DTU Aqua
National Institute of Aquatic Resources

Effects of fisheries discards on the benthic ecosystem

Discards of Danish set nets fisheries in the Kattegat

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Introduction

The Danish set (gill- and trammel) nets fleet

- ✓ reducing since the mid-1990s but still of importance (1) (3)
- ✓ likely to gain increasing interest in response to (12) (13)
  - ✓ economic issues (rising fuel prices)
  - ✓ political context (strong support for environmentally friendly practices from consumers and environmental organizations)

Challenges

- ✓ getting more information on interactions between marine environment and commercial set nets fisheries with regard to
  - ✓ the Ecosystem Approach to Fisheries proposed by the Food and Agriculture Organization
  - ✓ the European Union Marine Strategy Framework directive
  - ✓ the revision of the European Union Common Fisheries policy

Upcoming progressive implementation of an obligation to land

- ✓ direct effect on the living resource
- ✓ indirect ecological effects (2)
  - ✓ dead or fatally damaged discarded species available as a food resource for seabed-living invertebrates, or decomposed and recycled to the food web
  - ✓ ecological interactions of importance for the surrounding ecosystem, especially in shallow waters (Kattegat)

Material and methods

Discard data

- ✓ observers at sea
- ✓ in the Kattegat
- ✓ from 1997 to 2012

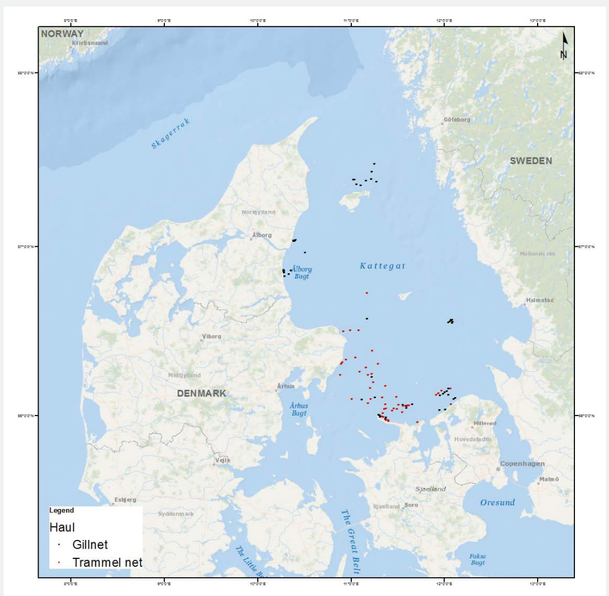


Figure 1- Map of the study area with location of hauls. Each location represents the midway point of each haul.

Discard ratio

$$Discard\ ratio\ (\%) = \frac{No.\ of\ individuals\ discarded}{No.\ of\ individuals\ discarded + No.\ of\ individuals\ landed} \times 100$$

Vessels		Gear		Hauls		
No.	Length (m)	Type	Mesh size (mm)	No.	Soaking time (h)	Depth (m)
17	12.0 (5.3)	Gillnets (53%) and trammel nets (47%)	128.0 (37.3)	103	32.7 (38.9)	11.8 (7.9)

Catch	Discard	Target species
No. of individuals per haul	Discard ratio per haul (%)	
488 (990)	41.40 (27.50)	Cod, lemon sole, lumpfish, plaice, sole, turbot

Table 1- Summary of discard data collected onboard gill- and trammel netters in the Kattegat from 1997 to 2012.
No.: number. Else, the mean is given with standard deviation in brackets.

Results

	Species		Discard ratio (%) (a)		Individuals (no.)	Stations (no.)	Fisheries management		Environmental protections		
	Order	Common name *(scientific name)*	<MLS or Lm (b)	>MLS or Lm (b)			Quota (c)	Discard ban (d)	IUCN (e)	OSPAR (f)	N2000 (g)
BENTHIC	Decapoda	Edible crab *(Cancer pagurus)*	38.79 (54.55)		42	2	x	x	NA	x	x
		Norway lobster *(Nephrops norvegicus)*	0.94 (0)	0	2	1	√	√	LC	x	x
DEMERSAL	Carcharhiniformes	Lesser spotted dogfish *(Scyliorhinus canicula)*	0	0.27 (0.28)	3	3	x	x	LC	x	x
	Gadiformes	Lesser forkbeard *(Raniceps raninus)*	0.5 (0.16)		11	4	x	x	NA	x	x
		Saithe *(Pollachius virens)*	1.18 (1.62)	3.56 (7.08)	116	14	√	√	NA	x	x
	Perciformes	Butterfish *(Pholis gunnellus)*	0.13 (0)		1	1	x	x	NA	x	x
		Dragonets *(Callionymus spp.)*	0.52 (0.04)		2	2	x	x	NA	x	x
		European perch *(Perca fluviatilis)*	0.45 (0)	0	1	1	x	x	LC	x	x
		Greater weever *(Trachinus draco)*	1.84 (2.01)		46	10	x	x	NA	x	x
		Spotted dragonet *(Callionymus maculatus)*	0.47 (0.25)		21	5	x	x	NA	x	x
	Pleuronectiformes	Brill *(Scophthalmus rhombus)*	2.26 (3.26)	6.41 (6.96)	397	42	x	√	NA	x	x
		Common dab *(Limanda limanda)*	24.13 (18.91)	3.89 (8.5)	16563	75	x	√	NA	x	x
		Common sole *(Solea solea)*	5.71 (7.7)	1.4 (1.56)	1735	34	√	√	NA	x	x
		European flounder *(Platichthys flesus)*	1.12 (1.36)	10.15 (13.21)	1875	60	x	√	LC	x	x
		Lemon sole *(Microstomus kitt)*	1.35 (1.42)	0.22 (0)	134	20	x	√	NA	x	x
		Long rough dab *(Hippoglossoides platessoides)*	0.83 (0.63)		45	12	x	√	NA	x	x
		Plaice *(Pleuronectes platessa)*	4.26 (5.11)	3.61 (4.61)	3128	64	√	√	LC	x	x
		Topknot *(Zeugopterus punctatus)*	0.6 (0.15)		12	5	x	x	NA	x	x
		Turbot *(Scophthalmus maximus)*	3.56 (7.75)	1.02 (0)	482	49	x	√	NA	x	x
	Rajiformes	Starry ray *(Amblyraja radiata)*	9.63 (11.36)	0	416	17	√	√	VU	x	x
	Scorpaeniformes	Grey gurnard *(Eutrigla gurnardus)*	0.59 (0.41)	1.11 (1.15)	126	15	x	x	NA	x	x
		Pogge *(Agonus cataphractus)*	1.43 (1.12)		442	23	x	x	NA	x	x
		Shorthorn sculpin *(Myoxocephalus scorpius)*	1.01 (0.92)	1.23 (1)	423	37	x	x	NA	x	x
		Tub gurnard *(Chelidonichthys lucerna)*	0.17 (0)		2	1	x	x	NA	x	x
	Syngnathiformes	Lesser pipefish *(Syngnathus rostellatus)*	0	0.26 (0)	2	1	x	x	NA	x	x
		Snake pipefish *(Entelurus aequoreus)*	0.13 (0)		1	1	x	x	NA	x	x
BENTHOPELAGIC	Clupeiformes	Herring *(Clupea harengus)*	0	0.62 (0.59)	12	3	√	√	LC	x	x
	Gadiformes	Cod *(Gadus morhua)*	3.04 (3.39)	1.79 (1.76)	835	63	√	√	VU	√	x
		Pollack *(Pollachius pollachius)*	0.45 (0.2)		2	2	x	√	NA	x	x
		Poor-cod *(Trisopterus minutus)*	0	0.73 (0.36)	11	6	x	x	LC	x	x
		Whiting *(Merlangius merlangus)*	1.66 (2.12)	2.09 (3.19)	495	34	√	√	NA	x	x
		Whiting pout *(Trisopterus luscus)*	0.91 (0)	0	1	1	x	x	NA	x	x
	Gasterosteiformes	Ten-spined stickleback *(Pungitius pungitius)*	0	1.64 (1.39)	13	2	x	x	LC	x	x
	Scorpaeniformes	Lumpfish *(Cyclopterus lumpus)*	5.99 (11.96)		211	18	x	√	NA	x	x
PELAGIC-NERITIC	Clupeiformes	Allis shad *(Alosa alosa)*	1.64 (0)		3	1	x	x	LC	√	II, V
	Perciformes	Atlantic horse mackerel *(Trachurus trachurus)*	0	0.39 (0)	1	1	x	√	NA	x	x
		Atlantic mackerel *(Scomber scombrus)*	0	4.05 (3.78)	11	6	√	√	LC	x	x
REEF-ASSOCIATED	Perciformes	Corkwing wrasse *(Symphodus melops)*	0	0.34 (0)	1	1	x	x	LC	x	x
		Cuckoo wrasse *(Labrus mixtus)*	0	0.91 (0)	1	1	x	x	LC	x	x

Table 2- Discard ratio per species and size category, fisheries management regulations and environmental protections for discarded species in the commercial Danish set nets fisheries in the Kattegat from 1997 to 2012.

Remark: Common lobster (*Homarus gammarus*), tope shark (*Galeorhinus galeus),* Atlantic wolffish *(Anarhichas lupus),* monkfish *(*Lophius *piscatorius),* ling *(Molva molva),* thick lipped mullet *(Chelon labrosus)* and witchflounder *(Glyptocephalus cynoglossus)* were also caught but with no discard.

(a) Discard ratio is given as a mean with standard deviation in brackets
(b) Minimum Landing Size (MLS) as listed in (5) including updates throughout the years. MLS also corresponds to the Minimum Conservation Reference Size. When there is no MLS, length of maturity (Lm) from (8) and (14) is used, with mean of ranges when applicable. Cells are merged when neither MLS nor Lm is available
(c) Based on (6): species to be possibly included in the obligation to land (√), not on the list (x)
(d) Based on (7): species under quota in ICES area IIIa (√) or not (x)
(e) International Union for Conservation of Nature (IUCN) Red List of threatened species (9): Least Concern (LC), Vulnerable (VU), not evaluated (NA)
(f) OSPAR List of Threatened and/or Declining Species and Habitats (10): species under threat and/or in decline in the OSPAR region of interest (Kattegat) (√), not on the list (x)
(g) European Union Habitats Directive (N2000) (4): species of community interest whose conservation requires the designation of special areas of conservation (Natura 2000 network) listed in annex II (II), whose taking in the wild and exploitation may be subject to management measures listed in annex V (V), not on the list (x)

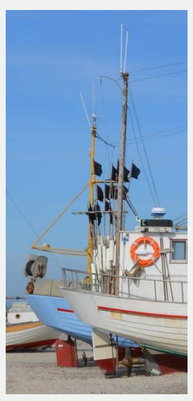
Next steps

Ecosystem Approach to Fisheries

- ✓ Relate results to the research Baltic International Trawl Survey (BITS)

Discarding behaviour

- ✓ Explore factors of variability (fishery, depth, soaking time,…)
- ✓ Explore discard of invertebrates (sea trials)



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