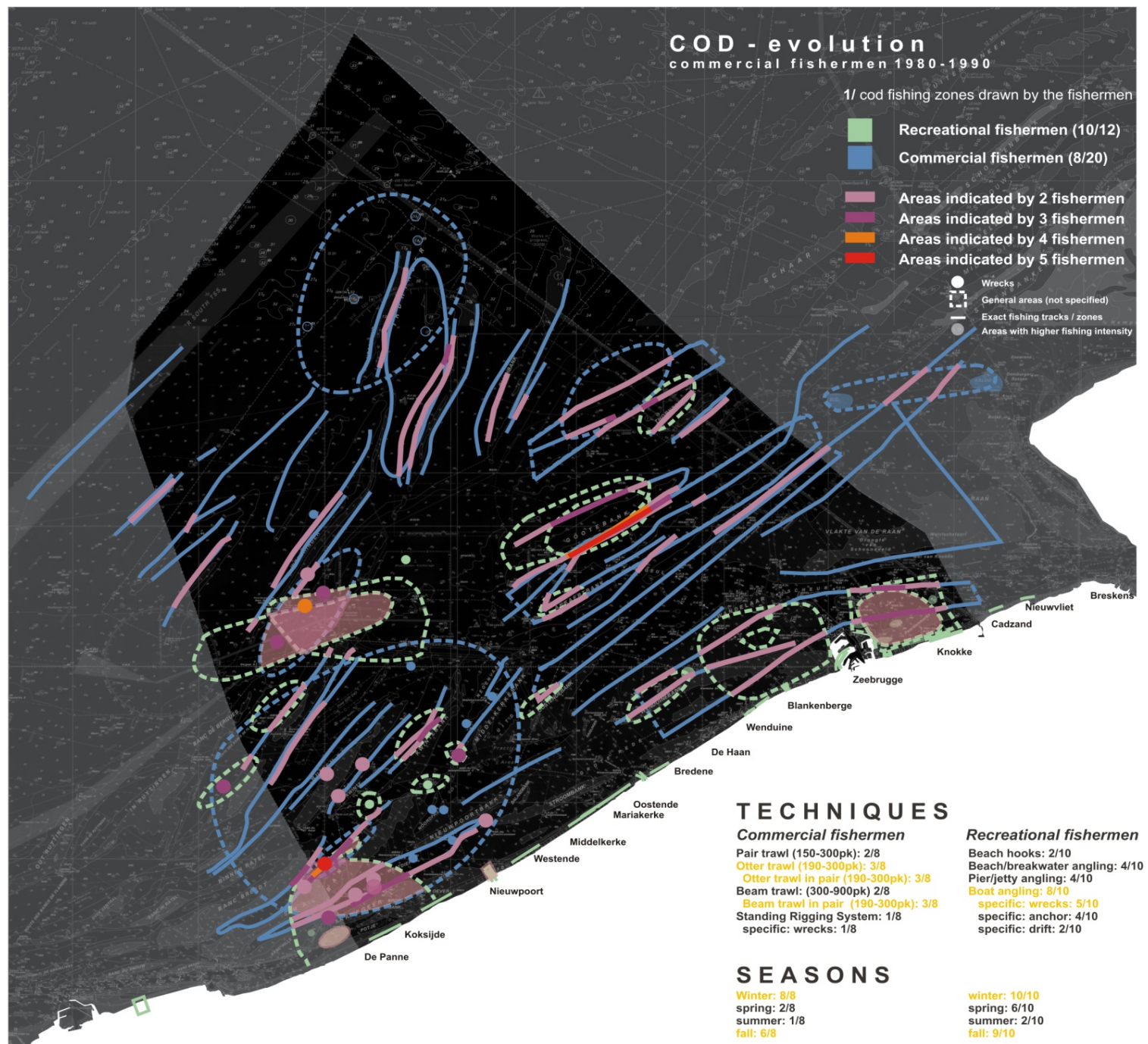
COD - evolution

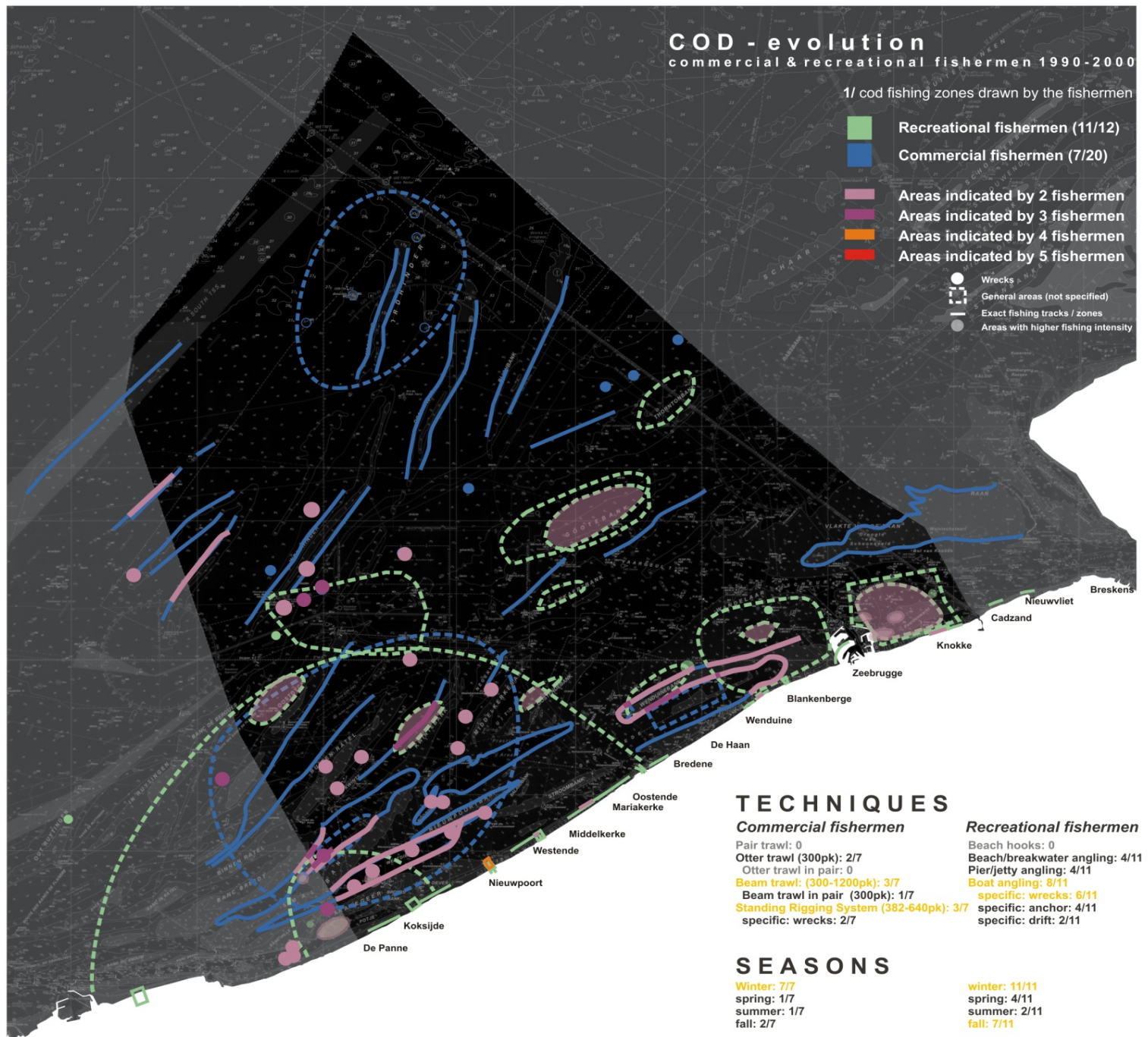
commercial fishermen 1980-1990

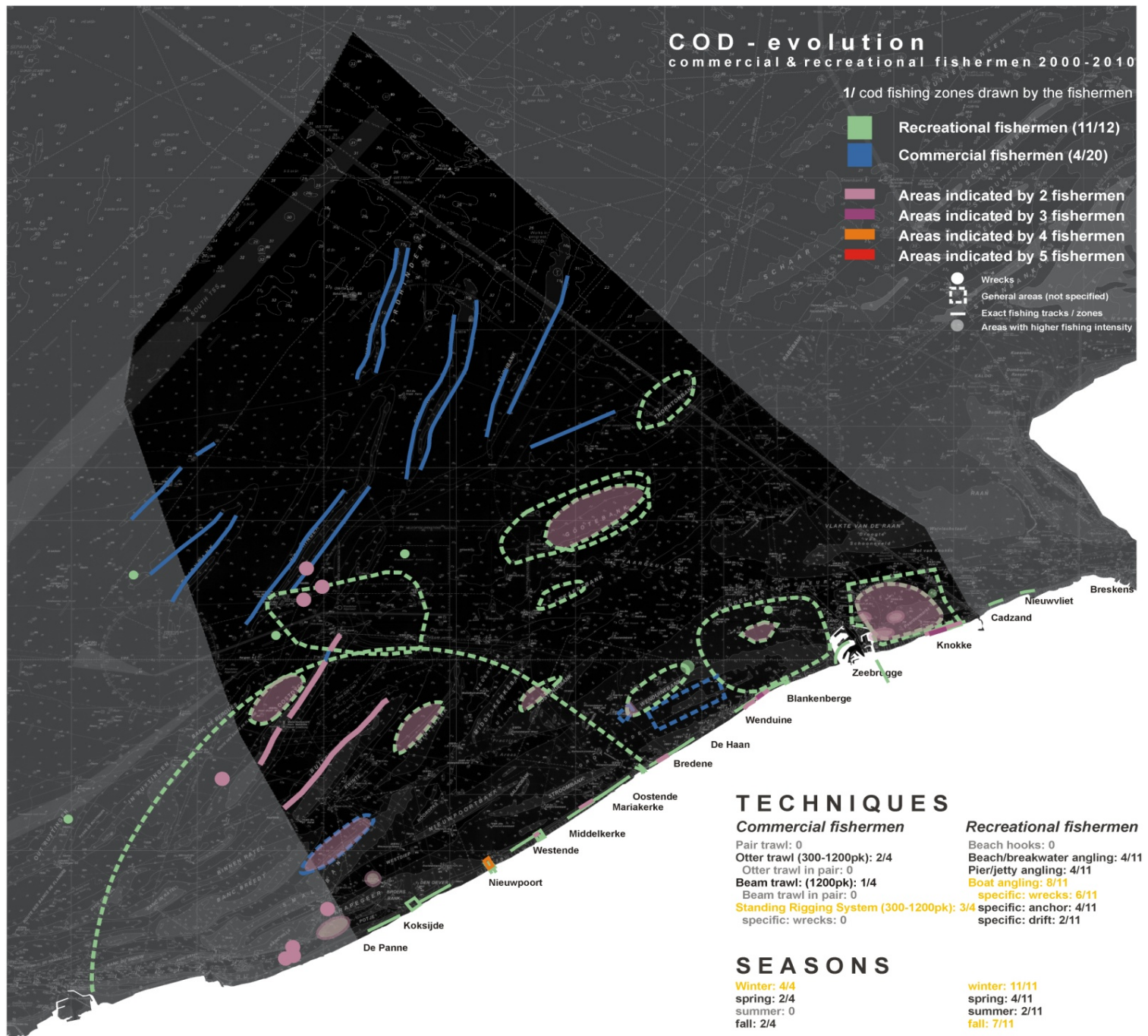
1/ cod fishing zones drawn by the fishermen

- Recreational fishermen (10/12)
- Commercial fishermen (8/20)
- Areas indicated by 2 fishermen
- Areas indicated by 3 fishermen
- Areas indicated by 4 fishermen
- Areas indicated by 5 fishermen

- Wrecks
- General areas (not specified)
- Exact fishing tracks / zones
- Areas with higher fishing intensity









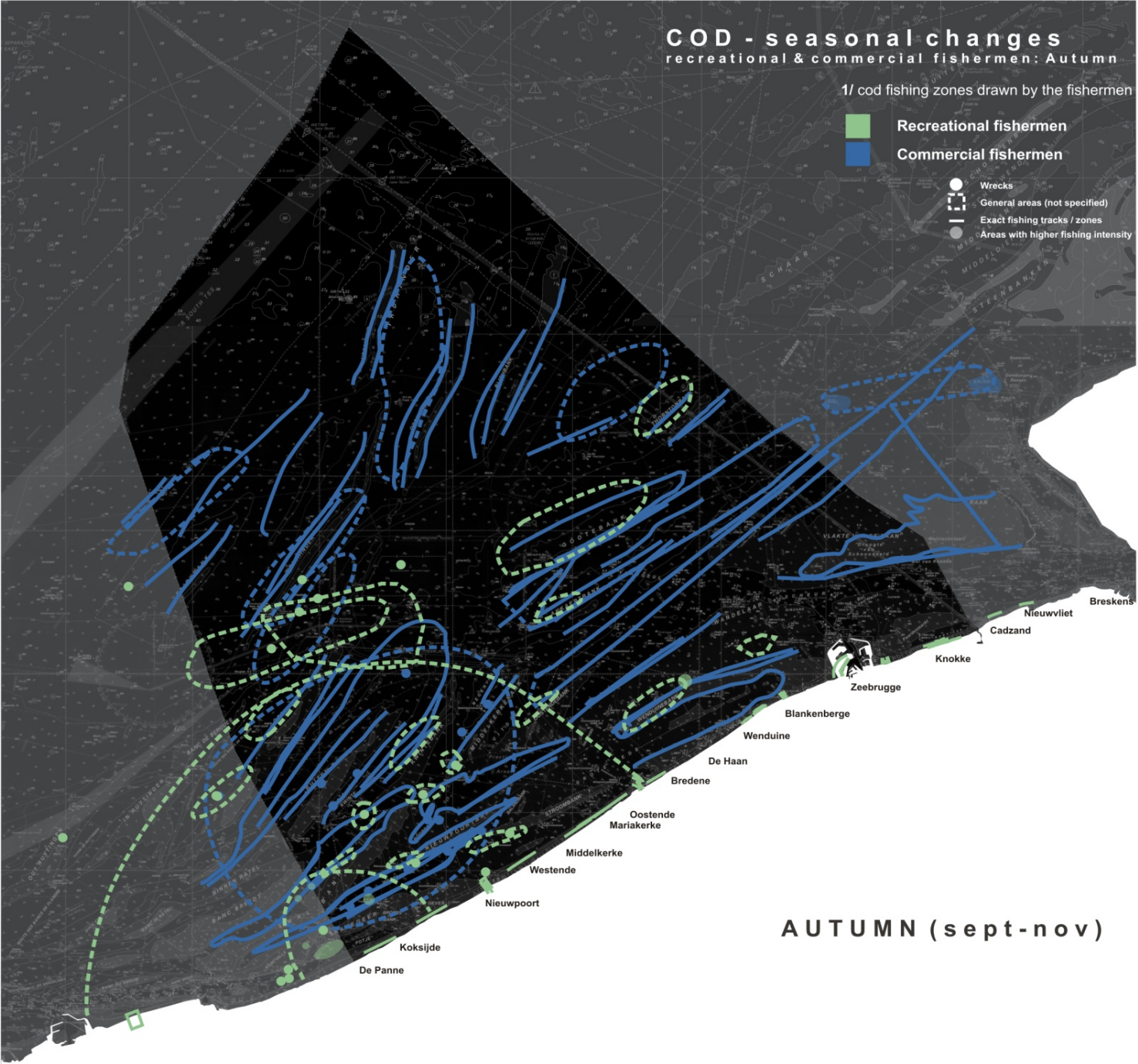
FISHING ZONES - COD

commercial & recreational fishermen 1950-2010

1/ cod fishing zones drawn by the fishermen

- Recreational fishermen (11/12)
- Commercial fishermen (14/20)
- Wrecks
- General areas (not specified)
- Exact fishing tracks / zones



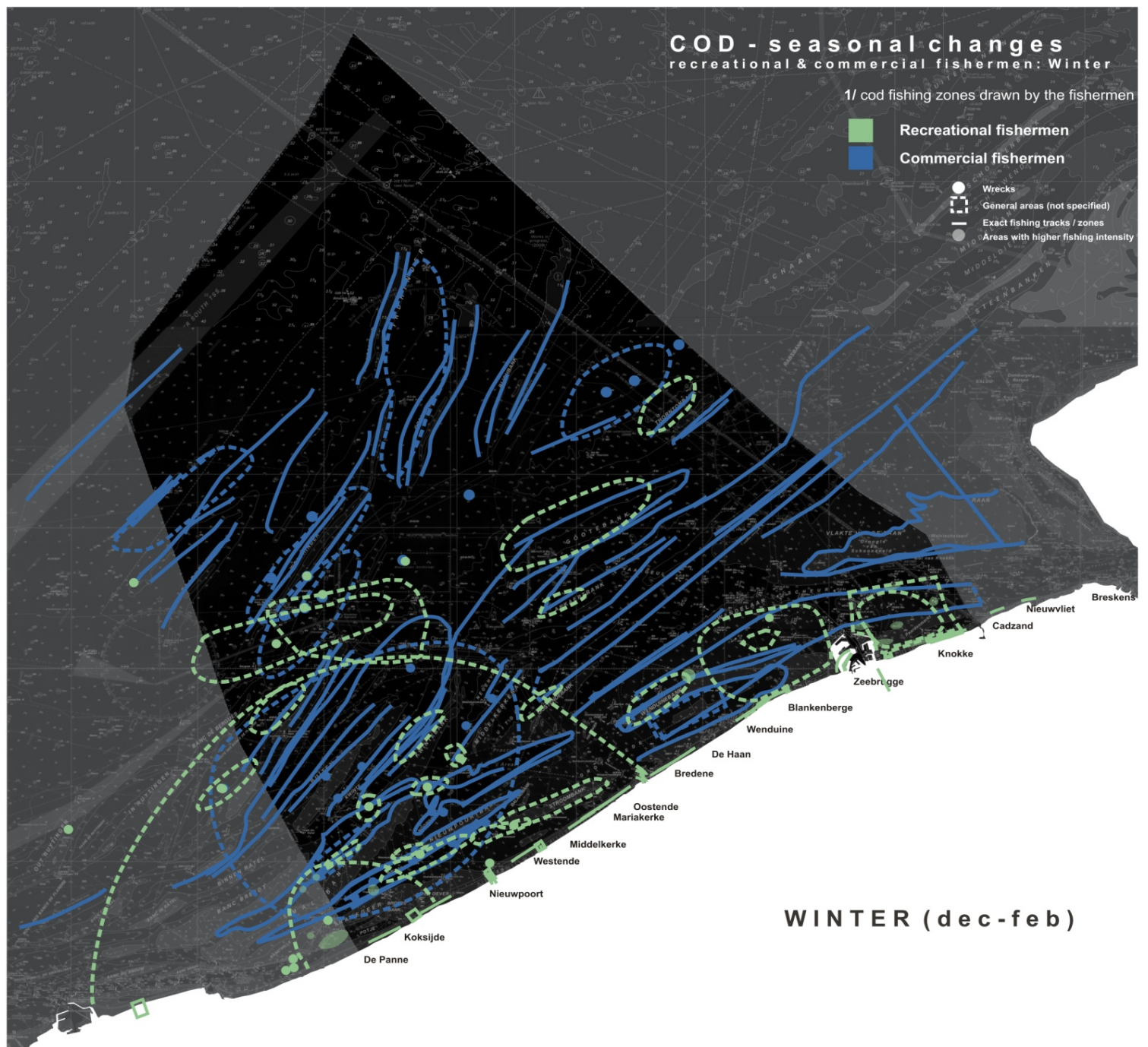


COD - seasonal changes

recreational & commercial fishermen: Winter

1/ cod fishing zones drawn by the fishermen

- Recreational fishermen
- Commercial fishermen
- Wrecks
- General areas (not specified)
- Exact fishing tracks / zones
- Areas with higher fishing intensity



WINTER (dec-feb)

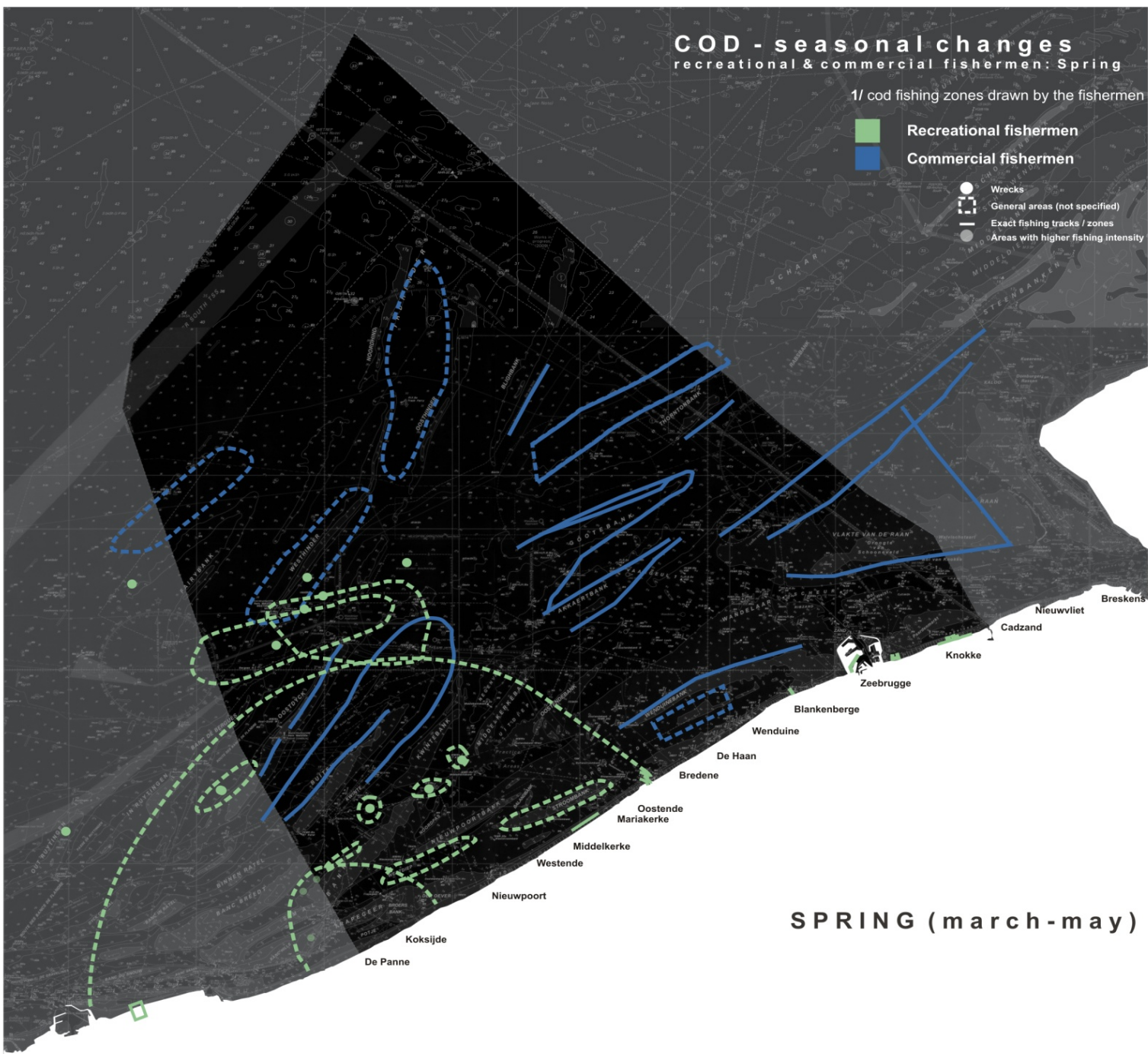


COD - seasonal changes

recreational & commercial fishermen: Spring

1/ cod fishing zones drawn by the fishermen

- Recreational fishermen
- Commercial fishermen
- Wrecks
- General areas (not specified)
- Exact fishing tracks / zones
- Areas with higher fishing intensity



SPRING (march-may)

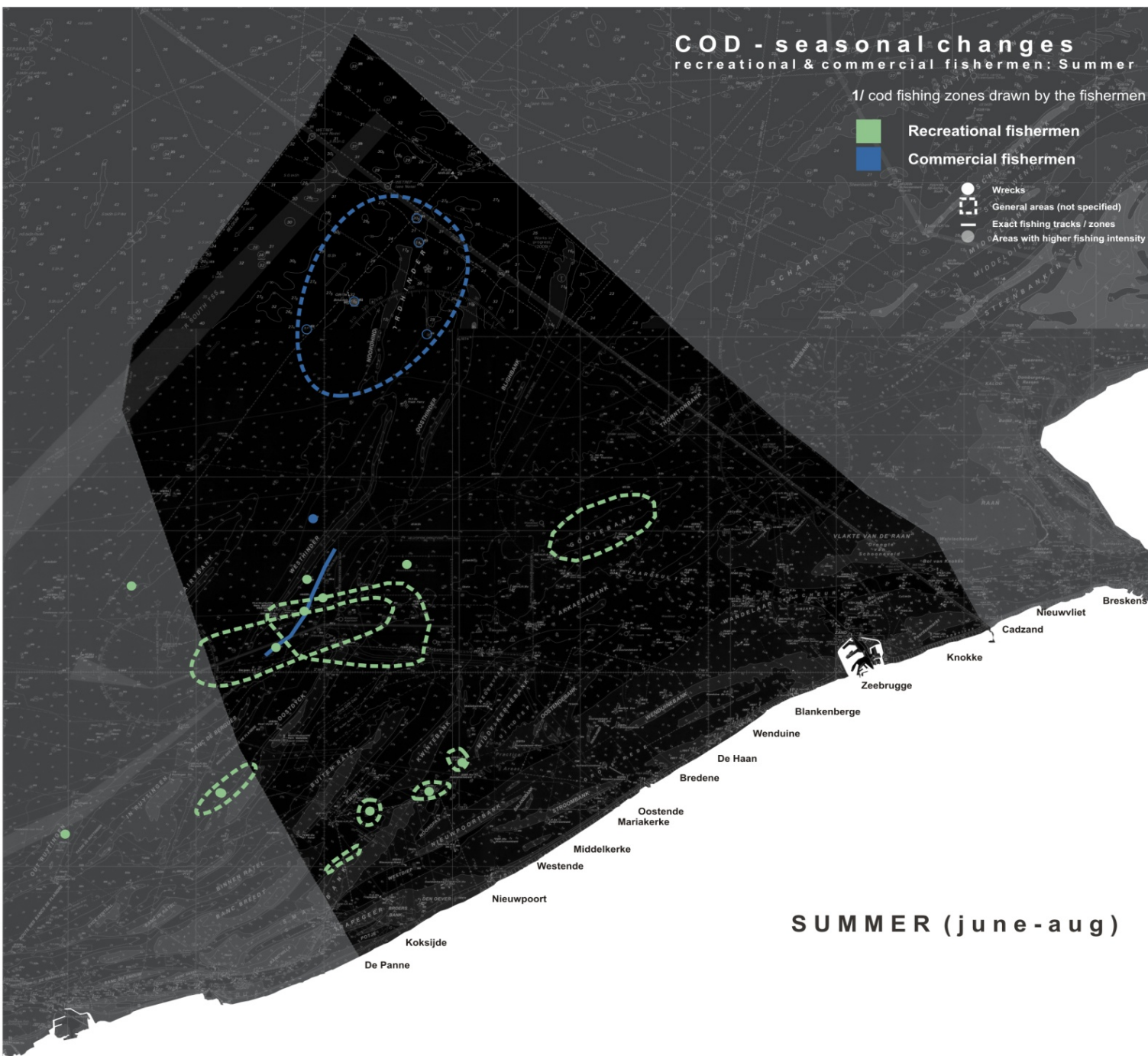


COD - seasonal changes

recreational & commercial fishermen: Summer

1/ cod fishing zones drawn by the fishermen

- Recreational fishermen
- Commercial fishermen
- Wrecks
- General areas (not specified)
- Exact fishing tracks / zones
- Areas with higher fishing intensity



SUMMER (june - aug)

SPRING

Map of the Netherlands showing water levels in yellow. The word "SPRING" is written in large white letters in the top right corner. The map includes labels for various cities and regions: Rotterdam, Amsterdam, Utrecht, Eindhoven, Groningen, Maastricht, and others. The yellow areas represent flooded regions, primarily in the western and central parts of the country.

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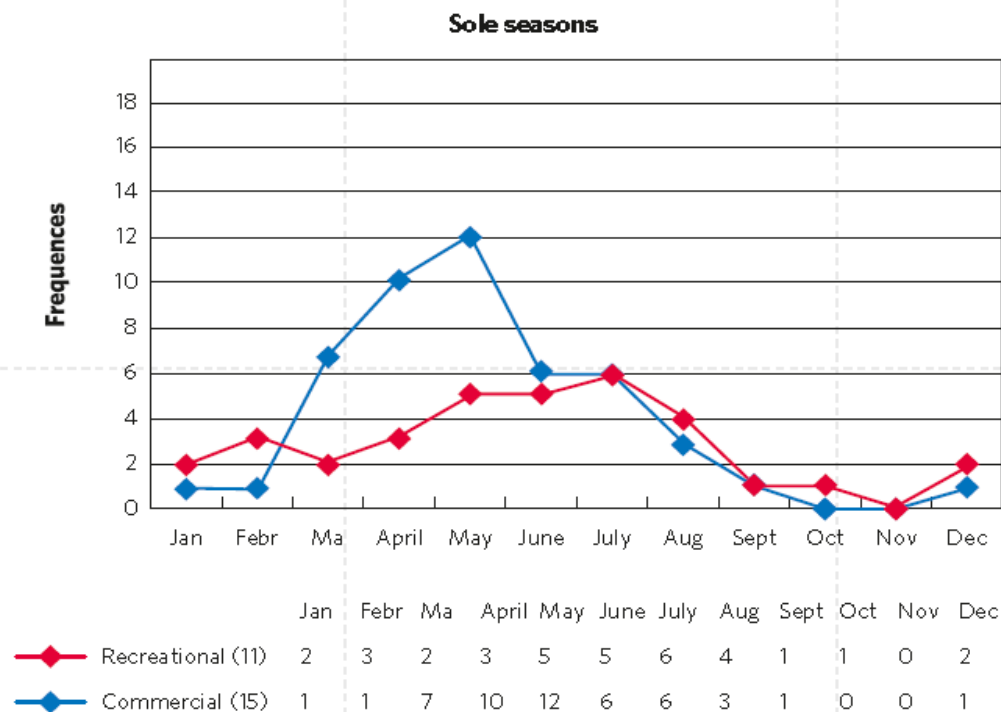
commercial & recreational fishermen 1960-2010

banks / beach / ports indicated by fishermen

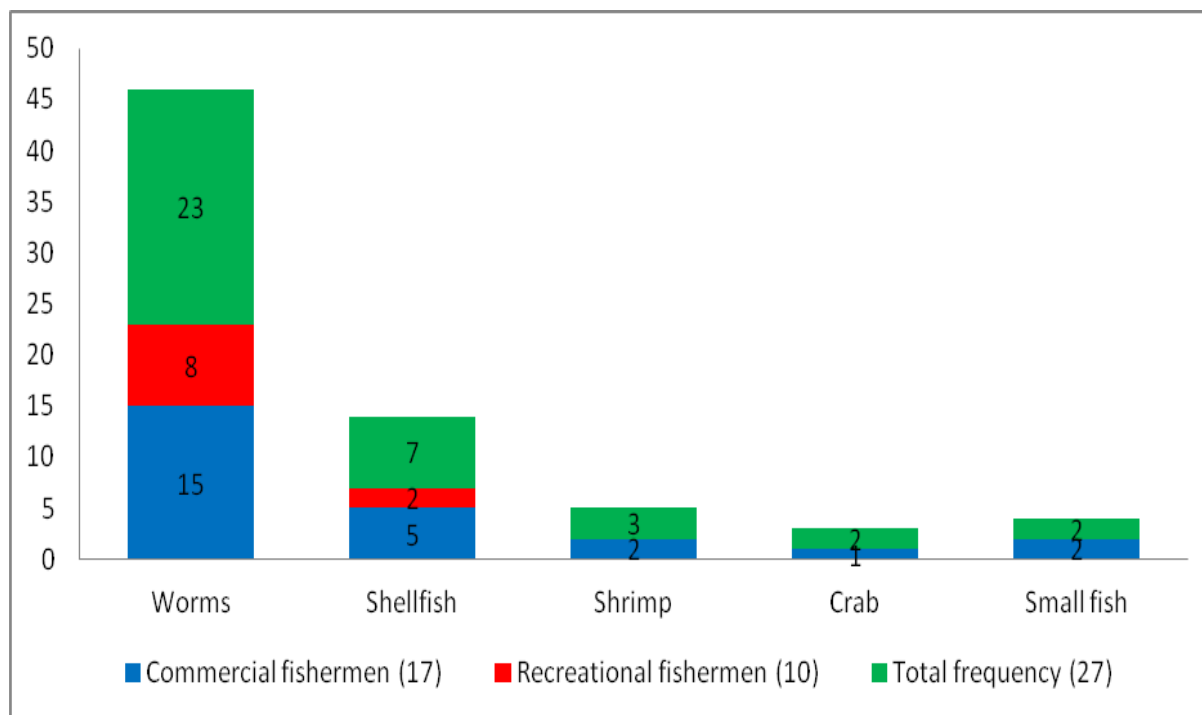
number of fishermen on same spot :

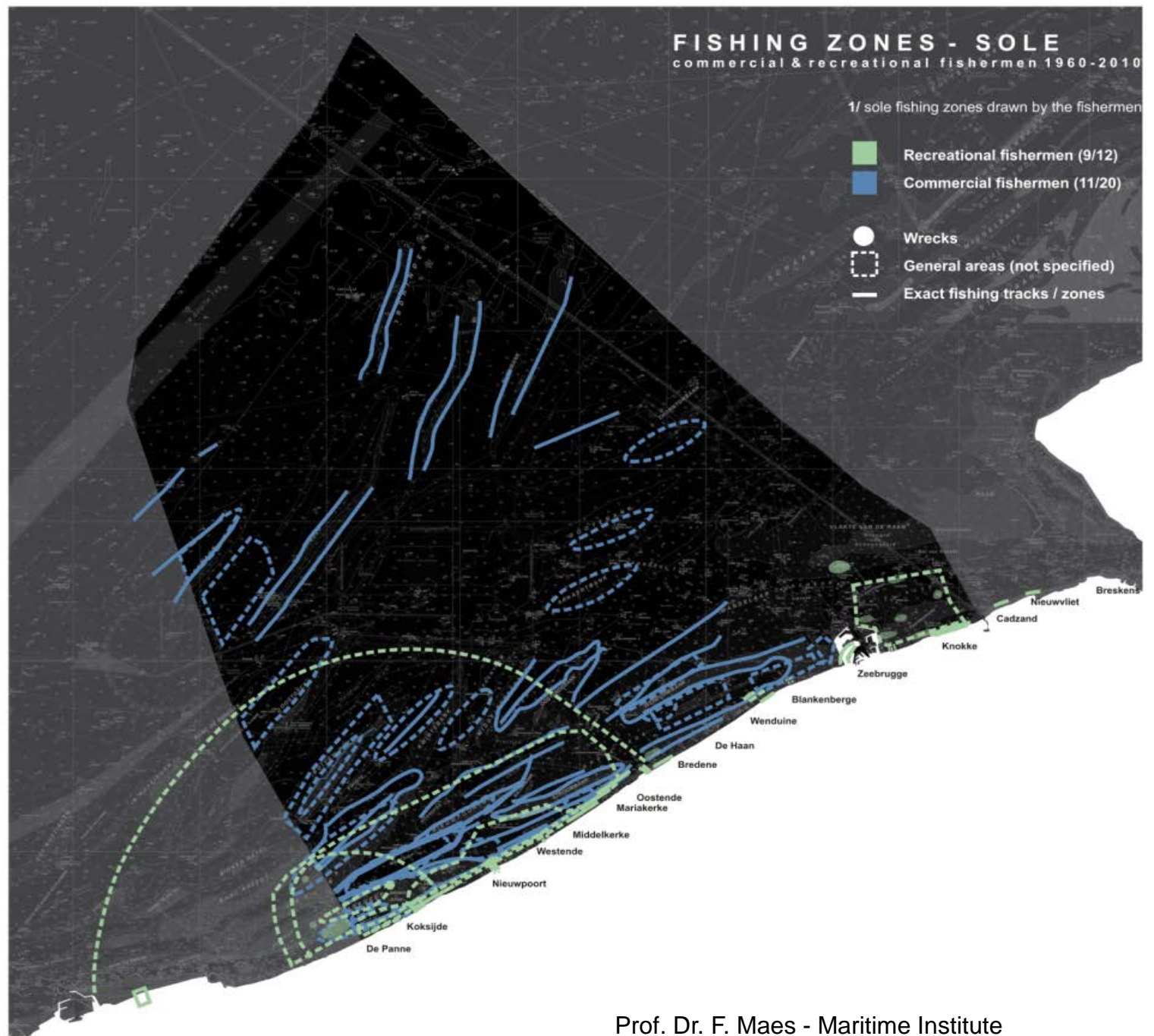


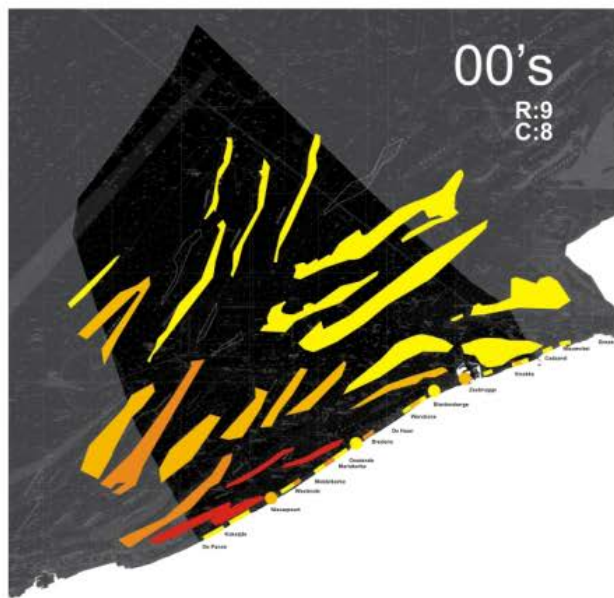
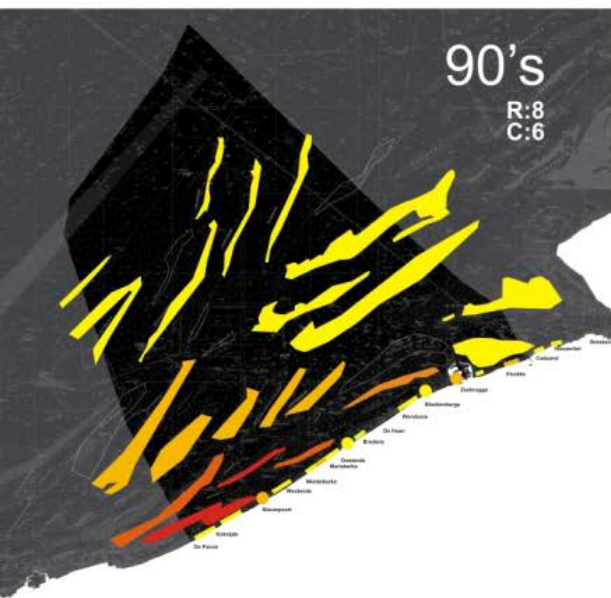
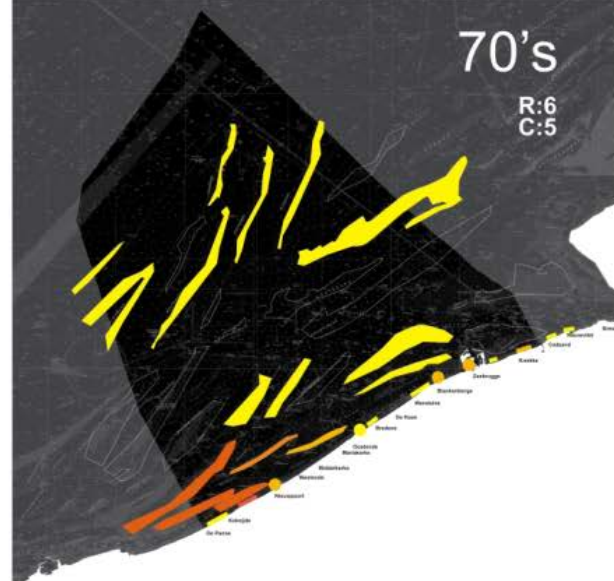
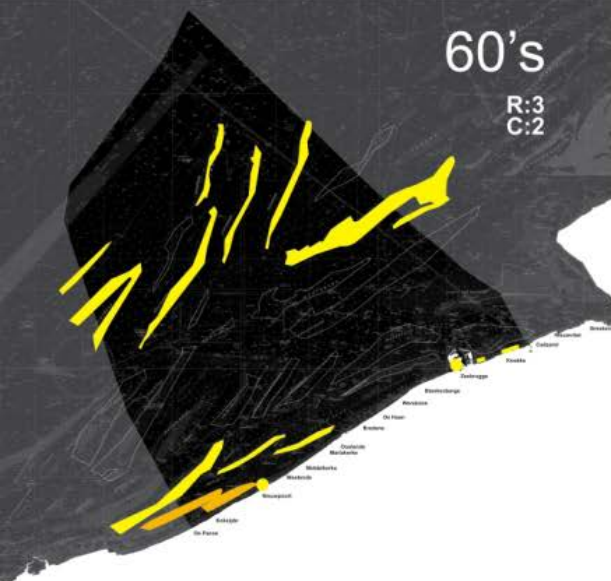
4.2. Sole



4.2. Sole







SOLE - EVOLUTION OF FISHING ZONES

commercial & recreational fishermen 1960-2010

banks / beach / ports indicated by fishermen

number of fishermen on same spot :



LECOFISH SEPTEMBER 2011

SPRING



SUMMER



SOLE - SEASONAL CHANGES

commercial & recreational fishermen 1960-2010

banks / beach / ports indicated by fishermen

number of fishermen on same spot :



AUTUMN



WINTER



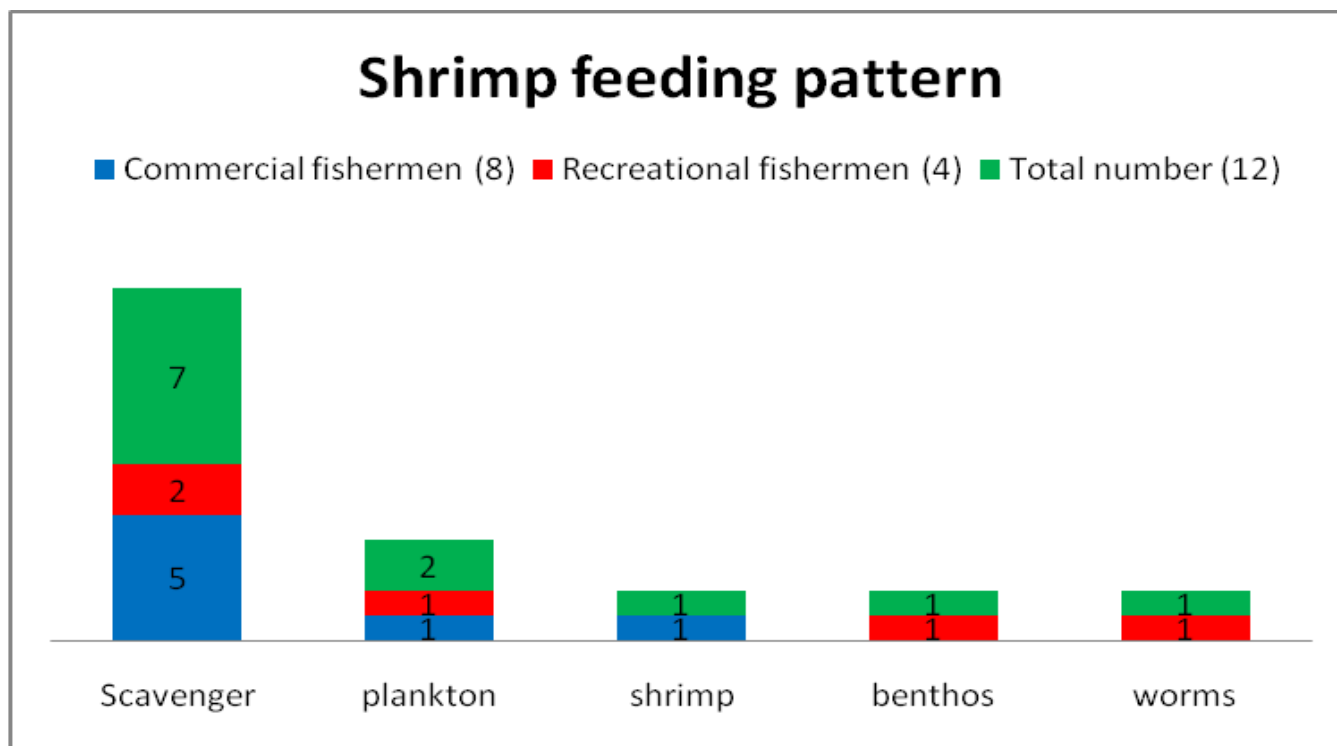
LECOFISH SEPTEMBER 2011

4.3. Shrimp

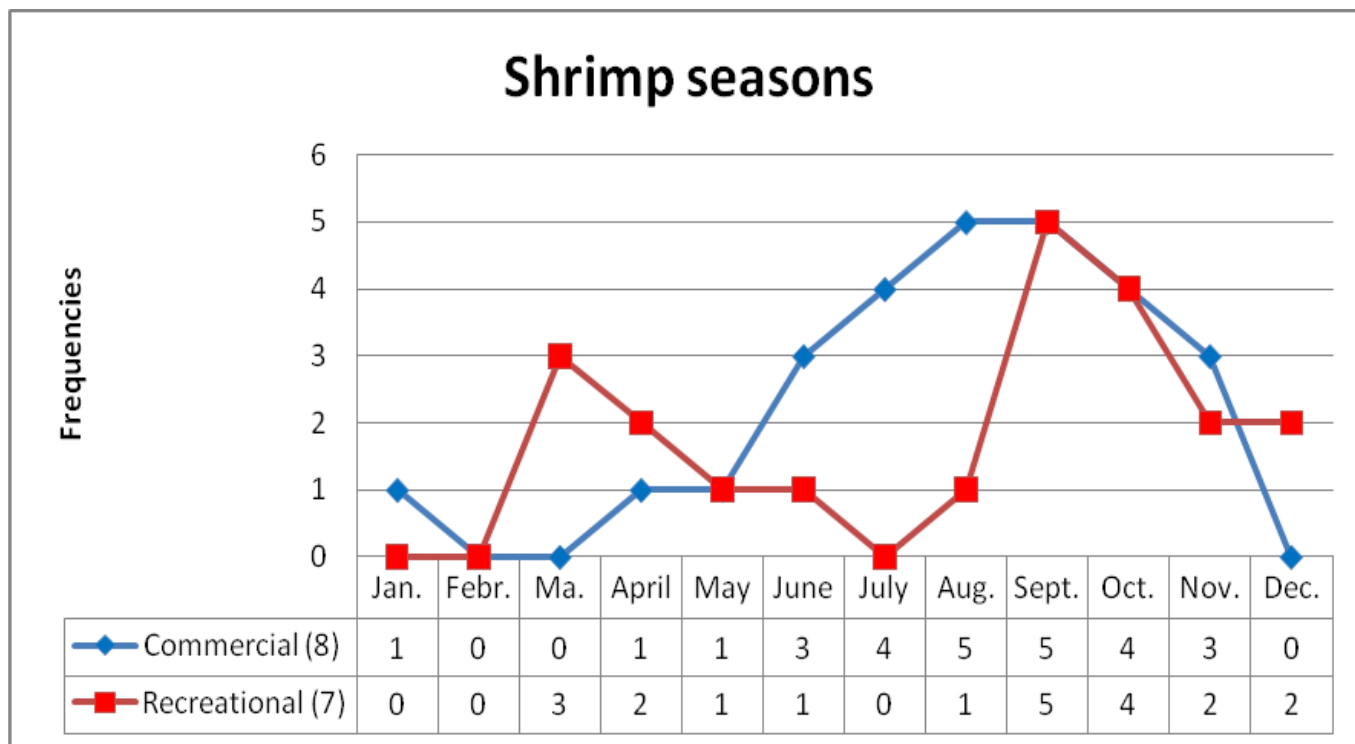
Shrimp is a species living close to the seabed. According to a number of fishermen, shrimp is mostly situated in sand (2C + 3R) but it is also spotted in mud or between rocks (1C).

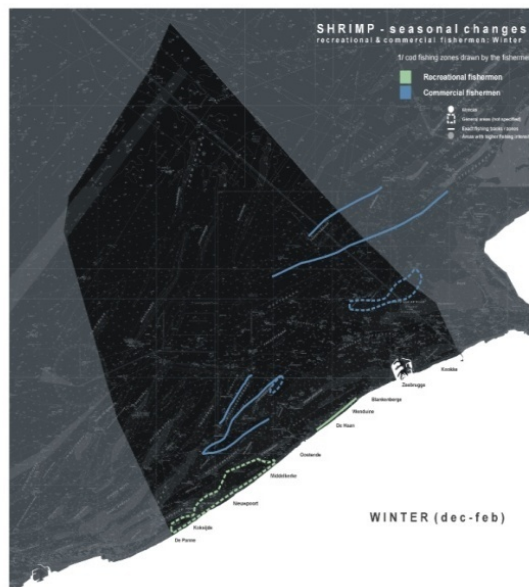
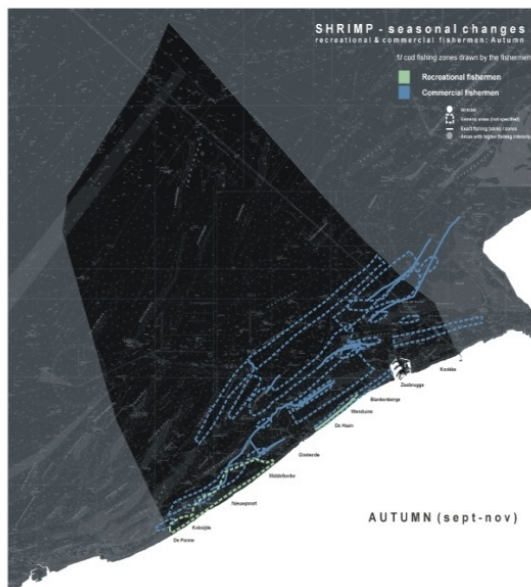
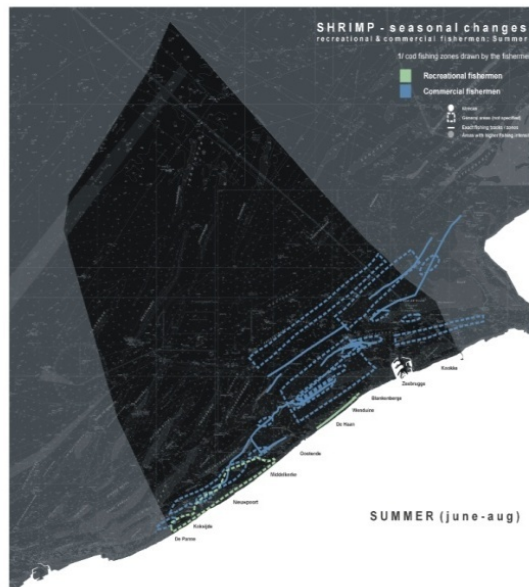
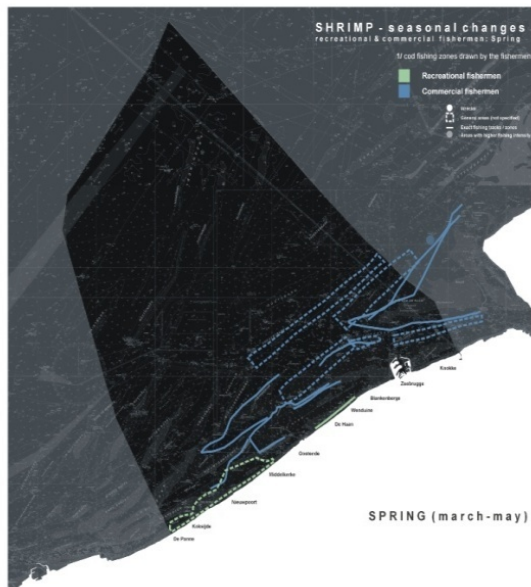
The water temperature has a significant influence on shrimp as it has an effect on its movements and therefore on its locations. More precisely, shrimp prefers warm surroundings (4C + 1R). If the water temperature is less than 7 or 8 degrees, shrimp will move away towards deeper water (2C). A good water temperature is around 10-12 degrees (1C + 1R) .

4.3. Shrimp



4.3. Shrimp










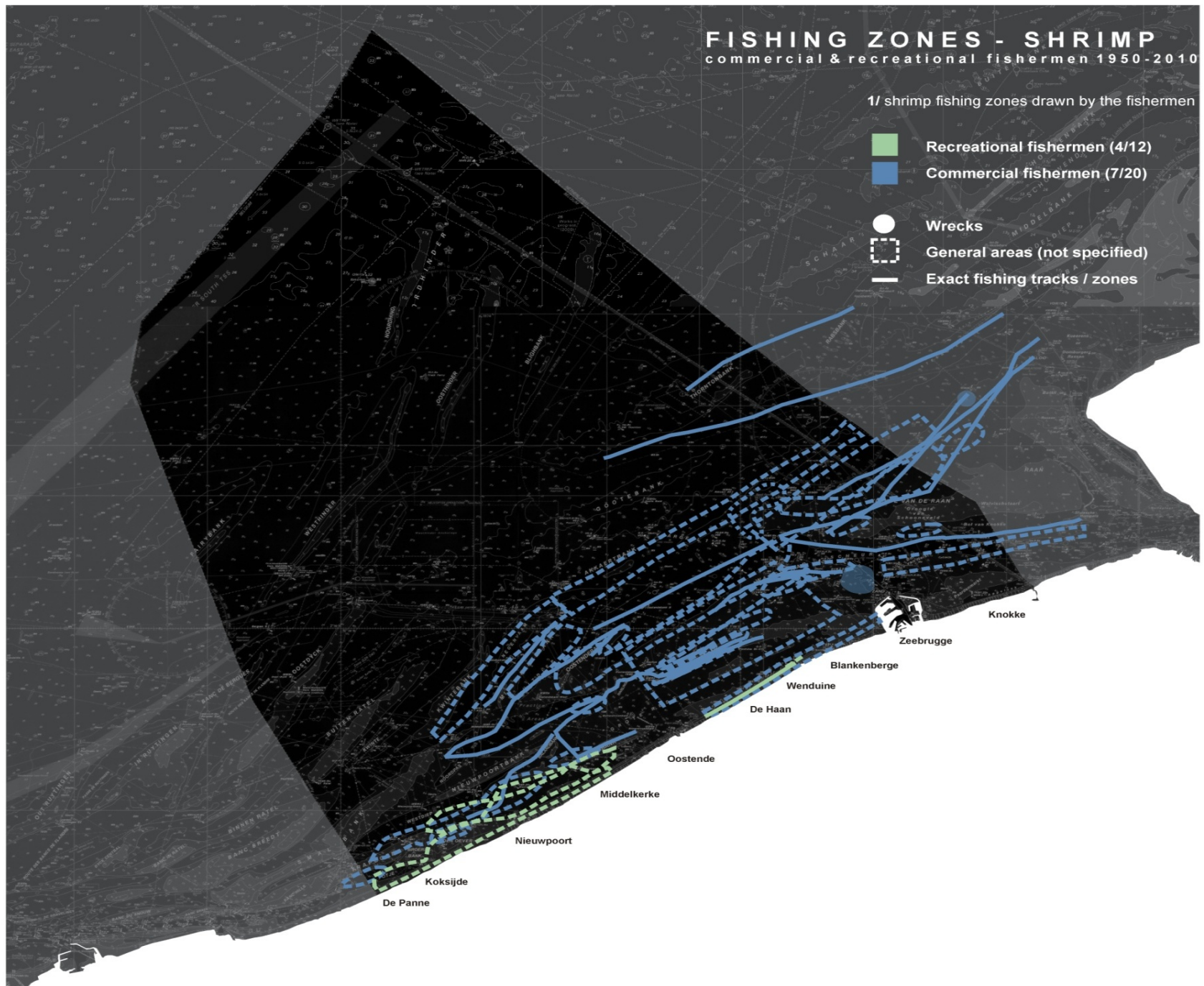
BELGIAN SCIENCE POLICY

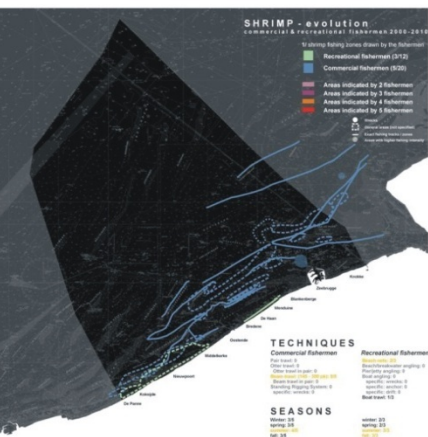
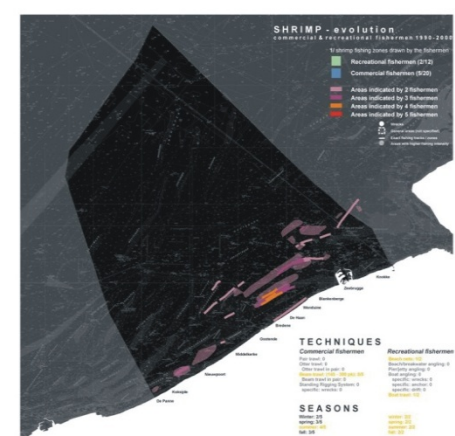
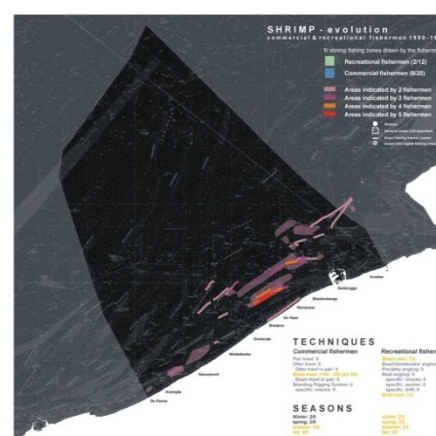
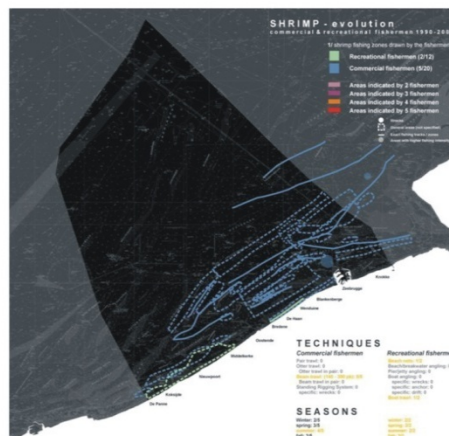
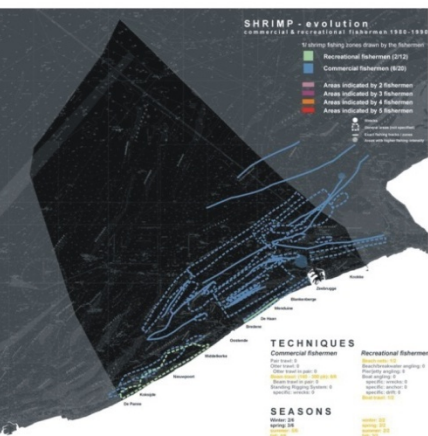
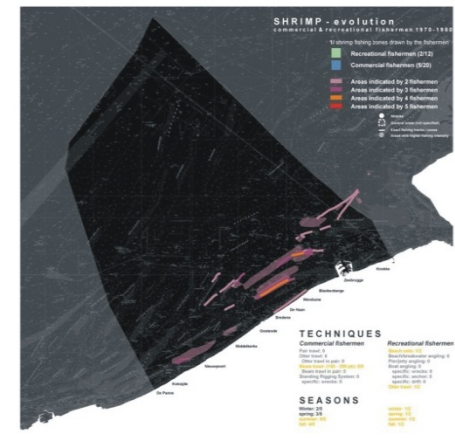
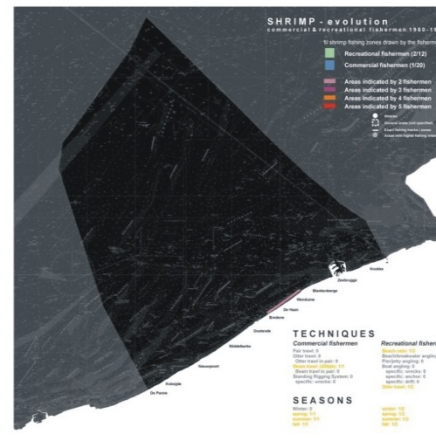
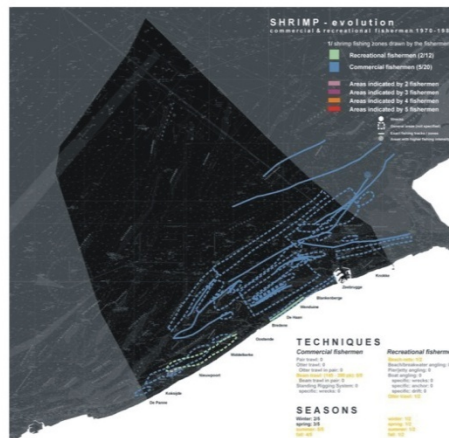
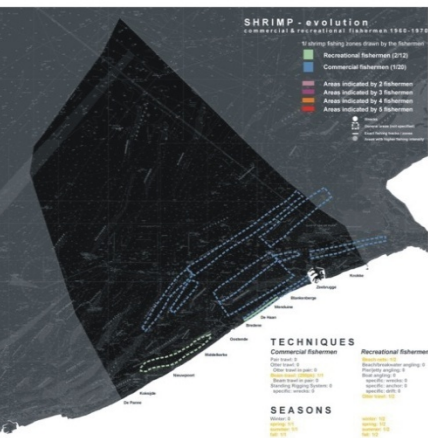
FISHING ZONES - SHRIMP

commercial & recreational fishermen 1950-2010

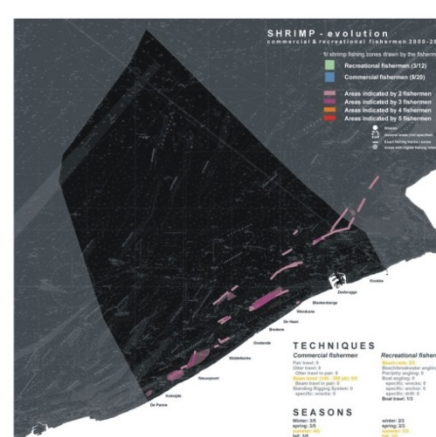
1/ shrimp fishing zones drawn by the fishermen

-  Recreational fishermen (4/12)
-  Commercial fishermen (7/20)
-  Wrecks
-  General areas (not specified)
-  Exact fishing tracks / zones

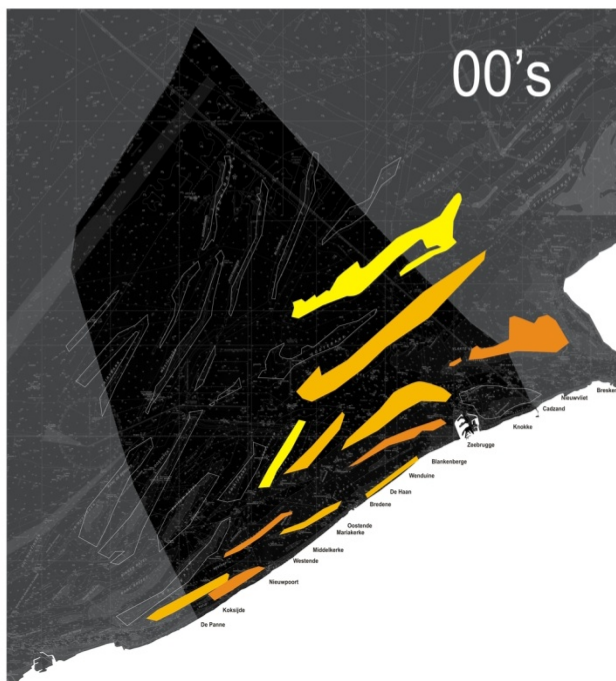
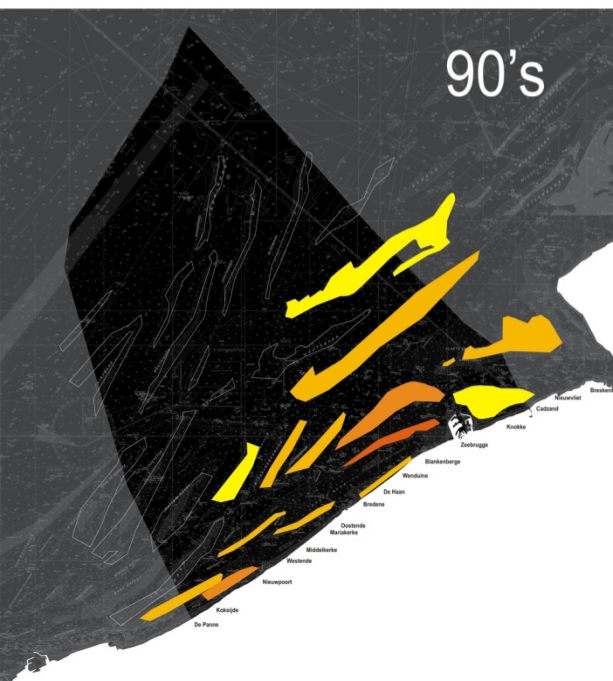
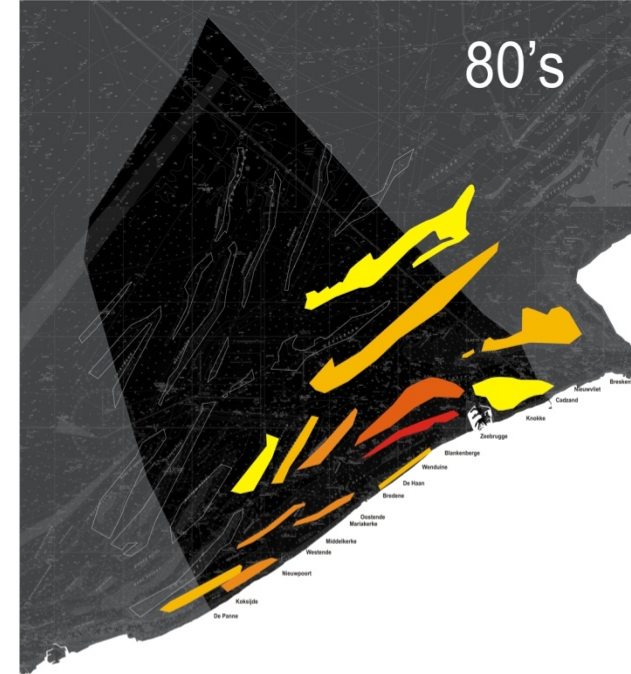
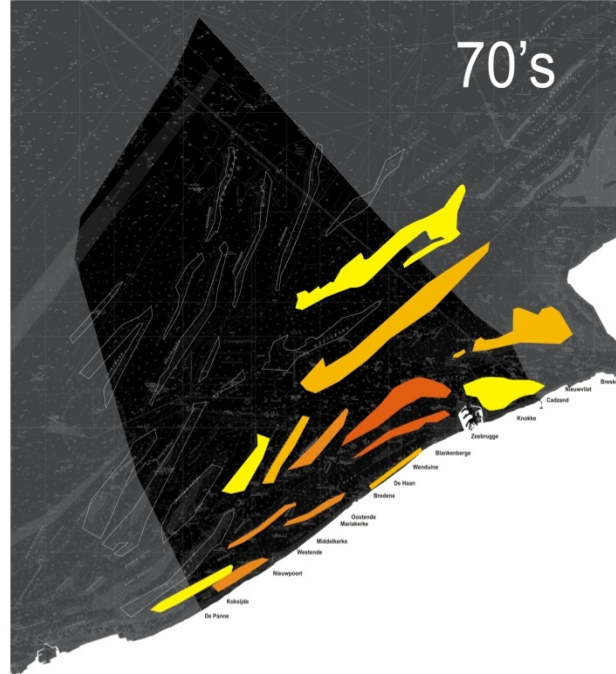
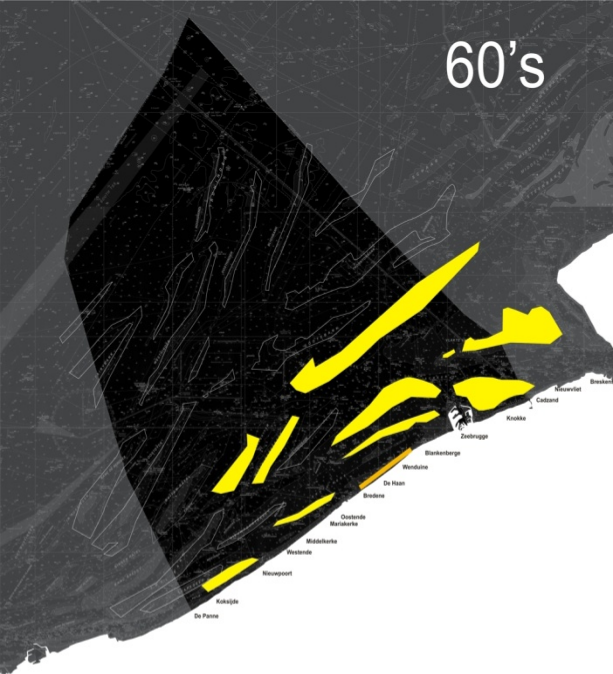




SHRIMP - evolution
commercial & recreational
fishermen 1960-2010



SHRIMP - evolution
commercial & recreational
fishermen 1960-2010
intensely fished areas



5. LECOFISH conclusion

- Co-operation with fishermen was surprisingly successful
- The LEK results on cod, sole and shrimp that haven been validated by SEK have a reliability of about 90%.
- LEK and mapping for MSP purposes seems in Belgium an additional way to indicate fishery zones, past and present, supported by the stakeholders.
- ICES info is less/not suitable due to grids used.

Acknowledgments

Belgian Science Policy for funding LECOFISH

Belgian fishermen for their co-operation

Members of the guidance committee (SEK)

Members of the focus groups (SEK & stakeholders)