

Fish and Fisheries

*Baseline Reports
regarding Fehmarnbelt*

Final report
Recreational Fisheries in
Fehmarnbelt

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1. Summary

The extent of the German and Danish recreational fisheries in Fehmarnbelt and region were investigated to establish baseline information for assessing the potential impacts of the Fehmarnbelt Fixed Link. Investigations included characterizing the coastal and offshore recreational fisheries, naming the primary fish species of interest and their fishing seasons, estimating general fishing effort and the location of the coastal and offshore fisheries in Fehmarnbelt. Official data was supplemented with interviews of members of sports fishing clubs, hobby fishing organisations and commercial angling vessels that offer offshore fishing tours for anglers.

On a national level approximately 18% and 5% of the Danish and German population, respectively, undertake recreational fishing activities on an annual basis. In Fehmarnbelt, the coastal recreational fishing activities extend along most of the shoreline of the island of Fehmarn on the German side and along the entire southern shoreline of Lolland on the Danish side. In both areas, there are a number of popular locations where anglers primarily target sea trout, cod, flatfish and garfish when in season.

The offshore recreational fishing activities in Fehmarnbelt is considerably greater on the German side of Fehmarnbelt because of the large number (21 vessels) of commercial angling vessels that fish on a regular basis throughout the year. There are no Danish commercial angling vessels that fish in Fehmarnbelt. Offshore angling in private boats in Fehmarnbelt is limited as only a few boats troll, jig and bait fish during the year.

There are very few German and Danish hobby fishermen undertaking their activities in Fehmarnbelt. Reasons for this have been attributed to the strong currents, excessive fouling of gear with vegetation, and weather conditions which are often not very good for fishing with stationary gear (gill nets and fyke nets etc.) along the coast of Fehmarnbelt. In Denmark, however, there is a considerable amount of hobby fishing in the regional area in Nysted Nor and Nysted Fjord, to the northeast of Fehmarnbelt.

Extensive interviews with the German commercial angling vessels primarily fishing in and around Fehmarnbelt on their past and current businesses and anticipations of their future perspectives indicated that they had approximately 67.000 angling guests in 2008. The vast majority of their guests were tourists visiting the area. The interviews with commercial angling vessel owners also exposed concerns for the potential impacts due to the construction and operation of a bridge or tunnel by 20% and 12% of the votes by owners, respectively. Their greatest overall concern was the continuation of decreasing stocks (primarily cod).

The overall results of the baseline investigations on the extent of the recreational fisheries in Fehmarnbelt and region can be summarized in the following:

- The coastal fisheries along the German and Danish shoreline of Fehmarnbelt can be extensive along both coastlines with seasonal fluctuations in the number of anglers dependent on the season of the target species of interest
- The offshore recreational fisheries is most extensive on the German side of Fehmarnbelt mainly due to a large number of commercial angling vessels that offer fishing tours
- There is only a very limited amount of German and Danish hobby fishing in Fehmarnbelt.



In the Environmental Impact Statement (EIS) framework, the environmental factors concerning the recreational fisheries can be divided into 3 main components. For each environmental component, the importance will be evaluated based upon the baseline data.

Environmental Factor	Environmental sub-factor	Environmental component
Human Beings	Recreational Fisheries	Anglers
		Hobby fishermen
		Commercial angling vessels



2. Background

The construction and operation of a fixed link from Fehmarn to Lolland across Fehmarnbelt has the potential to directly or indirectly affect the German and Danish recreational fisheries in the Western Baltic and more specifically in the area between Fehmarn Island and southern Lolland, Figure 2.1.



Figure 2.1: Map of the western Baltic, including an overview of the German states of Schleswig-Holstein and Mecklenburg-Vorpommern and the island of Fehmarn, and southern Denmark including the islands of Lolland, Falster and Langeland.

On a national level, approximately 18% of the Danish population or more than 600.000 people, and 5% of the German population or about 3.3 million undertake recreational fishery activities on an annual basis, Figure 2.2.

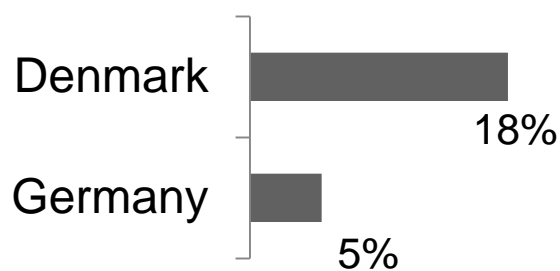


Figure 2.2: The percentage of the Danish and German populations that were recreational fishermen in 2008 (Source: The Danish Ministry of Food, Agriculture and Fisheries, 2010).



In Fehmarnbelt the German recreational fishing activities can be considerably extensive year round while the Danish recreational fisheries activities are more seasonal.

The coastline of Fehmarn Island in Germany and the southern coastline of Lolland and Falster in Denmark have a number of popular angling areas for fishing sea trout, cod, different flatfish species and other species such as garfish when seasonally abundant. Furthermore, there are many local and regional clubs in each country that have members that visit these areas on a regular basis and often during the spring and autumn when several species of interest are most abundant, Figure 5.1, Figure 5.2 and Figure 5.3.

Offshore, both German and Danish anglers in small private boats troll for sea trout, jig for cod and herring and in some areas use bait to catch flatfish within Fehmarnbelt. In Germany however, the offshore recreational fisheries in and around Fehmarnbelt appears to be more extensive than in Denmark mainly because of the large number of commercial angling vessels (21 vessels in 2009) that have their home harbours on or near Fehmarn Island and fish in and near Fehmarnbelt during the entire year. In contrast, there are no Danish commercial angling vessels that fish in Fehmarnbelt. Furthermore, the status of Fehmarn Island as an attractive tourist area and the focus and easy access to the Baltic Sea for German anglers, adds to the popularity of Fehmarnbelt.

Because both coastal and offshore recreational fishing activities have importance within Fehmarnbelt in both Germany and Denmark, effects such as temporary closure and/or permanent loss of fishing grounds during the construction or operational phase of a fixed link will to some degree have an impact on these fisheries in the respective areas. Furthermore, impacts affecting the distribution of recreational species of interest such as sediment plumes from dredging or changes in hydrographic regimes or habitat diversity from bridge pylons may also play a role in affecting the recreational fisheries.

To thoroughly assess these and other impacts to the recreational fisheries and their associated components from the establishment of a fixed link over Fehmarnbelt, it is necessary to describe the extent and importance of the German and Danish coastal and offshore recreational fisheries in the near field and regional areas of Fehmarnbelt. This information can thereafter be compared with impact scenarios to help make a valid assessment of the potential impact to these fishing activities during construction and operation as well as in response to new structures.



3. Objectives

Recreational fisheries are generally not monitored within the society with the same intensity and regularity as for example, the commercial fisheries. Recreational fishermen are not required to register their catch and there are many different types of fishing activities such as anglers fishing with rod and reel from the shoreline or from private or commercial angling vessels, or hobby fishermen using a few stationary gear such as gill- and fyke nets in shallow waters etc.). There are anglers that travel far distances to fish only a few times during the year while others live within short distance and fish often. This makes it very difficult to find and collect satisfactory data on the recreational fisheries where information is often diffuse and undocumented and there are many more people represented in the society than, for example, commercial fishing operations.

The overall objective of this study is to give an overview of the extent distribution and importance of the recreational fisheries in Fehmarnbelt and region with the goal to have sufficient data to undertake a qualified assessment of the potential impacts to these fisheries from establishing a fixed link over Fehmarnbelt.

This will be attempted by presenting the quantitative data on the recreational fisheries that is available i.e. the number of fishing licenses sold in the German and Danish regional areas around Fehmarnbelt (Schleswig-Holstein and Lolland) and the number of annual fishing trips by commercial angling vessels fishing in Fehmarnbelt etc. To gather information on where and when fishing is taking place, and what species are being targeted, official data was supplemented by interviews with anglers and members of local angling clubs as well as surveys of the owners of recreational fishing enterprises using commercial angling vessels that fish in the Fehmarnbelt area. Surveys with commercial angling vessels owners were undertaken to also get historical background of the extent of these recreational fisheries, and to document the expectations of the vessel owners with regard to the future commercial angling fisheries in relation to the establishment of the fixed link across Fehmarnbelt.

The influences of the Fehmarnbelt Fixed Link on the associations between the recreational fisheries, tourism and their socioeconomic aspects are assessed in other studies and are therefore not part of this report.

3.1 Rules and regulations of recreational fishing in the Fehmarnbelt region

Recreational fishermen are not allowed to sell their landings, in contrast to commercial fishermen. Furthermore, recreational fishermen are not obliged to report their catch to the authorities, except catches from angling events. There are therefore no official catch statistics which could provide data and a potential proxy for assessing the importance of the different recreational fishery activities at the species level in the Fehmarnbelt.

3.1.1 Germany - Schleswig-Holstein and Mecklenburg-Vorpommern

Recreational fisheries in Schleswig-Holstein and Mecklenburg-Vorpommern are strongly supported by the region because of its status as a tourist area and association with the western Baltic. The German recreational fisheries can be divided into 3 main groups: 1) anglers fishing along the coast typically with a rod and reel using artificial or natural baits, 2) anglers fishing offshore from private boats or commercial angling vessels by trolling, jigging or bait fishing and 3) hobby fishermen fishing most often near the coast with a special license to use stationary gear such as gill nets, fyke nets, eel traps and longlines etc.



A short summary of the most important regulations for recreational fishing in the German coastal waters of Schleswig-Holstein are summarised in Table 3.1. Anglers fishing along the coast or offshore (on board vessels) are bound by the same rules and regulations. The commercial angling vessels are, however, bound further by strict directives of the Seamen's Accident Prevention and Assurance Association (See-BG) and EU laws (EU, 2006). For hobby fishermen in Germany, the type, size and number of gear allowed is different in each federal state). A thorough description of the legal framework for marine fisheries in Schleswig-Holstein and Mecklenburg-Vorpommern are given in the Fisheries Act (LFischG) (MLUR, 2005; MLUV, 2005) and the Coastal Fisheries Ordinance (KüFO) (LLUR, 2008; MLUV, 2006).

Table 3.1: Rules and regulations for recreational anglers and hobby fishermen in Schleswig-Holstein (LLUR, 2006 and 2008, MLUR, 2005 and 2008).

Rules	Anglers	Hobby fishermen
Fishing license needed	Yes (valid fishing license of Schleswig-Holstein or another federal state)	Yes (valid for 2 years)
Tourist fisheries license	Yes (valid for 40 days for people living outside Schleswig-Holstein and not having a valid German fishing license). Licenses are purchased from the local authorities of the district in which fishing will take place.	
Allowance to fish in coastal waters	German or tourist fishing license sufficient (in M-V additional allowance for coastal waters)	Schleswig-Holstein fishing license sufficient (in M-V additional allowance for coastal waters)
Gear allowed	Rod and reel, umbrella net of max. 1 m ² , stow net of max. 2 m width or similar gear	Fyke nets - 4 single or 2 double longlines – max 100 hooks
Minimum length (cm) of selected target species	Cod (<i>Gadus morhua</i>) Eel (<i>Anguilla anguilla</i>) Salmon (<i>Salmo salar</i>) Sea trout (<i>Salmo trutta</i>) Plaice (<i>Pleuronectes platessa</i>) Herring (<i>Clupea harengus</i>) Mullet (<i>Chelon labrosus</i>) Turbot (<i>Psetta maxima</i>)	38 cm 35 cm 60 cm 40 cm 25 cm 11 cm 40 cm 30 cm
Closed season for selected target species	Salmon and sea trout from 1 st of Oct. - 31 st of Dec.	
Catch limit per fishing day	None	None
Obligatory catch declaration	From fishing events (competitions) only	None

Most German anglers are members of local clubs, which are organised under regional or state organisations. These organisations are members of one of two umbrella associations – the German Angling Association (DAV) and the Association of German Sports Anglers (VDSF). Some anglers are additionally organised in special associations like the German Marine Angling Association (DMV) (~1000 members, Illmaier, 2009) which are sections of the DAV.

Fehmarnbelt region Anglers

In the federal state of Schleswig-Holstein in 2008, about 70,000 people had a valid fishing license (Brämick, 2008). Thus, there were one or more anglers in approximately 22% of the



households in Schleswig-Holstein making this state one of the three federal states with the highest percentage of households with anglers (Arlinghaus, 2004).

The Landessportfischerverband Schleswig-Holstein e.V. has about 40,000 members (Boots-Angel-Club e.V., 2009) and the Landesanglerverband Schleswig-Holstein (Landesanglerunion Nord e.V. - LSFV) has more than 600 members (LAV-Nord, 2009). This means that about 1.4% of the population of Schleswig-Holstein are organised anglers i.e. anglers that are members of clubs. The region around Fehmarn is a stronghold of recreational fisheries in Schleswig-Holstein (Stockfleth, 2010 - pers. comm.).

Hobby Fishermen

Until the mid-1990s, every citizen of Schleswig-Holstein could obtain a hobby fishing license without any qualifications. Since then, a hobby fishing license can only be obtained by those with relevant qualifications such as being a professional fisherman or a fish farmer (aquaculture). In 2006, there were about 1,000 fishermen with hobby fishing licenses on the Baltic coast of Schleswig-Holstein (Schultz and Gebel, 2007). Hobby fishing licenses are generally issued for a couple of years at a time, which makes it difficult to estimate the exact number of valid licenses per year.

Commercial angling vessels

The region of Ostholstein plays an important role for the recreational fisheries sector in northern Germany as it is the area with the largest fleet of commercial angling vessels in Schleswig-Holstein (EOGH, 2008). Since the 1960s, the harbour of Heiligenhafen has been a popular starting point for commercial angling trips and in 1985 was the basis harbour for 16 commercial angling vessels (Möller and Tiffert, 1988). Since then, Heiligenhafen has continually evolved into one of the most important harbours for angling trips with the largest fleet of commercial angling vessels in Germany (Möller and Tiffert, 1988, Dwif, 2005). In 2005, Heiligenhafen had a combined number of 20 vessels divided amongst 11 owners offering commercial angling tours (Dwif, 2005). In 2009, the harbour of Heiligenhafen had a combined number of 15 vessels divided amongst 12 owners offering commercial angling trips.

3.1.2 Denmark - Lolland and Fehmarnbelt region

Similar to Germany, the Danish recreational fisheries in the western Baltic and Belt region can also be divided into 3 main groups; 1) anglers fishing along the coast typically with a rod and reel, 2) anglers that fish offshore from private boats or commercial angling vessels and 3) hobby fishermen that typically fish close to shore with a special license to use stationary gear. Hobby fishermen also typically use a small boat to set nets and retrieve their catch. In general, the Danish recreational fisheries in the Fehmarnbelt and region do not appear to be as extensive as that of Germany, particularly the offshore fisheries. This can mainly be attributed to the lack of Danish commercial angling vessels offering tours in Fehmarnbelt.

The rules and regulations of recreational fishing in the Danish coastal waters of southern Lolland and Falster along with the minimum sizes of the most important fish species and closed fishing seasons are summarised in Table 3.2. A valid fishing license is required for coastal and offshore anglers between the ages of 18 and 65 years, and for hobby fishermen from 12 years and older.

For the coastal and offshore anglers a state license can be purchased for 1 day, 1 week or 1 year, accordingly. For hobby fishermen a special hobby fishing license can be purchased and is valid for 1 year. The hobby fishermen licenses are also valid for all other forms of coastal and offshore angling. The most important restriction for hobby fishermen is the use of a maximum of 6 gear such as fyke nets, longlines (maximum 100 hooks) and pots etc., however only 3 of these may be gill nets. The catches from recreational anglers and hobby fishermen are not allowed to be sold commercially.



Table 3.2: Rules and regulations for anglers and hobby fishermen fishing in the Danish waters of Fehmarnbelt and region. (The Danish Directorate of Fisheries).

Rules	Anglers (resident and non-resident)	Hobby fishermen
Fishing license needed (resident, non-resident and tourist)	Yes (day, week or year) (ages 18-65 yrs)	Yes (only per year) (12 yrs and older)
Obligatory catch declaration	None	None
Catch limit per fishing day	None	None
Gear allowed (Anon 2008a, Order Nr. 1199 of December 2008)	Rod and reel – only light hand tackle	Maximum of 6 gears allowed, however of these only 3 may be gill nets; - gill nets (maximum 3) - fyke net (single and double) - longline (maximum 100 hooks) - pots
Minimum length of selected target species (Anon 2008b, Order Nr. 1143 of December 2008 + Appendix)	Cod (<i>Gadus morhua</i>) Yellow eel (<i>Anguilla anguilla</i>) Salmon (<i>Salmo salar</i>) Sea trout (<i>Salmo trutta</i>) Flounder (<i>Platichthys flesus</i>) Plaice (<i>Pleuronectes platessa</i>) Sole (<i>Solea solea</i>) Turbot (<i>Psetta maxima</i>) Herring (<i>Clupea harengus</i>)	38 cm 37 cm (increases 1 cm each calendar year to 40 cm in 2013) 60 cm 40 cm 25,5 cm 25 cm 24 cm 30 cm 20 cm
Closed seasons for selected target species and use of specific gear (Anon, 2008a, Order No. 1199 of Dec. 2008)	Salmon and Sea trout in “spawning dress” from 16 Nov. – 15 th Jan. Plaice (females) from 15 th Jan. – 30 th Apr. Flounder (females) from 15 th Jan. - 15 th May Fyke nets from 10 th May - 31 st July (does not include shrimp traps) Longlines from 1 st May - 30 th Sept. Gill nets with mesh sizes 100-130 mm from 1 July – 15 th November	

In an effort to protect the endangered populations of European eel the use of fyke nets are prohibited from 10 May-31 July and the use of longlines are prohibited from 1 May-30 September (Anonymous, 2008a).

A more thorough description of the laws and regulations including the number and design of the gear allowed for anglers and hobby fishermen in the Danish recreational fisheries is given in the “Salt- and Freshwater Fishery Laws” found on the website for the Danish Directorate for Fisheries (<http://fd.fvm.dk>).



4. Methodology

Different approaches were used to gather information on recreational fisheries due to differences in data availability between Germany and Denmark.

4.1 Data collection, Germany

Data on the preferences in target species, seasons and the position of angling locations along the shoreline were sufficiently described in available literature.

There was no official data on the number of German recreational anglers using the area in and around Fehmarnbelt and no data providing a basis from which the number of marine anglers in particular areas in Germany could be calculated. Thus, estimates on the number of marine anglers in Schleswig-Holstein were used from a report on the cod catches by recreational fishermen in Germany by Schultz and Gebel (2007). These results were supplemented with official data from local authorities to make estimates on the number of marine anglers fishing in Fehmarnbelt and region.

Data on preferred target species, fishing seasons and the location of angling grounds used by coastal anglers was derived from literature by Schroeter (2003, 2004 and 2005). Similar information for the offshore fisheries was derived from comprehensive surveys of the majority of owners of commercial angling vessels from the harbours of Heiligenhafen, Burgstaaken and Orth in the northern part of Ostholstein. Vessels from these harbours are close to Fehmarnbelt and typically use the Fehmarnbelt for angling trips year round. All owners of commercial angling vessels at these harbours were first contacted by letter explaining the intentions of the survey. Then, they were contacted again to set up interviews with those interested in collaborating (Fisch-hitparade, 2009; Blinker, 2009). With the help of a standardized questionnaire (Appendix 1), this survey contained questions on the size and capacity of the vessels, number of guests, main target species and their seasons and location of angling areas.

Furthermore, because the German commercial recreational fisheries in Fehmarnbelt is considerably extensive, the survey was expanded to include questions to the majority of owners on the historical development of their commercial angling businesses over the past 10 years, and their concerns to what the main challenges and perspectives will be for their business in the future, as well as their knowledge and opinion about what effects the establishment of a fixed link over Fehmarnbelt might lead to for their fisheries.

4.2 Data collection, Denmark

There is no comprehensive description of the extent or character of the Danish recreational fisheries in and around Fehmarnbelt. There is however, a series of reports describing the behaviour, motives, preferences and economic importance of the recreational fisheries in Denmark (Ministry of Food, Agriculture and Fisheries, 2010). On a local scale in Fehmarnbelt, there is a report describing the recreational fisheries at Rødsand to the east of Fehmarnbelt in relation to an environmental impact assessment of the Nysted Wind Farm (SEAS, 2000). Furthermore, official data on the number of daily, weekly and yearly licenses issued to residential and visiting anglers and hobby fishermen from the island of Lolland over the last 5 years was obtained from the Danish Directorate of Fisheries. This data was supplemented with 17 interviews of anglers, members of local angling clubs, small firms that charter commercial angling vessels in the region, small boat clubs, and hobby fishermen



organisations to get more specific information on the number of anglers, location of fishing grounds and their associated target species and seasonal fisheries in Fehmarnbelt and region.

4.3 Data handling

Information of coastal anglers fishing from the shoreline and anglers fishing offshore from private boats and commercial angling vessels were analysed and presented separately.

Information on the location of fishing areas were plotted on maps using GIS programs to help present the spatial patterns of the most important recreational fishing activities.

Information from interviews of 10 German owners representing 15 commercial angling vessels in the northern part of Ostholstein were analysed and presented according to the percentage (%) of the number of allotted answers that were allowed in each subject segment (Challenges – 50 votes in all or 5 per owner; Perspectives – 30 votes in all or 3 per owner and Impacts (anticipated) during the Construction phase, Bridge operation and Tunnel operation – only one vote could be given for each comment, however each owner is allowed to answer as many comments as wanted. There were owners of 6 commercial angling vessels that were not surveyed and thus their anticipated challenges, perspectives and concerns about the impacts are not represented.



5. Recreational fisheries in Germany and Denmark

Patterns in the recreational fisheries showed some differences between Germany and Denmark.

5.1 Characteristics of the angling activities and their target species

5.1.1 Germany

On the German side of Fehmarnbelt, the district of Schleswig-Holstein has a coastline of approximately 402 km (Statistisches Amt für Hamburg und Schleswig-Holstein, 2008), including Fehmarn Island, which is equally frequented by anglers (Illmaier, 2009). According to Wrackangeln.de (2010a), five main types of marine angling activities can be described:

- Fishing with artificial lures from the shore, primarily using a light hand held rod and a spinner, wobbler or spoon targeting sea trout, cod and occasionally herring.
- Fly fishing from the shore primarily targeting sea trout.
- Surfcasting from the shore using heavy rods and natural baits targeting cod, flatfish and occasionally eel.
- Angling (trolling and jigging) offshore on board small private vessels with natural or artificial baits.
- Angling (jigging and bait fishing) offshore on board commercial angling vessels.

The primary target species and the percentages of these species caught with each angling method on the coast of Schleswig-Holstein are listed in Table 5.3 The investigations by Schultz and Gebel (2007) also included the recreational fisheries in Fehmarn and Heiligenhafen so it is assumed that the overall proportion of species caught by anglers in Schleswig-Holstein is also representative for the region around Fehmarnbelt.



Table 5.3: The percentage of target species caught with different angling methods on the coast of Schleswig-Holstein (Schultz and Gebel, 2007).

Angling method	From the shoreline		Offshore Onboard a boat/vessel			% of fishing activities	
	surfcasting	waders / coastal	private boats		commercial angling vessel	angling from the shore (total)	angling on board a vessel (total)
Fish species in %			angling	trolling			
Cod	53.6	18.7	63.5	31.7	90.5	36.2	61.9
Flounder	39.1	0.9	20.3	2.4	5.0	20	9.2
Sea Trout	2.5	73.3	4.9	61	1.1	37.9	22.3
Garfish	2.5	6.5	3	2.4	0.4	4.5	1.9
Herring	0.2	0.0	7.2	0.0	1.3	0.1	2.8
Whiting			0.4	0.0	0.6	0.0	0.3
Salmon		0.6		2.4		0.3	0.8
Mackerel			0.1		1.1	0.0	0.4
Eel	2.1		0.3			1.05	0.1
Pike			0.3			0.0	0.1

Results by Schultz and Gebel (2007) showed that cod, sea trout and flounder are the main target species for anglers fishing along the Baltic coast of Schleswig-Holstein. Garfish and herring are also of importance to anglers, while all other species made up less than two percent of the total estimated catch. Sea trout was the main target species of angling along the shore with waders and trolling by boat, while cod was the main target species by anglers surfcasting and to a large extent by anglers fishing from boats other than trolling. The large interest in fishing for cod from boats was also verified in interviews with owners of commercial angling vessels as they consistently named cod as the most important species for their guests and catches of cod as being the primary influence of the angler's satisfaction with a fishing trip, Table 5.4 Most owners said that other species were seldom caught and generally only as bycatch.

Table 5.4: The main fish species targeted and caught on commercial angling vessels and the importance of different species to the anglers according to the vessel owners (based on surveys of the majority of owners of commercial angling vessels using the Fehmarnbelt and region).

Main target species of importance	Cod
Other - less important target species and bycatch	Herring
	Flatfish
	Mackerel
	Whiting
	Garfish
	Sea Trout
	Eel

5.1.2 Denmark

Fehmarnbelt runs along the southern coast of Lolland and Falster where there is approximately 100 km of coastline that can be used for recreational fisheries by anglers and hobby fishermen. According to a report on the recreational fisheries in Denmark (Ministry of



Food, Agriculture and Fisheries, 2010), there are primarily 5 types of angling fisheries undertaken in marine waters (Table 5.5), similar to the characteristics of the recreational angling in Germany.

Table 5.5: The percentages of the 5 primary types of coastal and offshore saltwater angling activities (modified from the report “The recreational fisheries in Denmark” - Ministry of Food, Agriculture and Fisheries, 2010).

Types of angling activities		Primary target species	% of recreational fisheries
Angling along the shoreline	Coastal angling – waders, spoons, spinners and flyfishing	Sea trout, garfish, cod etc.	48%
	Angling (bait fishing) along the shoreline and from piers and harbour barriers	Flatfish and cod	14%
	Surfcasting - along shoreline with bait	Flatfish and cod	4%
Angling at sea	Jigging and bait fishing – from private boats and commercial angling vessels	Cod, herring and flatfish	23%
	Trolling - private boats	Sea trout, salmon etc.	11%

In Denmark, the most common form of recreational fisheries in saltwater is angling along the shoreline primarily with a rod and reel (66% of angling activities). Angling along the coast using waders, light tackle and artificial lures (spoons, spinners and flies) and targeting sea trout and occasionally garfish and cod is the most common (48%). This form for angling is practiced almost everywhere in Denmark, with the exception of the west coast of Jutland. Shoreline angling (bait fishing) from piers, protective barriers along harbours and surfcasting make up a smaller amount of the coastal fishing activities (18%), but this type of fishing method is more versatile and anglers generally target a wider variety of species (i.e. flounder, dab, plaice, cod, turbot, mullet etc.) depending on the season. Offshore saltwater angling (jigging and bait fishing (23%) and trolling (11%)) is undertaken by 34% of saltwater anglers.

5.2 Fishing seasons in Fehmarnbelt

5.2.1 Germany

With the exception of January and February, when the catch perspectives for the main target species of recreational fishermen are lower, anglers fishing from the shoreline are using almost the entire northern coast of Fehmarn during the entire year (Schroeter, 2004). On the shores of Fehmarn Island, the best fishing seasons for different fish species are summarised in this report after Schroeter (2004). The fishing seasons were presented separately for the northwestern, northern and eastern coasts of Fehmarn and for the southern and western coasts of Fehmarn, Figure 5.1 and Figure 5.2. This was done to determine if alternative fishing grounds on Fehmarn Island are available in the event that some areas on the northerly shores of Fehmarn are closed due to disturbances or impacts from the fixed link.



Fish species	J	F	M	A	M	J	J	A	S	O	N	D
Sea Trout												
Flatfish												
Cod												
Garfish												
Mullet												
Eel												

Figure 5.1: Primary fishing seasons for select species on the northwestern, northern and eastern coast of Fehmarn based on 15 angling locations (after Schroeter, 2004).

Fish species	J	F	M	A	M	J	J	A	S	O	N	D
Sea Trout												
Flatfish												
Cod												
Garfish												
Mullet												
Eel												

Figure 5.2: Primary fishing season for select species on the southern and western coast of Fehmarn based on 7 angling locations (after Schroeter, 2004).

Spring and autumn/winter are generally the best time of the year to fish for sea trout and cod and to a certain extent garfish (primarily spring), while flatfish can be fished most of the year except for the coldest periods during the winter. The species eel and mullet are generally targeted in the summer and early autumn. There are only minor differences for some species in the seasonal fisheries between the northwestern, northern and eastern coasts of Fehmarn Island and the southern and western coast of Fehmarn Island, Figure 5.1 and Figure 5.2. It is therefore concluded, that the most important recreational fish species can be caught on the majority of the shoreline of Fehmarn Island during the same season and thus alternative fishing areas are almost always available. This is probably due to the variety of coastal habitat characteristics (sand, stones and cobbles – see Figure 5.6) constantly repeated with varying intensity along the entire coast of Fehmarn.

The general fishing seasons for fish species that are caught offshore in Fehmarnbelt and region are given in



Table 5.6. Commercial angling vessels almost exclusively target cod and are active in the Fehmarnbelt all year round when weather permits. Thus, there is not much of a difference in the seasonal changes in the cod fisheries. However, when other recreational species of interest are also in season, these species will also be targeted on occasion as a supplement to the traditional cod fishery,



Table 5.6.



Table 5.6: Approximate fishing seasons of particular target species for the offshore recreational fisheries (after Schroeter, 2004).

Fish species	Fishing season
Cod	all year
Whiting	all year
Herring	Jan.-May (Jun.), Sept.-Nov.
Flatfish	all year
Garfish	May-Jun. (-Sept.)
Sea trout	March-May, Sept.-Nov., all year
Mackerel	Jun.-Sept.
Eel	Jun.-Sept.

Trolling

The best fishing seasons for the two main areas for trolling around Fehmarn Island (on the west coast and on the east coast of Fehmarn Island) are March-May and October-December when the fisheries for sea trout and garfish (primarily March-May) in particular, as well as cod are often at their best.

5.2.2 Denmark

The general seasons for the primary fish species targeted in the Danish recreational fisheries along the shoreline of Fehmarnbelt which includes the southern parts of Lolland and Gedser are given in Figure 5.3. Although some species are targeted almost year round (cod and sea trout) most species have a primary season (or seasons) during the year when they are more abundant. For example, although cod is fished year round the best season for fishing cod are generally the colder months of the year. Similarly, sea trout are also fished year round but have two main periods a year (spring and autumn) where they are generally more abundant along the coast. The season for bait fishing along the shoreline is generally in the warmer months of the year, although it has been noted that angling for flatfish species (plaice, flounder and dab) is undertaken throughout most of the year, except from February-April (Fish guide, 2005). Garfish (spring) and other species such as mullet (summer) have a relative short season as they are along the coast for only short periods during the year.

Fish species	J	F	M	A	M	J	J	A	S	O	N	D
Sea Trout												
Garfish												
Cod												
Flatfish												
Mullet												
Eel												

Figure 5.3: The Danish fishing seasons (primary-dark grey / general-light grey) for select species in Fehmarnbelt along the southern coasts of Lolland and Gedser. Based on interviews with anglers, information from fishing clubs and guidelines from a recreational fishing guide for Lolland and Falster – tourism in eastern Denmark (Fish guide, 2005).

The primary season of offshore fishing activity for anglers using private boats along the southern coast of Lolland in Fehmarnbelt is from early spring to late autumn. During this time anglers generally target sea trout and garfish (spring) and occasionally jig for cod or bait fish for flatfish.

As mentioned, there are no Danish commercial angling vessels that fish in Fehmarnbelt. The commercial angling vessels in the region are fishing more to the west (in Langelandsbelt) and



to the east (southern and eastern Gedser) of Fehmarnbelt all year round as they primarily target cod, and a few other species of interest, Figure 5.3 and Figure 5.9.

5.3 Number of anglers and estimates of effort

5.3.1 Germany

Based on data from the years 2004, 2005 and 2006, Schultz and Gebel (2007) estimated the number of marine anglers in Schleswig-Holstein (S-H) was somewhere between 47,000-70,000 per year. The basis for these estimates was the total number of marine anglers in Mecklenburg-Vorpommern (M-V) and the ratio of organised anglers in M-V and S-H and the overall total number of anglers in M-V and the ratio of valid fishing licenses in M-V and S-H. These estimates include all people fishing in the marine waters in Schleswig-Holstein, including anglers with different types of fishing licenses.

To estimate the development of the number of anglers in Schleswig-Holstein over the last 10 years it is assumed that the number of marine anglers in Schleswig-Holstein is proportional to the number of valid fishing licenses or the number of organised anglers in the state, Table 5.7 and Figure 5.4.

Table 5.7: Number of angling associations, total number of members of angling associations, number of valid fishing licenses, number of successful exams for hobby fishing licenses and the catch (tons) of the angling fisheries in Schleswig-Holstein (Brämick, 2003-2008; Lukowicz and Brämick, 1999-2002; ¹Schultz and Gebel, 2007). a - previous years value, g - estimated, nd - not determined.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number of angling associations	306	338	338	342	352	350	348	348	369	365	352
Number of members of angling associations	39,600	40,215	40,215	40,668	43,626	43,831	44,072	44,072	43,400	42,528	34,393
Number of angling fishing licenses	74,682	81,102	77,800	75,000	75,000 ^g	65,000 ^g	65,000	65,000 ^a	57,600 ^g (66,700 ¹)	75,000 ^g	70,000
Number of hobby fishing licenses	5,250	4,335	4,335	5,234	5,841	5,456	5,495	5,495 ^a	4,920	5,245	4,826
Amount of catch (tons)	n,d,	n,d,	n,d,	345 ^g	796 ^g	796 ^{ga}	796 ^{ga}	n,d,	219	341	341

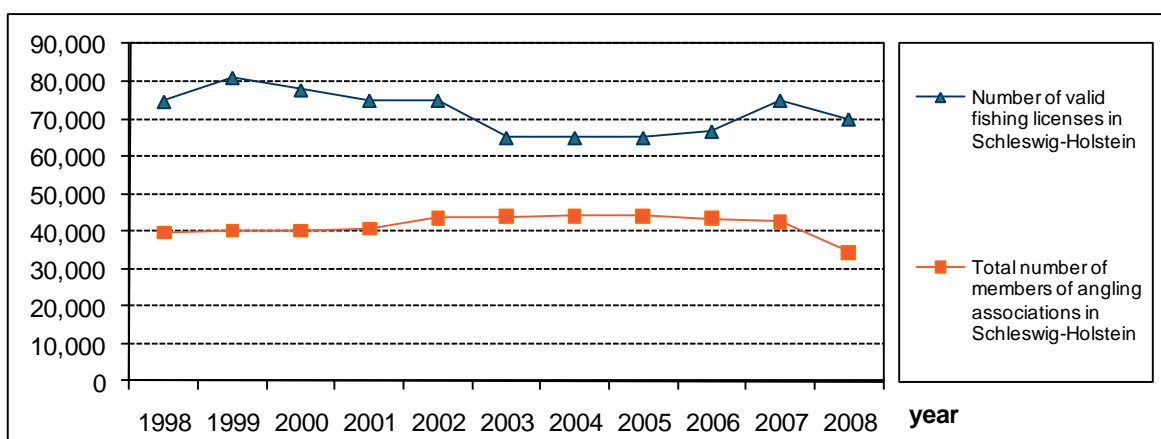


Figure 5.4: Development of the number of members of angling associations and the number of valid fishing licenses in Schleswig-Holstein from 1998-2008 (Source: Brämick, 2003-2008; Lukowicz and Brämick, 1999-2002; ¹Schultz and Gebel 2007).



The number of valid angling licenses in Schleswig-Holstein varied around an average of 72,000 over the past ten years, Table 5.7 and Figure 5.4.

In the first half of the past decade, the numbers of fishing licenses that were issued were generally a bit higher than in more recent years. The total number of anglers in Schleswig-Holstein that are members of associations varied around an average of 40,000. Numbers were generally lower in the first half of the decade and have been slightly higher the last years, except 2008. Heiligenhafen authorities alone estimate the number of angling guests per year to be 70.000 (heiligenhafen.de, 2009).

From 2004-2006 and 2008 about 8% more people in Schleswig-Holstein had a valid fishing license. In contrast, the number of anglers organised in angling associations decreased by about 22%, Table 5.7 and Figure 5.4.

In all, however, it is assumed that the total number of marine anglers in Schleswig-Holstein is still similar in numbers to the estimates by Schultz and Gebel (2007).

In 2008, about 1,000 tourist angling licenses were sold in the northern parts of the districts of Ostholstein and Plön (Municipal administration, 2009). Of these, 558 tourist angling licenses were sold on Fehmarn and 207 in Heiligenhafen.

Illmaier (2009) estimates that the majority (~80%) of marine anglers in the Fehmarn region come directly from their home to fish, and about 20% come from their holiday locations to fish. Furthermore, he assumes that about 5% of the marine anglers in the region come from Ostholstein, 10% from the rest of Schleswig-Holstein, 10% from Niedersachsen, Hamburg, Bremen and Nordrhein-Westfalen and 75% from the rest of Germany and abroad.

Schultz and Gebel (2007) suggested that angling onboard commercial vessels and trolling in small boats made up 40% of the angling effort of recreational fishermen in Schleswig-Holstein in 2005. The annual effort of recreational fishing was estimated to be between 450,000 and 890,000 angling days in 2005. These can be divided into one third for surfcasting, about one fourth each for angling on private or chartered boats and angling with waders, about 10 to 15% angling on commercial angling vessels and 2% on trolling (Schultz and Gelbel, 2007).

The total effort of commercial angling vessels amounted to 211-222 days at sea per year. According to the number and capacity of the vessels, the commercial angling fleet around Fehmarn has the capacity to sail with about 175,000 guests a year. In 2009, only about 67,500 angling guests and an additional 7,200 non-angling guests have been counted. Thus, only about 43% of the potential capacity for 2009 was used. The results of the interviews concerning the types and length of trips offered by the commercial angling firms in Heiligenhafen and Fehmarn are shown in Table 5.8. The majority of commercial angling vessels have day trips which last about 8 hours and start and end in the same harbour.

Table 5.8: Types of angling trips provided by the commercial angling vessels in Heiligenhafen and Fehmarn.

% of firms	types of angling trips	
50%	of the firms provide	100% day trips
10%	of the firms provide	75% day trips and 25% multi-day trips
10%	of the firms provide	50% day trips and 50% multi-day trips
20%	of the firms provide	≤ 5% day trips and 95-100% multi-day trips
10%	of the firms provide	charter ships (no data on duration of trips)



5.3.2 Denmark

In Denmark, 12-18% of the Danish population between the ages of 16-74 years or from 400,000-600,000 people are engaged in recreational fishing activities on an annual basis (Ministry of Food, Agriculture and Fisheries, 2010). Of these approximately 50% fish only 5 days or less per year, while a small group are very active and fish more than 40 days a year, Table 5.9. The average number of days a recreational fisherman goes fishing per year is 10 (Ministry of Food, Agriculture and Fisheries, 2010).

Table 5.9: Grouping of Danish recreational fishermen after the number of days they fish each year. Source: Results from a survey on the recreational fisheries in Denmark (Ministry of Food, Agriculture and Fisheries, 2010).

Grouping after activity level	Number of fishing days per year	% of recreational fishermen
Seldom	1-5 days	53%
Occasional	6-20 days	34%
Often	21-40 days	8%
Very often	More than 40 days	5%

For all of Denmark, the number of angler and hobby licenses sold over the last 5 years has been relatively constant (approximately 160,000 angling licenses and approximately 35,000 hobby fishing licenses), Table 5.10.

Table 5.10: Overview of the number of annual licenses sold to anglers and hobby fishermen from 2005-2009 according to which part of Denmark they live (The Danish Directorate of Fisheries).

	No. of Anglers				
	2005	2006	2007	2008	2009
North Jutland	12,345	12,319	12,560	12,636	-
Mid Jutland	34,908	34,915	34,549	34,545	-
South Denmark	42,250	42,180	42,655	41,331	-
Copenhagen	31,849	31,906	30,061	32,708	-
Zealand	23,274	22,908	23,908	23,205	-
Foreign and unknown	15,512	12,351	13,961	15,761	-
Total	160,138	156,579	157,694	160,186	156,000

	No. of Hobby Fishermen				
	2005	2006	2007	2008	2009
North Jutland	4,245	4,157	4,150	4,440	-
Mid Jutland	5,210	6,136	6,234	6,527	-
South Denmark	9,525	9,837	9,552	10,228	-
Copenhagen	4,375	5,057	5,150	5,429	-
Zealand	8,794	8,270	8,296	8,203	-
Foreign and unknown	329	301	325	394	-
Total	32,478	33,758	33,707	35,221	34,000

In 2009, a total of 230,000 fishing licenses were purchased in Denmark. Of these 156,000 (68%) were angling licenses for 1 year, 17,800 (8%) were angling licenses for 1 week and 22,200 (9%) were angling licenses for 1 day. The number of hobby fishing licenses sold in



2009 was approximately 34,000 (15% of the total). These are valid for 1 year and can also be used for angling.

Number of recreational fishermen near Fehmarnbelt

On Lolland, approximately 1,500-2,000 anglers have purchased a state angling license (daily, weekly or annual) every year over the last 5 years, Figure 5.5. The majority of the annual licenses are most probably purchased by residential anglers. Resident anglers that fish only occasionally and tourists, generally purchase a weekly or daily license. The number of annual licenses has been steadily decreasing since 2005.

Hobby Fishermen

The average number of Danish residents buying hobby licenses on Lolland since 2005 has been around 800-1,000 and has slightly decreased over the years, Figure 5.5.

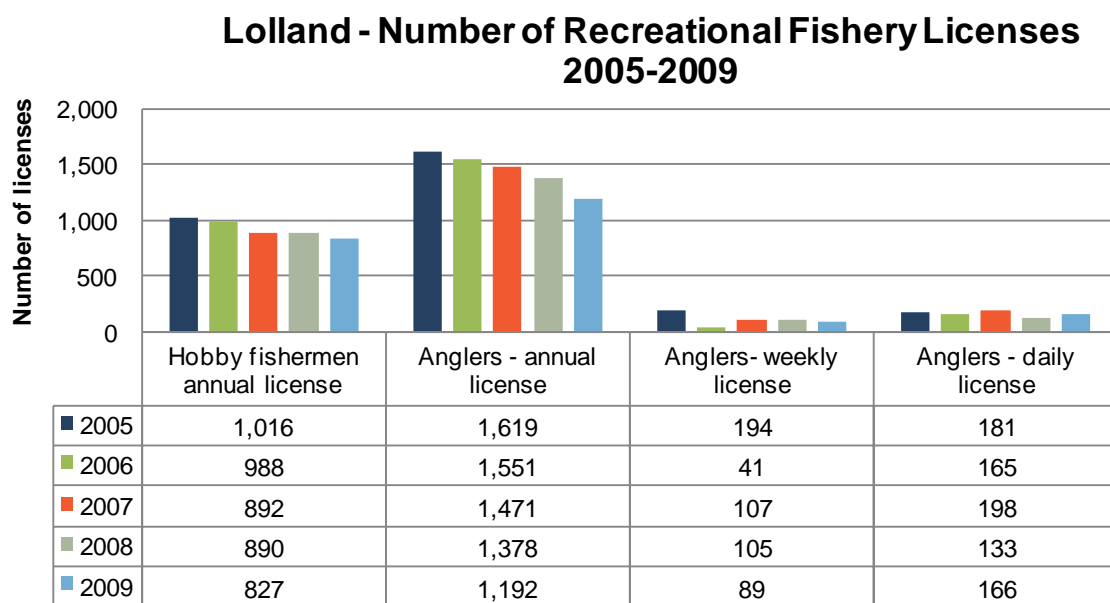


Figure 5.5: The number of daily, weekly and yearly licenses sold to anglers and hobby fishermen on the island of Lolland from 2005-2009 (The Danish Directorate of Fisheries).

The statistics on the number of recreational fishery licenses gives an overview and proxy of the potential effort by local anglers and hobby fishermen on Lolland but it does not indicate where and how often their fisheries are being undertaken. It is important to note the sale of licenses on Lolland does not include anglers with licenses purchased in other parts of Denmark and who are also allowed to fish in Fehmarnbelt. To increase the detail of information of the recreational fisheries, the overall data was supplemented with interviews with members of local and regional fishing clubs as well as hobby fishing organisations.

Angling clubs in the Fehmarnbelt region

Information from the main sports fishing clubs on Lolland and in the region of Fehmarnbelt (Rødby, Nakskov, Nykøbing and Guldborgsund) indicated that these clubs represent approximately 450 anglers. The number of members in each club and a short description of their primary fishing activities are given in Table 5.11.



Table 5.11: The names of local sports angling clubs, and the approximate number of members and primary fishing activities on Lolland and the region of Fehmarnbelt.

Sports angling clubs	Approx. number of members	Relevant fishing activities
Rødby	112	Many members (approx. 40) fish along the southern coast of Lolland from Nysted Nor to Nakskov after sea trout and garfish when in season. Rødby fishing club organises an annual fishing tournament in Rødbyhavn with bait that targets flatfish and cod.
Nakskov	150	Many members fish after sea trout along the western and southern coast of Lolland from Nakskov to Kramnitze. Organise trips with commercial angling vessels to Langelands Belt primarily targeting cod. Several members (15-20) have private boats and occasionally fish after cod and troll after sea trout in Fehmarnbelt along the southern coast of Lolland. Otherwise trolling is undertaken primarily in other areas; Langelands Belt, Rügen-Germany, and the area around Klintholm, Møn.
Guldborgsund	100	Some members fish in Fehmarnbelt along the southern coast of Lolland after sea trout and garfish. Several members have small boats in Rødbyhavn harbour and fish in Fehmarnbelt among other places.
Nykøbing	100	Most of their members fish along the coast or at sea from Lolland-Falster all year.

Many members of these clubs fish along the coastline of Fehmarnbelt on the southern coast of Lolland and Falster. Similarly, there are several club members that either have small boats in the harbours of Rødbyhavn and Kramnitze or launch boats from these harbours to fish (troll and jig) in Fehmarnbelt.

Hobby fishermen in Fehmarnbelt

In interviews with chairmen and members of the hobby fishermen associations (Organisations for Amateur Fishermen) representing southern Denmark and the Belt Region, there was a common consensus that very few hobby fishermen had their efforts in Fehmarnbelt. In all, it was estimated that only 6-7 hobby fishermen fish in Fehmarnbelt (4-5 from Rødbyhavn and 2 from Kramnitze). It was reported that they primarily fish with gill nets and target cod and flatfish. In contrast, on the southeastern part of Lolland there were approximately 70 hobby fishermen fishing in Nysted Fjord which opens into Nysted Nor.

5.4 Location of the coastal and offshore angling areas for recreational fisheries

Locations of the coastal and offshore angling areas for recreational fisheries are numerous along the coastlines of Germany and Denmark in the Fehmarnbelt area.

5.4.1 Coastal angling areas in Fehmarnbelt - Germany

Almost the entire northern coastline of Fehmarn is a well frequented angling area. The only areas where angling is not possible are the nature reserve 'Grüner Brink' and the ferry port of Puttgarden. Coastline anglers profit from a rapid increase of water depth from the shoreline and from the relatively fast and changing currents in Fehmarnbelt which create a variety of habitats for the recreational fish of interest close to the shore (Schroeter, 2004). The angling areas along the north coast of Fehmarn shown in Figure 5.6 make up approximately 25 km of

shoreline which is approximately 34% of the total coast of Fehmarn Island and 6% of the coast of Schleswig-Holstein.

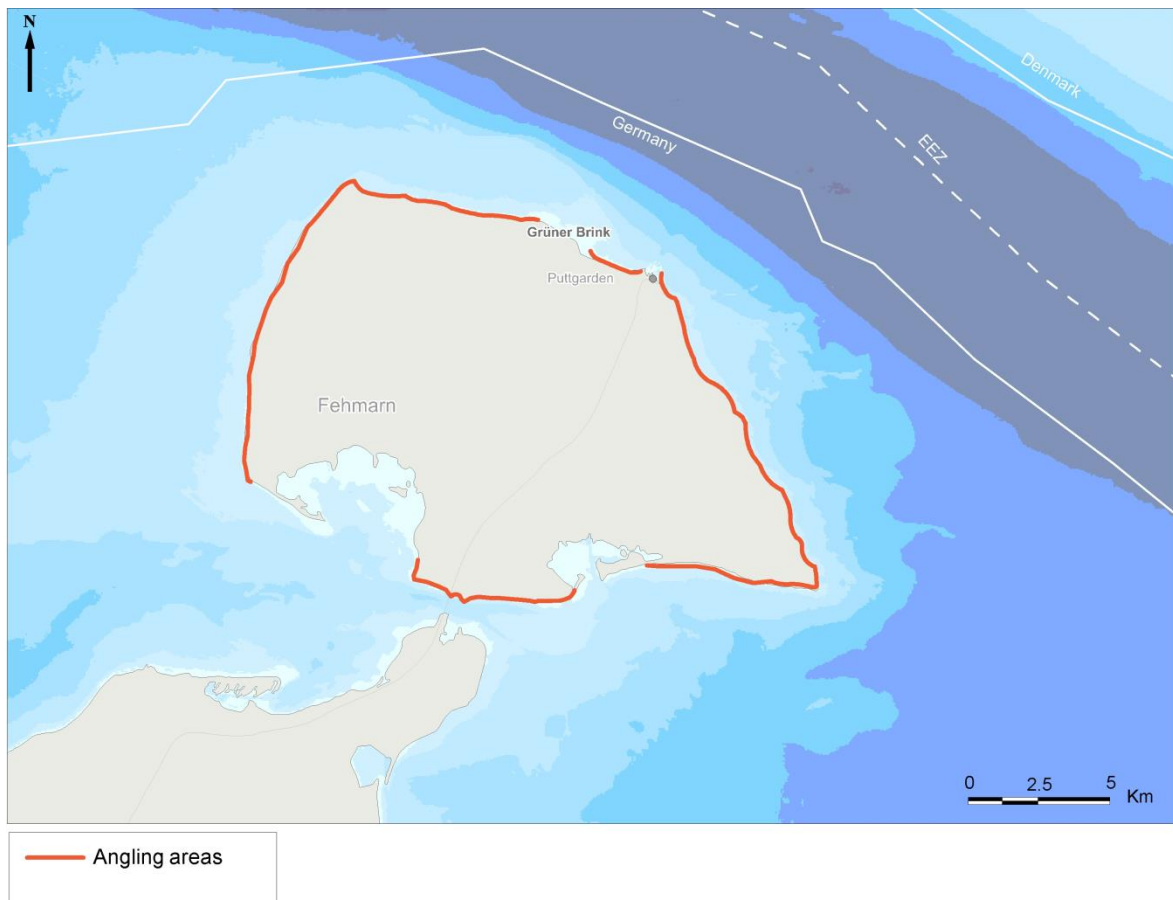


Figure 5.6: Coastal angling areas (marked in orange) on the shoreline of Fehmarn with general bathymetry structures (after Schroeter, 2004).

The similarity of bottom characteristics in different angling areas along the shoreline of Fehmarn Island and Fehmarnbelt (Schroeter, 2004) with other angling areas along the shoreline of Schleswig-Holstein (Schroeter, 2003 and 2005), suggests that similar catches could be expected. Illmaier (2009) also stated that all the common marine fish species are caught throughout the coast of Schleswig-Holstein and that the catch composition on the Island of Fehmarn is probably no exception.

5.4.2 Offshore angling areas in Fehmarnbelt - Germany

The primary locations of the offshore angling areas in Fehmarnbelt on the German side are derived from the fishing activity of the commercial angling vessels. The full extent of the offshore fishing areas of commercial angling vessels in Fehmarnbelt is mostly determined by the specifications of marine law and by the limited time these vessels have at sea when they take day trips (see Figure 5.11 showing 5 and 10 nm spatial restrictions). The commercial angling vessels from Heiligenhafen, Orth and Burgstaaken primarily concentrate in a zone of 5 nautical miles around the coasts of Fehmarn and the mainland, Figure 5.7. According to owners of commercial angling vessel the areas where they concentrate their efforts in Fehmarnbelt and around Fehmarn Island depend largely on the weather, fishing seasons and success of the fisheries. The bottom characteristics of the areas targeted for offshore angling generally have a variety of substrate types, which provide good feeding grounds for cod. These areas are often in the transition zone between hard bottom substrates and sandy or

muddy bottom areas. In Fehmarnbelt, the majority of the angling effort is in locations where cod, and to a lesser extent herring is most abundant, (see dark shading in Figure 5.7). In the areas south and west of Fehmarnbelt are locations that contain both hard and soft bottoms and are therefore also good fishing grounds for flatfish and herring.

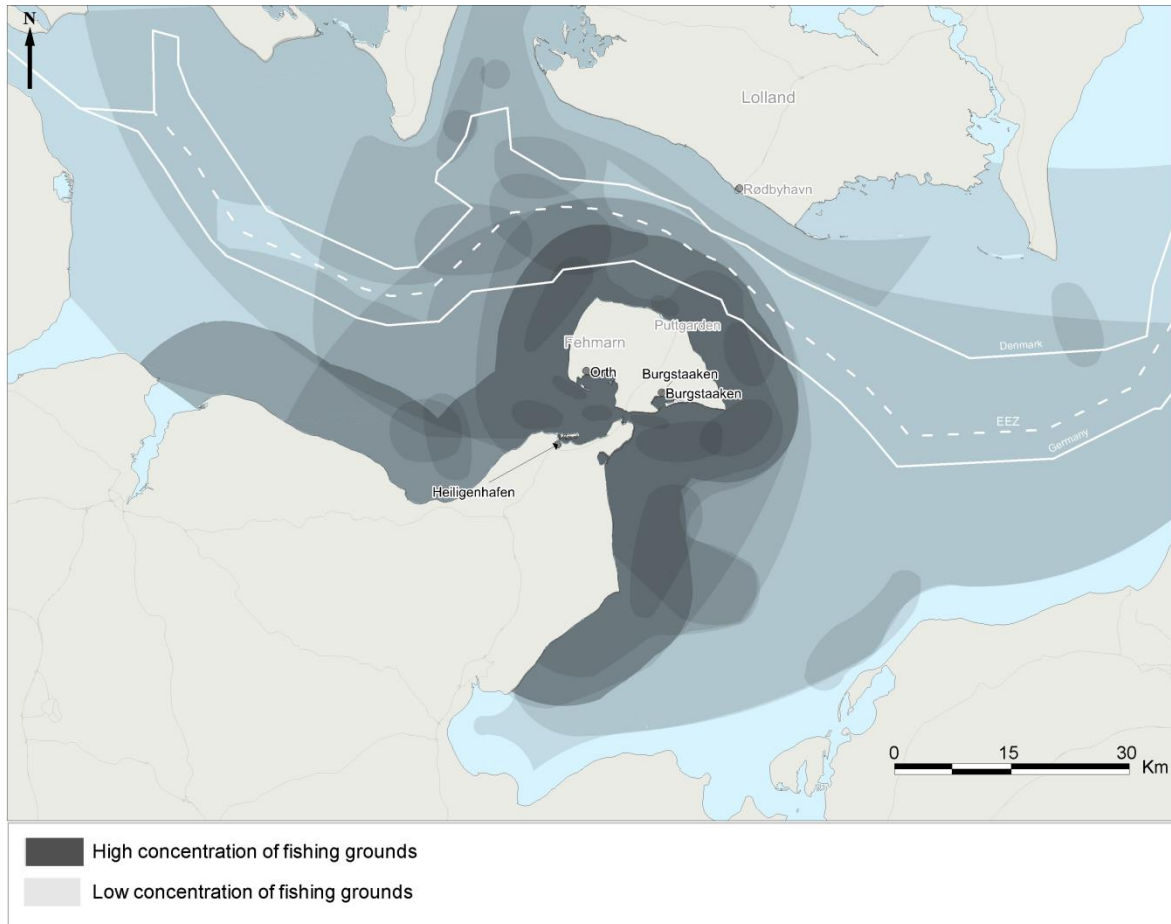


Figure 5.7: The most common fishing grounds used by German commercial angling vessels in Fehmarnbelt and region (Interviews with commercial angling vessel owners in Heiligenhafen, Burgstaaken and Orth in 2009).

The importance of wind for coastal and offshore anglers around Fehmarn Island

The marine angling areas around Fehmarn Island are some of the most diverse in Germany (Wrackangeln.de, 2010b). Unlike the mainland, Fehmarn offers the opportunity to change the angling location quickly depending on the wind forecast (Illmaier, 2009). According to Schroeter (2003, 2004 and 2005) onshore winds on Fehmarn provide the most favourable conditions for coastal anglers fishing from the shoreline. Since winds in the Fehmarnbelt come predominantly from western and eastern directions throughout the year, Figure 5.8, the northeastern and northwestern coasts of Fehmarn are probably of considerable importance to coastal anglers in relation to Fehmarnbelt. Similarly, when the winds are strong and fishing is best in the shelter of the wind, the northern coast of Fehmarn is probably of considerable importance because the predominant winds during these times are often from the south and southwest (Kaufeld *et al.*, 1997), Figure 5.8.

Other parameters such as the fishing season, fishing practice, bottom characteristics and water currents also influence the decision about which angling area to fish. Therefore, it is not possible to fully determine the location and frequency of angling activities along the coast



according to the frequency of onshore winds. However, it is possible to estimate the relative importance of certain coastal areas according to the prevailing wind directions.

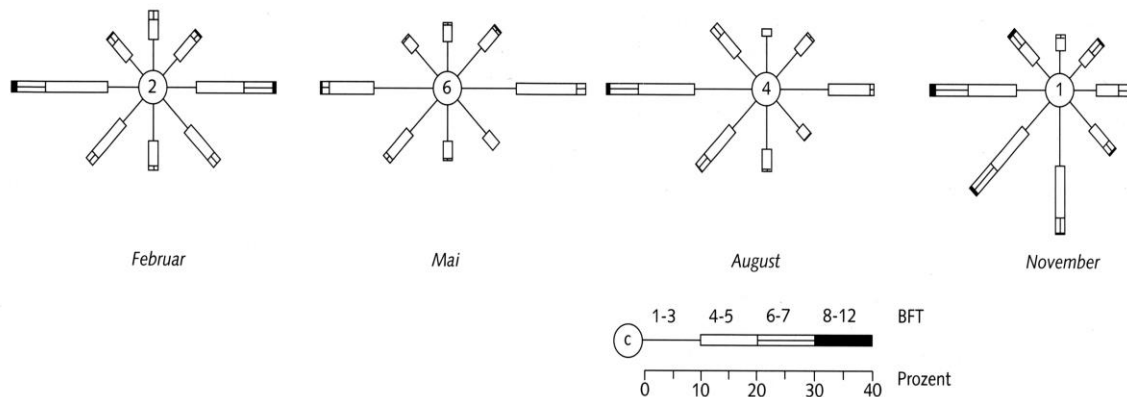


Figure 5.8: Wind roses showing the distribution of wind directions and speed during the year for the Western Baltic (from Kaufeld et al., 1997).

The importance of wind for offshore angling

Harsh weather conditions offshore and particularly strong winds are not good for recreational fisheries on private boats or commercial angling vessels. Small private angling boats usually need considerable shelter from wind and high waves to be able to undertake angling. Similarly, according to the owners of commercial angling vessels, it is important for their angling success and the well-being of guests to be able to stay on the sheltered side of the land during strong winds. Fehmarn Island offers this opportunity for all wind directions without the need to travel extensive distances.

This is most apparent when winds come from the northeast, north or northwest over Fehmarnbelt, which occurs approximately 14-18% of the time, Table 5.12. In these instances, Fehmarn Island offers the only opportunity for angling vessels to fish in sheltered areas.

Table 5.12: Percentages of wind from N, NE and NW in the Western Baltic in representative months (after Kaufeld et al. 1997).

Wind direction	February	May	August	November
Northwest	9%	8%	10%	10%
North	9%	8%	6%	6%
Northeast	9%	10%	8%	8%

Furthermore, many angling boats and commercial angling vessels decide to go to areas around Fehmarn even when low wind speeds are forecasted because Fehmarn always offers the possibility to find areas sheltered from wind in the event of unanticipated changes in weather and wind conditions.

5.4.3 Coastal angling areas in Fehmarnbelt - Denmark

Results from interviews with fishermen and members of angling clubs about where the coastal fisheries take place indicated that the majority of the southern coastline of Lolland (including Nysted Nor on the southeast of Lolland) and southern Falster are fished by coastal anglers, Table 5.11. Furthermore, there is a rather extensive amount of this angling between Nysted Nor to the east of Rødbyhavn and the towns of Nakskov/Langø on the western side of Lolland, Figure 5.9.

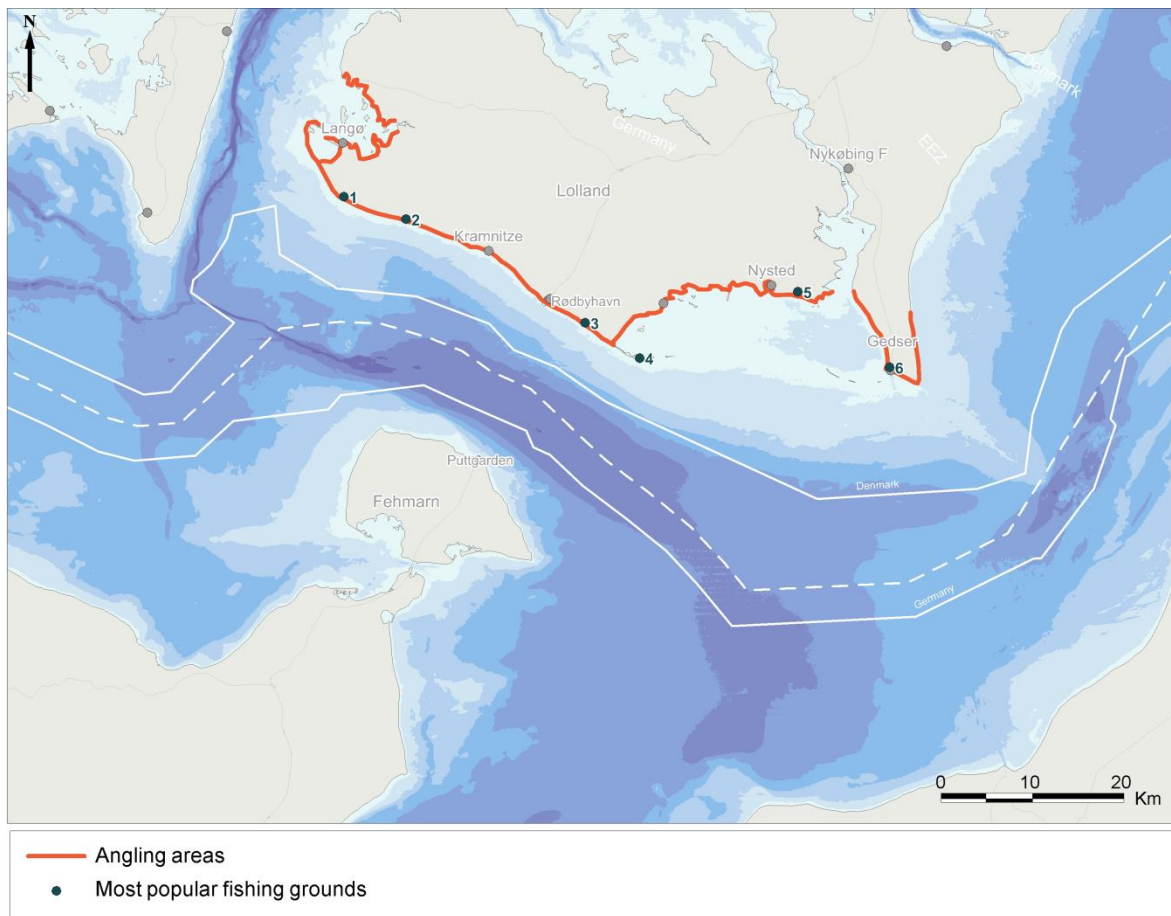


Figure 5.9: Angling areas along the southern coast of Lolland and Falster (marked in orange) and the location of the main harbours and most popular fishing grounds (numbers 1-6, see Table 5.13 for more details). Information based on interviews with anglers and angling clubs and information from a fish guide information folder for Lolland-Falster (Fish guide, 2005).

There are also several popular angling locations from southern Gedser to the southwestern part of Lolland that are fished frequently (areas 1-6 in Figure 5.9). The name of these fishing grounds and the primary fish species and the season they are most abundant are given in Table 5.13.



Table 5.13: The most popular fishing grounds along Fehmarnbelt from southwest Lolland to southern Gedser and the primary species and season they are most abundant (see Figure 5.9 for location of fishing areas). Information based on interviews with anglers and angling club officials, and a fish guide information folder for Lolland-Falster (Fish guide, 2005).

Popular fishing areas on southern Lolland and Gedser (Fehmarnbelt)	Species	Season
(1) Ålehoved (southwest Lolland)	sea trout cod flatfish garfish mullet	spring / autumn autumn-winter-spring all year (not Feb.-Apr.) spring summer
(2) Maglehøj Strand (southwest Lolland)	sea trout cod flatfish garfish	spring / autumn autumn-winter (not Feb.-Apr.) all year (not Feb.-Apr.) spring
(3) Østerbadet (east of Rødbyhavn)	sea trout cod flatfish garfish	spring / autumn autumn-winter all year spring
(4) Hyllekrog (at Store Bunddrag) (closed March-July)	sea trout cod flatfish	autumn autumn-winter autumn-winter
(5) Vantore Beach House (in Nysted Nor)	sea trout garfish	spring / autumn spring
(6) Krohage (southwest Gedser)	sea trout garfish eel salmon	all year spring summer-autumn summer-autumn

There is also a small recreational fishery on the piers and protective boulders around the main harbours facing Fehmarnbelt such as Rødbyhavn, Figure 5.9. Here, club members and other coastal anglers typically use bait and target flatfish (flounder and dab) and occasionally cod.

Hobby Fishermen

According to information from the local hobby fishermen associations, there are only 6-7 hobby fishermen fishing with stationary gear (gill nets) in Fehmarnbelt along the southern coast of Lolland. In Nysted Nor to the east, however, there are a considerable number of hobby fishermen (approximately 70 small boats) that are fishing in Nysted Fjord, Figure 5.9.

The hobby fishermen in Nysted Fjord are primarily targeting eel with fyke nets. One of these fishermen is participating in a nationwide registration of the fisheries in local areas to document which species and the number of fish caught in different gear according to location, season and effort (Pedersen *et al.*, 2005; Sparrevojn *et al.*, 2009). This hobby fisherman primarily uses fyke nets and results of his catches over the last 3 years indicated that cod, eel and flounder were the most abundant recreational fish species of interest in this area (Sparrevojn *et al.*, 2009).

In recent years there has been an increase in a variety of problems for hobby fishermen to undertake their fisheries. These have included stoppage of nets by excessive amounts of filamentous algae, problems with seals going in nets and in general fewer fish, especially in Nysted Nor. Furthermore, weather conditions are often not very good for fishing with gill- and fyke nets along the coast of Fehmarnbelt and recent restrictions to fisheries targeting eel (Anonymous, 2008a), especially for hobby fishermen, have further reduced the general extent of the Danish hobby fisheries in Fehmarnbelt and region.

5.4.4 Offshore angling areas in Fehmarnbelt - Denmark

The Danish offshore angling around Fehmarnbelt is fairly limited both seasonally and spatially. According to interviews with local sports fishing and boat clubs there is only a small number (approx. 15-20) of fishermen in private boats that occasionally fish in Fehmarnbelt (Figure 5.10 - low concentration of fishing grounds). When fishing, these fishermen primarily target cod, whereas trolling after sea trout is only undertaken on occasion. This was also the conclusion in the report on the recreational fisheries around Nysted Wind Farm (SEAS, 2000). In contrast, trolling in private boats is more widespread in the waters west of Fehmarnbelt (in Langelands Belt), and east/northeast of Fehmarnbelt for example in the area southeast of the harbour Klintholm, on the island of Møn (location not shown in Figure 5.10).

Commercial angling vessels

There are no Danish commercial angling vessels that are active in the Fehmarnbelt between southern Lolland and Fehmarn Island. Regionally however, there is some offshore angling activity from commercial angling vessels in Langelands Belt to the west of Fehmarnbelt and on the eastern side of Falster (Figure 5.10 - high concentration of fishing grounds).

These commercial angling vessels have their home ports in the harbours of Bagenkop and Spodsbjerg on the southern and eastern parts of the island of Langeland (Figure 5.10), and Onsevig on Lollands northwest coast. The port of Gedser is the home harbour of a commercial angling vessel “Amigo” that primarily fishes in the southeastern areas of the Island of Falster, east of Gedser (Figure 5.10). Similar to Germany, these commercial angling vessels primarily target cod on their tours with some trips targeting herring and flatfish such as flounder, dab and turbot during the season.

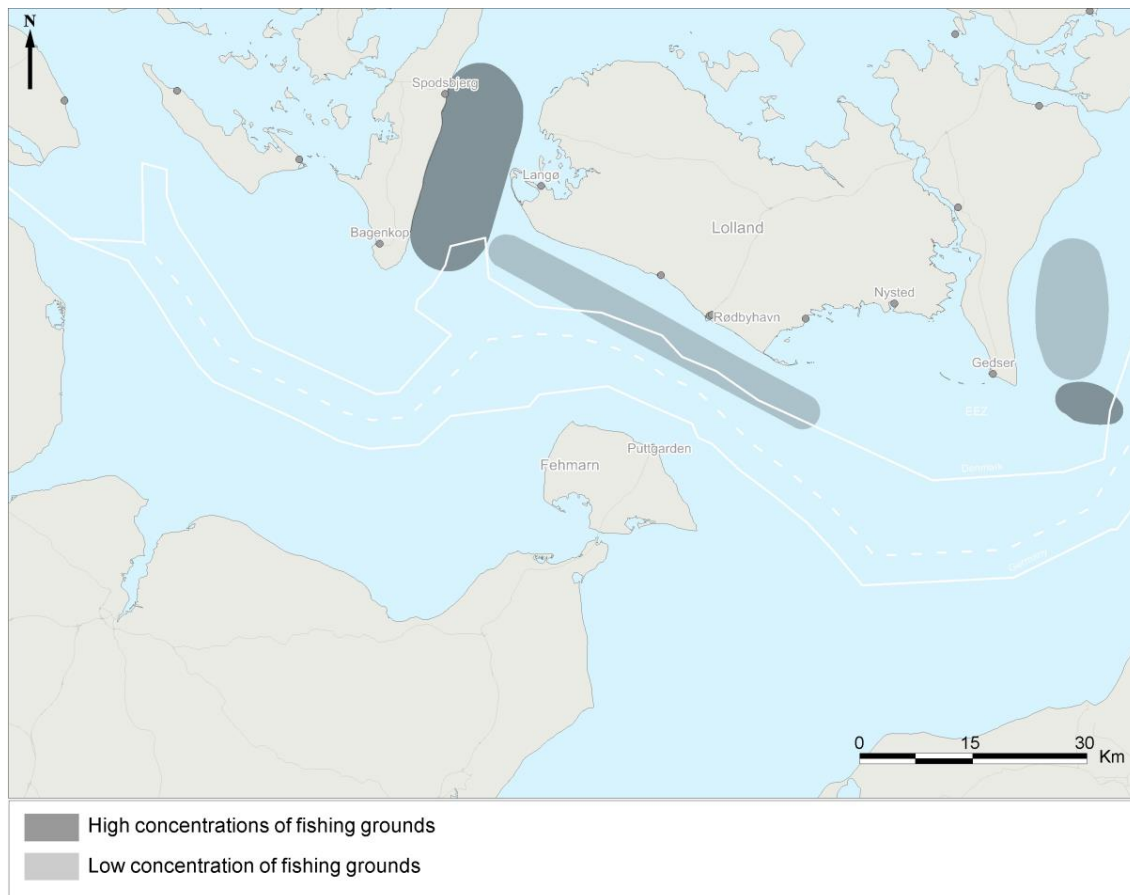


Figure 5.10: The most common fishing areas used by Danish angling boats and commercial vessels in Fehmarnbelt and region (Interviews with Danish recreational fishing clubs in 2010).



5.5 Interviews with German commercial angling vessels on their business and future perspectives

Because the offshore commercial angling from vessels is considerably more extensive in Germany than in Denmark, a representative number of vessel owners were interviewed about their current and future perspectives and expectations for their businesses, and their thoughts and opinion on the establishment of a fixed link across Fehmarnbelt.

5.5.1 Vessels, employment and regulations

In all, 16 German recreational angling firms with a total of 21 vessels have their basis harbours in Heiligenhafen (15 vessels), Orth (1 vessel) and Burgstaaken (5 vessels) on and near Fehmarn, Table 5.14. In all, there are about 60 people working in these recreational commercial angling firms; about 50 of them are working as crew. Of the people employed, 54% work full time all year, 22% work part time all year, 8% work full time during high season and 16% work part time during the high season.

Table 5.14: The names and lengths of the commercial angling vessels from the harbours of Heiligenhafen and the main harbours on Fehmarn (Orth and Burgstaaken) (Blinker.de, 2009; Fisch-hitparade.de, 2009; own investigations).

Number	Name	Length [m]	Basis harbour
1	MS Nickelswalde	34	Heiligenhafen
2	MS Jule	24	Heiligenhafen
3	Baltic III	9,8	Heiligenhafen
4	Baltic IV	10,8	Heiligenhafen
5	Clever	~10	Heiligenhafen
6	MS Südwind	25	Burgstaaken
7	MS Karoline	28	Heiligenhafen
8	MS Kehrheim	24	Burgstaaken
9	MS Silverland	28	Burgstaaken
10	MS Störtebecker	18	Burgstaaken
11	MS Störtebecker I	13,6	Burgstaaken
12	MS Antares	24	Orth
13	MS Seho	28	Heiligenhafen
14	MS Monika	24	Heiligenhafen
15	MS Hai IV	22,5	Heiligenhafen
16	MS Einigkeit	-	Heiligenhafen
17	SY Marco Polo	23	Heiligenhafen
18	MSS Alte Liebe	16	Heiligenhafen
19	MS Ostpreußen I	22,5	Heiligenhafen
20	MS Tanja	24	Heiligenhafen
21	MS Klaus-Peter	24	Heiligenhafen

One of the changes following the implementation of EU regulation No. 336/2006 (EU, 2006) for the commercial angling vessels is they were not allowed to sail more than 5 nautical miles off the coast if they only had one person (a captain) on board. If they have a captain and one extra crew member, they are allowed to sail up to 10 nautical miles from the shoreline. The areas in the western Baltic inaccessible to vessels that can only sail 5 and 10 nautical miles

(without and with an extra crew member) are shown in Figure 5.11. In Heiligenhafen and Fehmarn 4 vessels (approx. 20%) are not allowed to sail farther than 5 nautical miles from the shoreline while another 4 vessels (approx. 20%) usually do not sail more than 5 nautical miles from the shoreline, but have the opportunity to take an extra person on board if needed. To all these vessels apply the areas accessible to passenger ships class C (BSH, 2004). Approximately 10 commercial angling vessels have both a captain and minimum one extra crew member and are allowed to sail up to 10 nautical miles offshore. Three vessels (13%) sail under the British flag and do not have restrictions to the distance they are allowed to sail offshore.

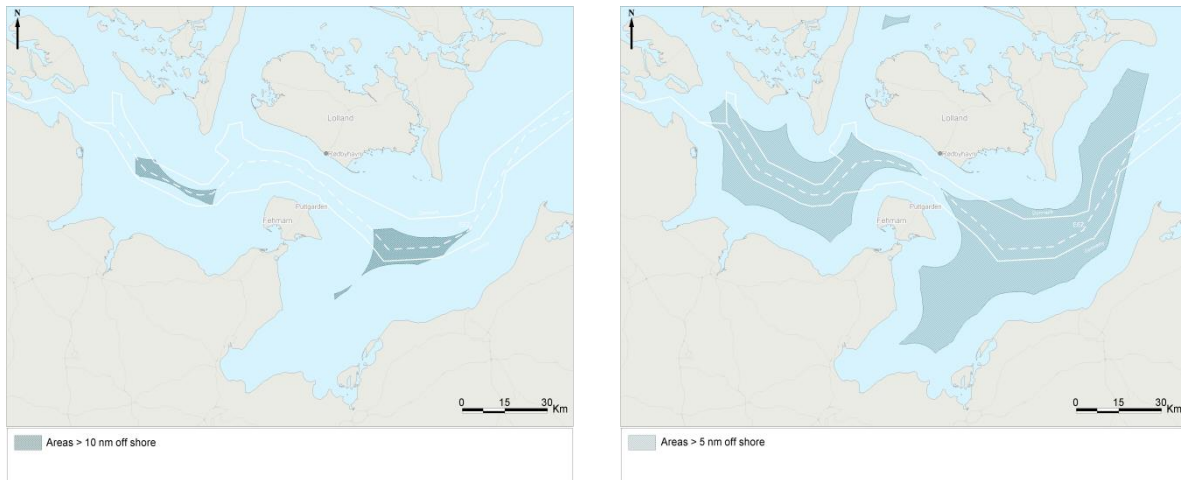


Figure 5.11: Spatial restrictions to German commercial angling vessels sailing in the western Baltic; vessels with a minimum of two crew members (captain and one crew member on board) and sailing under the German flag may sail up to 10 nautical miles from the shoreline (map on left). Vessels that have only one crew member (only a captain) may only sail up to 5 nautical miles from the shoreline (map on right).

5.5.2 Number of guests - anglers

In all, 12 of the investigated commercial angling vessels from Fehmarn and Heiligenhafen had a total of about 38,570 angling guests in 2008 (no data from 3 vessels). This amounts to a total of approx. 67,500 angling guests after extrapolating these numbers to the whole fleet of 21 commercial angling vessels in the area.

About 34% of the angling guests arrive for their angling tours from vacation resorts (51.5% on Fehmarn and 22.5% in Heiligenhafen) (own calculations). These figures show that at least 1/3, or about 23,000 angling guests, stay overnight in the area one or more times during the year. On Fehmarn, the percentage of people arriving from a vacation resort is higher than in Heiligenhafen, possibly because Heiligenhafen is located on the mainland and has better transportation possibilities. This information also suggests that approx. half the guests of angling vessels on Fehmarn are also staying for vacation in the area and are contributing to other sectors of the local economy.

The vast majority of angling guests on commercial angling vessels are tourists that live in other federal states than Schleswig-Holstein (76% of guests in Heiligenhafen and 93% of guests on Fehmarn), Table 5.15. Thus, guests from the district of Ostholstein (~ 3%) and the federal state of Schleswig-Holstein (~ 7%) make up only a small percentage of the anglers and consequently are of less importance for the commercial angling vessels. This suggests that influences of the Fehmarnbelt Fixed Link on tourism could affect the number of guests of commercial angling vessels. Furthermore, the difference in the percentage of guests arriving from vacation resorts (34%) and the guests living outside Schleswig-Holstein, suggests there



is a large number of angling guests coming to Heiligenhafen and Fehmarn solely for the purpose of taking an angling trip and not for other recreational reasons.

Table 5.15: Origin of angling guests on commercial angling vessels in Heiligenhafen and on Fehmarn (own data).

Area of origin	Fehmarn [%]	Heiligenhafen [%]	Total [%]
District Ostholstein	3	3	3
Schleswig-Holstein except Ostholstein	5	8	7
Niedersachsen, Hamburg, Bremen, Nordrhein-Westfalen	34	36	35
Rest of Germany, abroad	59	40	48
Undifferentiated: Ostholstein, Schleswig-Holstein, Niedersachsen, Hamburg, Bremen, Nordrhein-Westfalen	0	13	8

5.5.3 Development of commercial angling over the past 10 years - challenges and perspectives

70% of the vessel owners interviewed have experienced a decline in the numbers of guests and consequently the number angling trips over the past 10 years. Several of the owners suggested the main reason has been the decline in the abundance of cod, especially since 2007. Other suggested reasons are the end of duty free shopping (“Butterfahrten”) on the 1st of July 1999, the introduction of the Euro on January 2002, lower incomes of the guests and that some guests have gotten their own boats.

90% of the vessel owners that were interviewed have increased their prices for angling trips over the past 10 years. This was done to compensate for the extra costs of running their vessels due to a 129% increase in fuel prices (reason given by 8 owners). Fuel prices have increased from 58.3 cents/l in 1998 to 133.5 cents/l in 2008, Figure 5.12. Other important reasons for increasing the price of angling trips have been the rising costs of maintenance, security requirements and a rise in general costs and the end of duty-free shopping.

The most important challenges to the recreational angling firms at present and in the near future as suggested by the vessel owners are given in Figure 5.13. Decreasing fish (cod) stocks are given as the most crucial challenge for the angling businesses (named in 34% of the votes). Other important challenges are increasing security constraints (named 20% of the time by owners) and rising prices for fuel and maintenance (named in 14% of the votes).

The construction and operation of a bridge across the Fehmarnbelt are also seen as a substantial challenge (named in 20% of the votes). Of the responses given, this reason ranked 2nd after the development of the cod stocks. The vessel owners also anticipate the operation of a bridge (named in 12% of the votes) to be a much greater challenge to their firms than the operation of a tunnel (named in 4% of the votes).

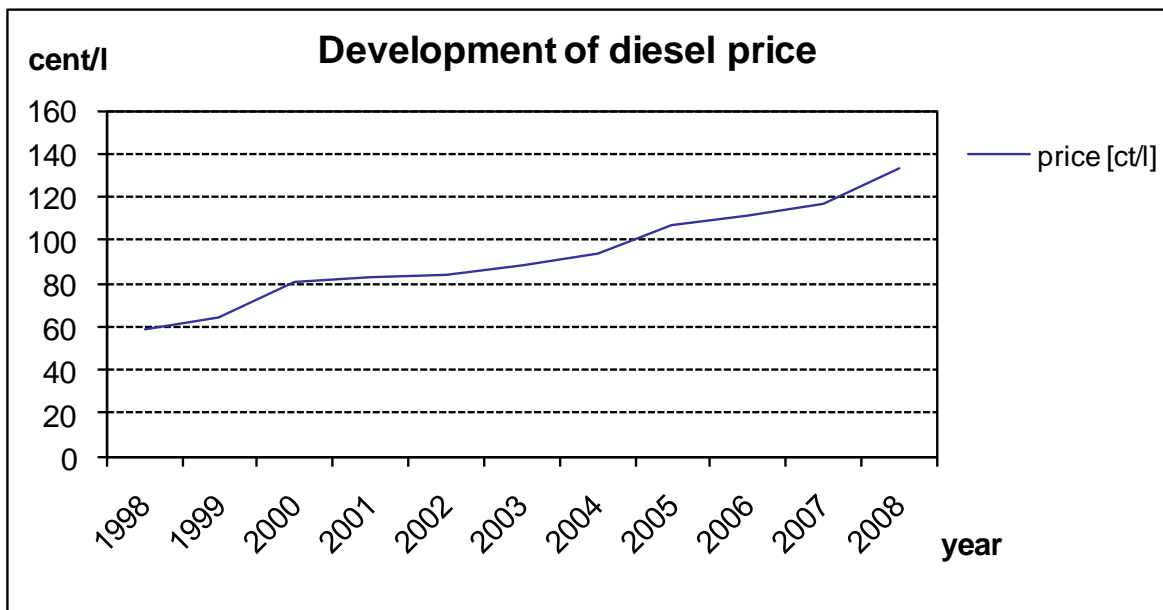


Figure 5.12: Development of the diesel price (cent in euro) from 1998-2008 (source: Mineralölwirtschaftsverband e.V., 2008).

The construction and operation of a tunnel under the Fehmarnbelt (named in 4% of the votes) was ranked sixth as one of the most important challenges to commercial angling vessels in the future. Environmental constraints (named in 4% of the votes) were also of some concern. Less important was a decrease or increase in the demand for trips by guests (named in 2% of the votes, in both cases). Increasing competition among the angling firms did not appear to play a role in their concerns for the future.

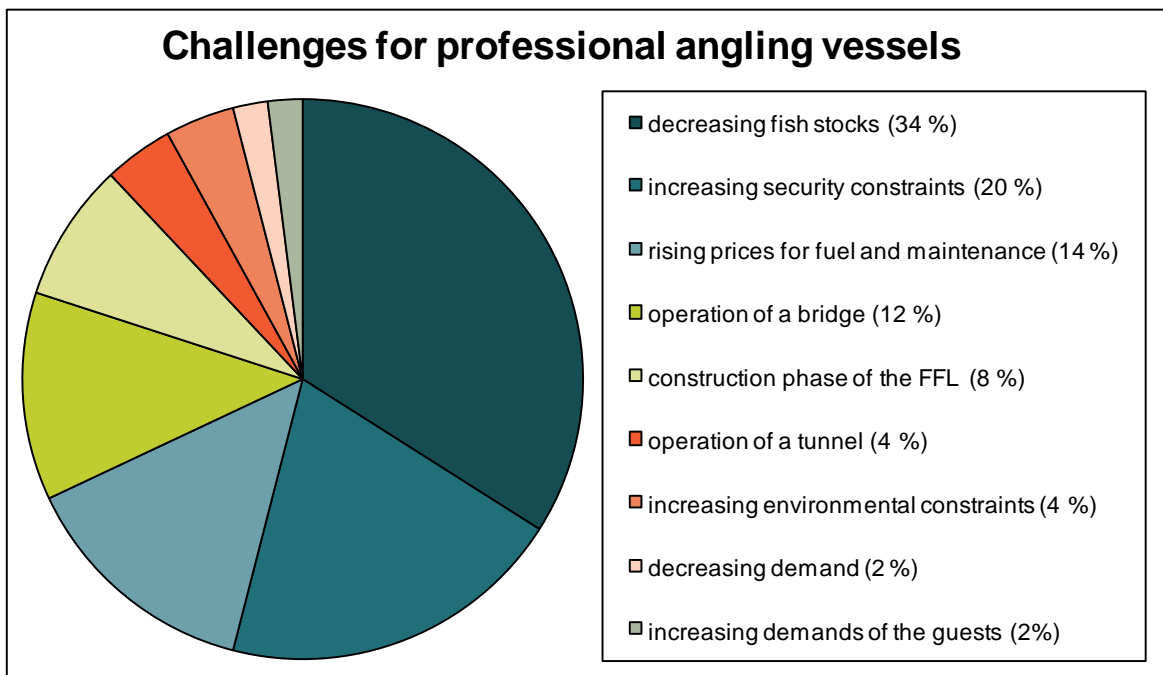


Figure 5.13: Present and near-future challenges for professional angling vessels (based on interviews with 10 commercial vessel owners representing 15 vessels that were allowed 5 votes each).

Results on questions regarding the perspectives for the future of the commercial angling firms are given in Figure 5.14.

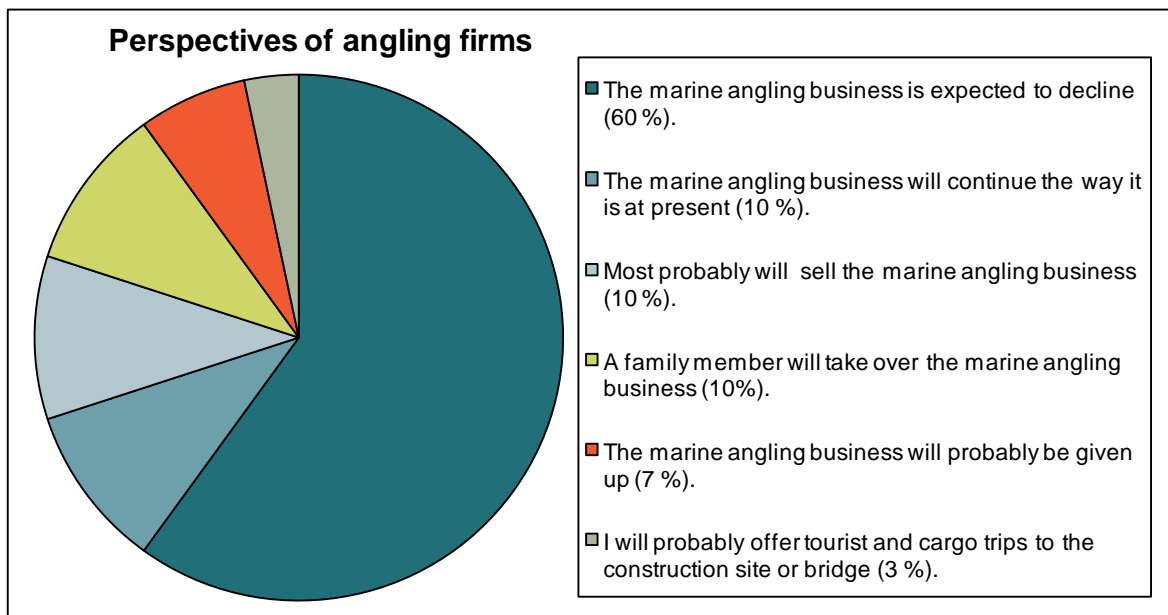


Figure 5.14: Perspectives which the owners of commercial angling vessels expect for their firms (based on interviews with 10 commercial vessel owners representing 15 vessels that were allowed 3 votes each).

5.5.4 Financial aspects

In 2008, nine of the investigated commercial angling firms operating a total of 12 vessels had a total turnover of 2,951,350 € from angling guests on day and multi-day trips and an additional 96,000 € from non-angling guests (no data from one firm). The total number of angling guests from these vessels was 38,570 and the number of non-angling guests was 4,100. Thus, the average number of angling and non-angling guests for each vessel was 3,214 and 342, respectively. The average price for each angling guest was 76.52 € per trip and for each non-angling guest 23.41 € per trip.

If these results are extrapolated to include all the firms in the region (16 angling firms with 21 vessels), the overall turnover amounts to about 5,2 million € from angling guests and 170.000 € from non-angling guests per year. This suggests the recreational angling vessels form a relevant branch of the local economy and tourist sector on Fehmarn and the region.

Results indicate that the average income for each vessel per year from fees paid by guests amounts to 254,000 €. This estimate is consistent with results by Möller and Tiffert (1988) who estimated the income from fees paid by anglers to be 150,000 DM, plus an additional 600,000 DM from duty-free shopping per vessel per year. This amounted to 382,500 € per vessel per year. Although the price of angling tours has increased in recent years (from 15 DM to 30 € since 1988), it is estimated that the income per angling vessel has decreased by more than 100,000 € over the past 10 years because of the loss of income from duty-free shopping and the decline in the number of angling guests.



6. Potential impacts due to the establishment of the Fehmarnbelt Fixed Link

The potential impacts to the recreational fisheries during the construction and operation of the Fehmarnbelt Fixed Link (bridge or tunnel) and introduced structures can be attributed to several primary conditions that are summarised in the following section.

6.1 Construction phase

The construction phase will generally have temporary impacts as certain areas along the coast and offshore where construction is taking place will be closed due to safety reasons. Furthermore, construction activities such as dredging or digging in the seabed will produce sediment plumes and sedimentation that could possibly induce some fish species to exhibit avoidance behaviour that might impact the recreational fisheries by causing reduced catches.

Restriction zones

The influence on the recreational fisheries due to restriction zones will most likely be on a local scale. The total loss of area for fishing possibilities by recreational fishermen and a reduction of potential catches is estimated to be minimal. Furthermore, the potential for undertaking the same recreational fisheries in adjacent areas both to the east and west of the anticipated construction areas along the German and Danish coast and offshore suggests that alternative nearby fishing grounds are available. Thus, the overall significance of the impact to both the coastal and offshore recreational fisheries due to restriction zones for either a bridge or tunnel solution is considered to be minor.

Temporary changes in the distribution of the fishery resources

Avoidance behaviour by fish due to an increase in suspended material and its consequent sedimentation can vary considerably dependent on the fish species, concentration of the material and exposure time. In general, to trigger an avoidance response by juvenile and adult fish the concentrations of suspended material needs to be in the range of mg/l (Engell-Sørensen and Skyt, 2000).

The species of most interest to the recreational fisheries in the Fehmarnbelt area are cod, sea trout, herring and some flatfish species. In general, pelagic species such as herring and sea trout and species that are not entirely associated with the bottom such as cod are less tolerant of the amount of suspended material than benthic (bottom dwelling) species such as flatfish.

At present, a thorough assessment of the avoidance responses of the recreational fish species around Fehmarnbelt to suspended material and its sedimentation is not available. However, the time-frame in which suspended material and its sedimentation are considered to have an impact in an area is expected to only be short-term. Consequently, it is anticipated that any avoidance behaviour by species of interest will also be short-term and it is expected that affected fish will move back into an impacted area again within a short time.

Preliminary scenarios on the spatial extent of sediment plumes suggest that a broader area will be affected from a bridge solution in comparison to a tunnel solution (FEHY, 2008). In contrast, it is anticipated that the concentration of suspended material within the areas of dredging will be greatest for a tunnel solution in comparison to a bridge solution (FEHY, 2008). For both fixed link solutions, however, it is anticipated that impacts from sediment plumes and sedimentation will only be for a limited amount of time and primarily in the local areas where dredging or land filling is taking place. Thus, the overall significance to both the coastal and offshore recreational fisheries due to sediment spills and sedimentation and temporary



changes in the distribution of fish species of interest for either a bridge or tunnel solution is considered to be “minor”.

Noise, vibration and light

Noise, vibrations and light primarily coming from construction activities can also have an effect on the distribution of fish and consequently the recreational fisheries. Currently, however, there is no information available on the potential reactions of fish in Fehmarnbelt to these disturbances.

6.2 Operational phase

During operation of the Fehmarnbelt Fixed Link the recreational fisheries can potentially be affected by a continuation of restriction zones limiting the recreational fisheries on shore and along the transect of the fixed link, as well as potential changes in the distribution of fish due to light or vibrations (noise) from the fixed link and its effect on catches.

In the event that permanent restrictions to recreational fisheries in zones on land and offshore in a bridge or tunnel solution were implemented, these would permanently reduce the total amount of area available to the recreational fisheries. In practice, restrictions along the coastline would probably affect the availability of recreational fisheries only in the local areas such as around ramps or harbours where the fixed link and land meet. Because of the relative small loss of area, restrictions to the recreational fisheries along the coast of this extent are only considered to have a “minor” impact.

In contrast, an offshore restriction for recreational fishing along the transect of the fixed link has the potential to impact the recreational fisheries on a greater spatial scale. Restrictions would probably only be associated with a bridge solution because of the enhanced safety precautions of a fixed link solution above water in comparison to a tunnel solution placed below the seabed. Thus, potential restrictions to the recreational fisheries around bridge structures would probably include a broader area. Furthermore, fishing restrictions around structures might also limit the possibility of utilizing the potentially positive “reef” effects, where some fish such as cod, aggregate around large physical structures (see section on impacts from “reef-effects”).

In summary, a restriction to the offshore recreational fisheries in a tunnel solution is highly unlikely and thus the long-term impact to the recreational fisheries is considered to be “minor” or negligible. In a bridge solution the spatial restrictions to the offshore recreational fisheries would create a greater loss of fishing area and not allow the utilization of the potential improvement of the recreational fisheries around bridge structures due to a “reef-effect”. In general, however, the total loss of fishing area in comparison to the entire Fehmarnbelt area as a whole is only small, and the availability of many alternative fishing areas indicate that the overall impact of zones restricting the offshore recreational fisheries is also “minor”.

Noise, vibrations and light

The influence of vibrations and/or light from a bridge or tunnel fixed link solution might have an impact on the distribution of fish. Changes in the distribution of fish caused by vibrations, noise and/or lights are species specific, but at present these effects from constructions such as bridges are not sufficiently studied. For migratory species avoidance reactions in relation to vibrations, noise or light may induce changes in migration patterns or these impacts may create barriers that some species might not pass. In circumstances where constructions at sea produce a more continual source of noise during their operation (wind farms), there are indications that fish appear to adapt and not display any differences in their normal distribution. This was shown in an investigation at Nysted Offshore Wind Farm where results showed no significant differences in the catches of a number of species (for example cod,



schools of gobies and wrasses etc.) in an area with structural noise (the base of the wind farm foundations) in comparison to catches in nearby reference areas without noise (Hvidt *et al.*, 2006).

At present, the intensity and frequency of noise and/or light from a bridge or tunnel fixed link solution is not known and an assessment on the potential impact on the distribution of fish is needed to estimate the potential impact of these disturbances on the recreational fisheries.

Structures

Potential structures such as bridge piers, pylons and seabed reclamation for ramps are permanent and irreversible impacts that not only occupy the seabed creating loss of fishing grounds but also can potentially change the distribution of fishery resources by creating changes in bathymetrical characteristics and hydrographical regimes. In contrast, hard structures, such as bridge pylons and pier supports, form a substrate that promotes the development of a reef environment that can change the fish community and cause aggregations of fish that are associated with reef habitats and may be of interest to the recreational fisheries.

Impacts from local changes in bathymetric characteristics and hydrographic regimes in Fehmarnbelt might affect the distribution of local fish species and fish communities and indirectly affect the availability of certain species and their catches in the recreational fisheries along the Fehmarnbelt transect. Similarly, in cases where the seabed is lost to reclamation for fixed link construction works or from the placement of other construction objects (bridge pylons and piers etc.), there will be a loss of fishing grounds and a change in the habitats characteristics and indirectly a change in the fishing community available for the recreational fisheries. Changes from for example, a sand/silt habitat to a hard bottom habitat, would probably reduce the number of flatfish species that are more associated with soft bottom habitats. However, change or loss of habitat will primarily be a local effect and theoretically only amount to a loss of a very little amount of the total seabed area around the fixed link. It is anticipated then, that the impacts from changes in bathymetric characteristics and hydrographic regimes and the loss of fishing grounds will only have a “minor” effect on the recreational fisheries.

“Reef-effects”

The potential introduction of hard substrates such as bridge pylons and piers to a marine environment will lead to an increase in reef associated organisms. It is also expected, that reef environments and its associated plant and animal communities will attract certain fish species that find both refuge and food in these hard bottom communities (Santos *et al.*, 1996). Fish species of interest to recreational fishermen such as cod and whiting are also attracted to stable heterogeneous environments (Valdemarsen, 1979). There has been some doubt as to whether the “reef-effect “ or added structures in the marine environment increases the overall abundance, biomass or diversity of fish in an area or just leads to an aggregation of the fish that are already there. Results from the monitoring of fish populations around the foundations of offshore wind farms indicated that species composition was the same both inside and outside the wind farm areas (Hvidt *et al.*, 2006). Similarly, there were no differences in the species composition of fish before and after the construction of the wind farm offshore in Barrow, NW England (BOWind, 2008). However, of interest for the recreational fisheries, interviews of commercial and recreational fishermen that fish around the Great Belt Bridge say there are considerably more cod near the bridge pylons than in the nearby open waters (pers. comm.). Thus, on a large scale a fish survey might not be able to register a difference in the fish community and biomass near hard substrates and in adjacent open water areas. However, on a small scale it appears that the reef associated community established on for example bridge pylons, may create an environment where fish of interest to the recreational fisheries might aggregate in greater numbers than in the surrounding open waters and enhance the recreational fisheries.



In summary, the total area of the introduced substrates and their associated reef communities primarily from a bridge solution if chosen will only amount to a very little area in relation to the total area of the fixed link and thus this impact is only considered to be “minor”. However, on a local scale, the aggregation of important recreational fish species (such as cod) could create new fishing areas primarily for the offshore recreational fisheries. Thus, this impact could be considered positive and could potentially have a comparatively positive impact to the offshore recreational fisheries in Fehmarnbelt.

An overall assessment on the impacts to the recreational fisheries due to the fixed link also needs to address other indirect impacts that might affect the distribution and abundance of certain recreational fish species. These could be greater changes in distribution and abundance of some species due to changes in flow-rates, local currents and/or turbulence in the water that are not addressed in this report. An overall assessment of these impacts to the recreational fisheries is thus dependent on the outcomes of the assessments of the biological and hydrological investigations and their impact scenarios on fish that will directly and indirectly affect the recreational fisheries.

6.3 Impacts anticipated by vessel owners of German commercial angling vessels

The owners of commercial angling vessels were asked which effects they expect on their enterprises during the construction phase. Owners were allowed one vote for each effect – if wanted. The results of this survey are presented in Figure 6.1.

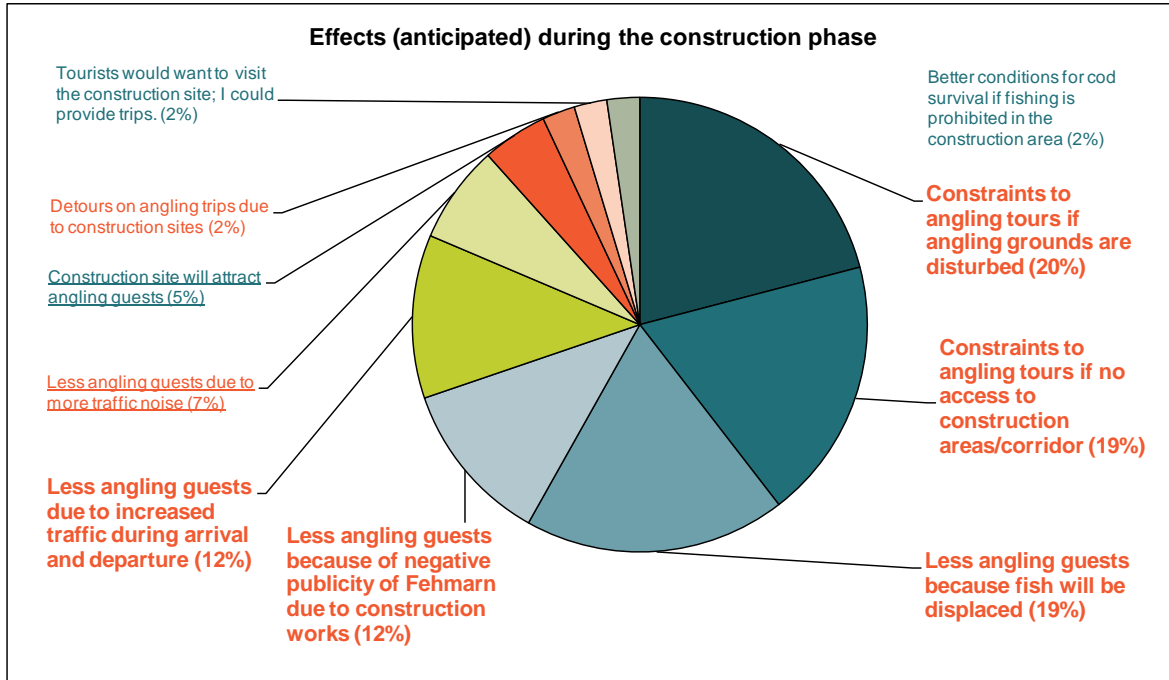


Figure 6.1: Anticipated effects on commercial angling vessels during the construction phase (Blue: positive effects, Orange: negative effects, Bold: effects represented by >10% of the votes by survey participants, Underlined: effects represented by 5 to 10% of the votes by survey participants) (based on interviews with commercial vessel owners).



The owners of angling vessels are mostly concerned about direct influences on their trips due to disturbances or restrictions to their angling grounds or fish being driven off (redistribution of fish). Another major concern is a possible decline in the number of guests because of negative publicity and increased problems with traffic due to the construction works. Only a few owners anticipate positive effects during the construction phase. For example, only 5% of votes were given to anticipations that the construction would also attract angling guests and only 2% of the votes were given to whether they expected to provide trips out to the construction site for visitors. All owners expect the construction to influence their trips one way or another and 90% of the votes showed owners expected it to influence the number of angling guests. 80% of the owners votes showed they expected negative effects to their enterprises, while only 10% expected positive effects, and 10% expect no overall changes in their enterprises to occur. In all, the anticipated impacts during the construction phase got a total of 40 negative responses and only 4 positive responses.

6.3.1 Anticipated effects from a bridge solution

Commercial angling vessels

The answers of the owners of commercial angling vessels on the question of what effects they anticipate on their enterprises from the operation of a bridge across the Fehmarnbelt are presented in Figure 6.2. The owners are mostly concerned about the bridge area not being accessible for angling vessels or for constraints to the angling trips if vessels are only allowed to sail in certain areas. The issue of largest concern was a further decline in the number of angling guests due to a loss of angling areas because of restricted access around the bridge, as well as disturbances to other fishing areas. Furthermore, they were concerned that former guests would discover other angling areas for themselves because of restrictions to the commercial angling fisheries during the construction phase.

Some owners of commercial angling vessels further anticipate fewer angling guests due to negative publicity for Fehmarn and the loss of its reputation as an island. A decline in guests, due to more traffic and traffic noise during arrival and departure is also mentioned in 16% of the votes, while 4% of owners votes showed they expected better road and train connections and less traffic.

The most important positive effect mentioned is its attraction to visitors and in turn for angling tourists.

There are a number of anticipated affects that have been given by only a few owners of commercial angling vessels. For example, only 2% of the votes showed owners expected influences to their business because of construction on the railway line, or that anglers will go to Denmark for angling instead. Only a few votes (2%) showed owners expressed their concerns about changes in local water currents, or that fish will be driven away by vibrations. In the questionnaire section for optional answers, both of these anticipated problems were added by the vessel owners. However, in direct conversations, both concerns were expressed by a greater number of vessel owners and may be more of an issue in their minds than what was displayed in their answers, Figure 6.2.

A few owners also added their expectations for potentially better breeding conditions for fish, because of an improved food basis on the physical structures and potential restrictions to the fisheries in the bridge area.

No owners expected a greater number of angling guests because Fehmarn will be better known due to the fixed link. Furthermore, it is not anticipated that local angling guests will use commercial angling vessels from other harbours - for example using vessels from



Heiligenhafen instead of Fehmarn, primarily because the commercial angling vessels from all harbours are using more or less the same angling areas.

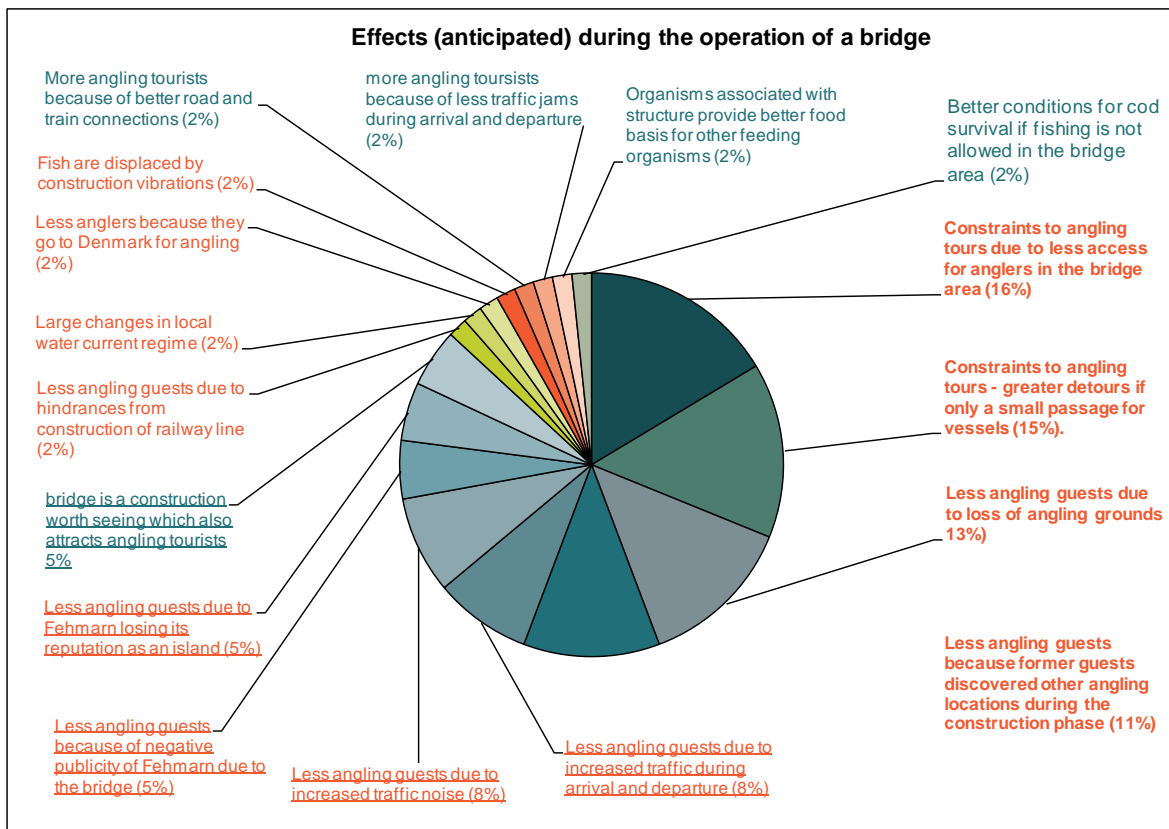


Figure 6.2: Anticipated effects on commercial angling vessels during the operation of a bridge (Blue: positive effects, Orange: negative effects, Bold: effects represented by >10% of the votes by survey participants, Underlined: effects represented by 5 to 10 % of the votes by survey participants).

All owners of commercial angling vessels expect impacts from the bridge on their trips and on their guests. Of them, 10% of the votes indicated that owners expect positive and negative effects to balance out while 10% of the votes suggested owners cannot determine whether positive or negative effects will prevail. Up to 80% of the votes showed that owners expect negative effects to prevail. In all, the operation of a bridge received a total of 54 negative and 9 positive responses.

6.3.2 Anticipated effects from a tunnel solution

Commercial angling vessels

The owners of commercial angling vessels were asked what effects they expect on their businesses from the operation of a tunnel under the Fehmarnbelt. The results of the survey are presented in Figure 6.3.

With the operation of a bridge, the owners of commercial angling vessels are mostly concerned about a loss of guests who discover other angling locations for themselves during the construction phase. Another major concern is that the number of angling guests will decline due to increased traffic (14% of the votes) and traffic noise (15% of the votes). In contrast, only 6% of the votes were given to expectations that there will be an increase in angling tourists because of better road and train connections and less traffic.



Furthermore, some owners expect a decline in the number of guests due to negative publicity for Fehmarn because of the tunnel (9% of the votes) and due to Fehmarn losing its reputation as an island (9% of the votes). Disturbances due to the railway line also seem to be of some concern to the owners.

On the positive side, it is anticipated by 9% of the votes indicate that owners think a tunnel is also seen as a construction worth seeing, which could attract angling tourists.

Up to 50% of votes by owners anticipate that a tunnel will have an impact on both their trips and the number of angling guests. Approximately 30% of the votes by owners indicate they think the tunnel will not have an impact on their angling trips but will have an impact on the number of their guests, while 20% of the votes suggest owners anticipate the tunnel will not have an impact on their trips or their guests. In all, the operation of a tunnel got a total of 27 negative responses and 9 positive responses.

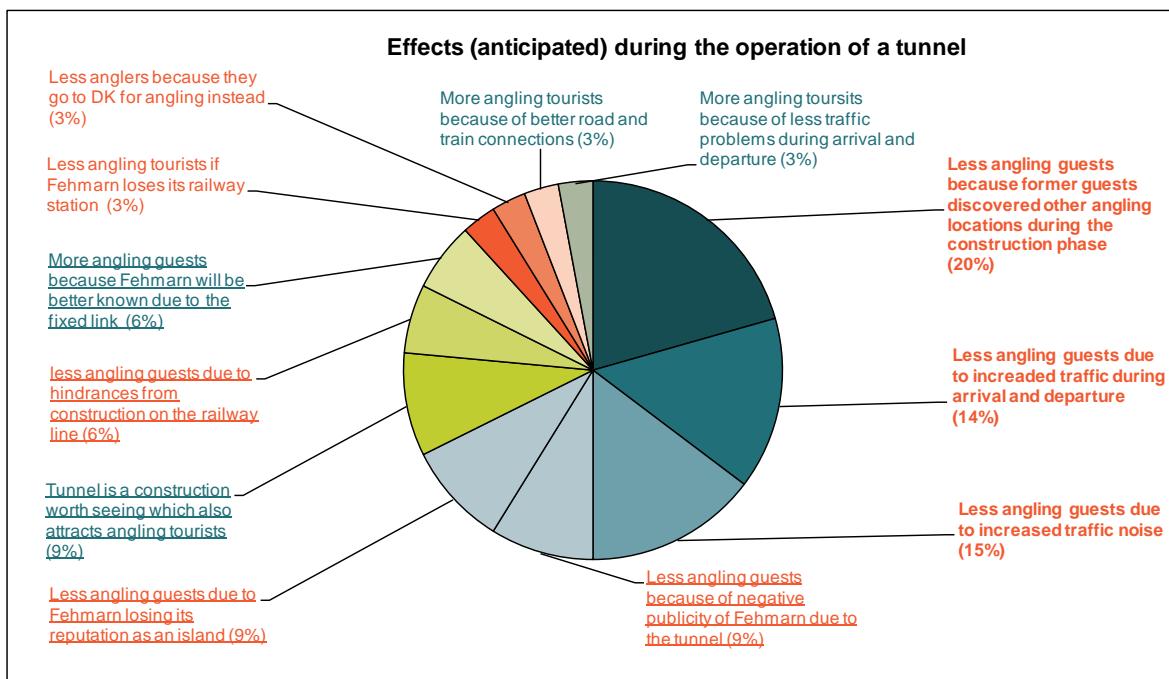


Figure 6.3: Anticipated effects on commercial angling vessels during the operation of a tunnel (Blue: positive effects, Orange: negative effects, Bold: effects represented by > 10% of the votes by survey participants, Underlined: effects represented by 5 to 10% of votes by survey participants).



7. Conclusion

A combined overview of the coastal and offshore areas in Fehmarnbelt and region that are fished by the German and Danish recreational anglers is shown in Figure 7.1.

The coastal areas along Fehmarnbelt on both Fehmarn Island and the southern coast of Lolland and Falster contain numerous popular areas for recreational anglers. Sea trout, cod, garfish and diverse flatfish species are the primary species of interest. In general, much of the coastal areas can be fished throughout the year, however, the intensity of fishing effort varies according to the seasonal abundance of the different target species.

There are not many hobby fishermen that fish along Fehmarnbelt, either on Fehmarn Island or the southern coast of Lolland. Those few that fish in Fehmarnbelt, generally use gill nets and primarily target cod and flatfish. On the southern coast of Lolland in Nysted Nor, and more specifically Nysted Fjord, there is an extensive fishery after eel with fyke nets. In recent years, however, this fishery has been declining due to greater restrictions on the fishery after eel, and the increase in disturbances to the hobby fisheries by excessive filamentous algae, seals and generally fewer fish.

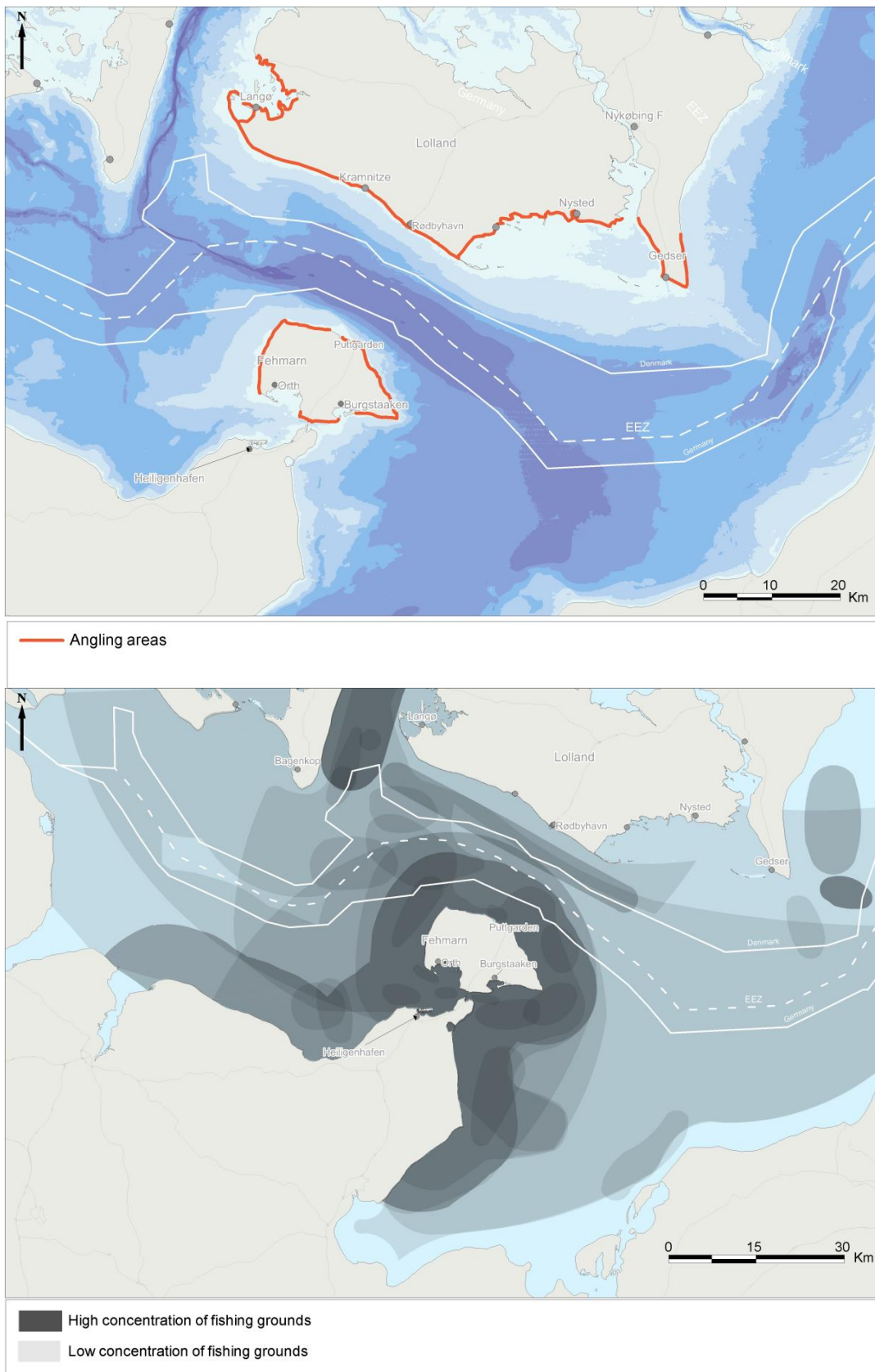


Figure 7.1: The coastal angling areas on the southern shoreline of Lolland and Falster and on Fehmarn (top map), and the low and high concentration of offshore fishing areas used by German and Danish angling vessels in Fehmarnbelt and region (bottom map).



The area in Fehmarnbelt that is utilised by offshore recreational anglers is considerably extensive. This is primarily due to the popularity of angling tours and the large number of commercial angling vessels in Germany. Cod is the fish species that is mostly targeted by these anglers and was mentioned as the most important fish for continuation of these businesses. There are no Danish commercial angling vessels that fish in Fehmarnbelt. The few Danish vessels that offer fishing tours in the region have their basis harbours closer to other popular offshore angling areas (Langelands Belt and the southwestern coast of Falster) and therefore do not have direct associations with Fehmarnbelt.

Fishing offshore from private boats in Fehmarnbelt from both Germany and Denmark is not very extensive. There is some trolling, jigging and bait fishing in Fehmarnbelt along the southern coast of Lolland by Danish anglers but this is limited to only occasional activity by approximately 15-20 vessels. According to both Danish and German anglers with private boats there are more popular fishing areas outside of Fehmarnbelt, both to the east and west, and in the area of Rügen along the northern coast of Germany.

The overall significance of potential impacts to the recreational fisheries during the construction and operation of the Fehmarnbelt Fixed Link (bridge or tunnel) are probably minor, however a more conclusive assessment is not possible before information on all the potential impacts to fish are available.

The impact of introduced structures to the recreational fisheries were also considered to be “minor” despite the potential aggregations of species of interest to the recreational fisheries around bridge pylons and other structures that create “reef-effects”. The impact of these structures could, however, be positive on a local scale and have a positive impact for the offshore recreational fisheries in Fehmarnbelt.

Interviews with the German commercial angling vessels on their past and current businesses and anticipations of their future perspectives indicated that up to 20% of vessel owners expressed concerns for the potential impacts due to the construction and operation of a bridge. Similarly, 12% of the commercial vessel owners expressed concerns for the potential impacts due to the construction and operation of a tunnel.

The greatest overall concern of the commercial angling vessels for their businesses was the continuation of decreasing stocks (primarily cod).

To avoid unnecessary adverse effects on the local commercial angling businesses in Germany there should be a means to continually inform them about the ongoing work at sea and the areas of concern. This could be achieved by an information system which is made known and accessible to the owners and captains of the each vessel. Contact in such matters could be taken up via the Entwicklungsgesellschaft Ostholstein (egoh.de) and/or the Verband der Bäder- und Hochseeangelschiffe e.V. (hochseeangelschiffe.de/impressum.php).



8. Abbreviations

DAV	Deutscher Anglerverband e.V. – German Angling Association
DMV	Deutscher Meeresangler-Verband e.V. – German Marine Angling Association
LLUR	Landesamt für Landwirtschaft, Umweltschutz und ländliche Räume Schleswig-Holstein
LSFV-SH	Landessportfischerverband Schleswig-Holstein e.V.
MLUR	Ministerium für Landwirtschaft, Umweltschutz und ländliche Räume Schleswig-Holstein
VDSF	Verband Deutscher Sportfischer e.V. – Association of German Sports Anglers
M-V	Federal state Mecklenburg-Vorpommern
S-H	Federal state Schleswig-Holstein
BSH	Bundesamt für Seeschifffahrt und Hydrographie
Bft	Beaufort



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12. Appendix

Survey questionnaire used in Germany for commercial angling vessels

<p style="text-align: right;">Questionnaire for commercial angling enterprises page 2</p> <p>3. In which sea areas do you undertake your angling trips? Please outline the areas on the sea chart.</p> <p>4. Which fish species are mainly caught in each area? Please note the fish species in the outlined areas.</p> <p>5. How many days does your vessel do your vessels approximately spend in the outlined areas? Alternatively: How many days does your vessel spend at sea on average? Please note the number in the outlined areas.</p> <p style="text-align: center;">Offers and prices</p> <p>6. How many anglers and non-anglers booked trips on your vessel and/or stayed overnight on your quarters in 2008 and what are the actual prices (2009) for your offers? Please fill in the table.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr style="background-color: #cccccc;"> <th colspan="2">Offers</th> <th>Guests</th> <th>Price [€]</th> <th>Price [€] (2009)</th> </tr> <tr style="background-color: #cccccc;"> <th colspan="2"></th> <th>Anglers Number (2008)</th> <th>(2009)</th> <th>(2009)</th> </tr> </thead> <tbody> <tr> <td>Day trip</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Multi-day trip</td> <td>of days</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Multi-day trip</td> <td>of days</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Multi-day trip</td> <td>of days</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Overnight stays at land</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>7. Did there occur noticeable changes to the number of angling trips or guests in the past 10 years in your business?</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <thead> <tr style="background-color: #cccccc;"> <th>yes</th> <th>no</th> <th>Reasons</th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td>Numbers have declined.</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td>Numbers have risen.</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td>Numbers are unchanged.</td> </tr> </tbody> </table> <p>8. 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Local angling firms may be particularly affected by the construction. Can I ask you for some details on your business to be able to assess the influence of the construction?</p> <p>Your data will be saved and analysed only in summarised statistics which do not allow identification of single respondents. The analysis of the data will be done by the fisheries group of the Fehmarn Belt Environmental Consortium (FeBEC). The results of the analysis will be made available to the decision makers and the public within the framework of the construction project.</p> <p>The original questionnaires will be kept until the end of the investigations and then be destroyed. Together with information from the professional fishermen, your data will be used in the planning process to keep the influence of the construction on fishing activities as low as possible.</p> <p>1. 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Fehmarn Belt fixed link

9. How do you rank your own knowledge on the Fehmarn Belt fixed link?
- excellent
 - good
 - satisfactory
 - incomplete
 - bad
10. According to recent plans, as from 2018 the Fehmarn Belt fixed link shall link the islands Fehmarn on the German and Lolland on the Danish side.
From 2012/2013 the link shall be built as a tunnel or bridge between Puttgarden and Rødby.
How do you personally evaluate those plans?
- Basically, I approve the plan.
 - I didn't form an opinion yet.
 - Basically, I disapprove the plan.
 - I am neutral to this planning.

11. Do you think that the **construction phase** of the Fehmarn Belt fixed link (2012/13 bis ca. 2018) will have influences on your business?

	Yes	No
Multiple answers possible		
More angling guests approaching from the construction area		
More angling guests for Fehmarn will be better known due to the FFL		
Construction site will be attracting angling guests		
Others:		
Constraints to angling tours if no access to construction corridor		
Constraints to angling tours if angling grounds are disturbed		
Less angling guests because fish will be driven off		
Less angling guests because of negative publicity of Fehmarn due to construction works on land and at sea		
Less angling guests due to more traffic jams during arrival and departure		
Less angling guests due to more traffic noise		
Less angling guests for the construction mutilates the landscape		
Others:		
Positive and negative effects would probably even themselves out.		
The following question can be approved of only if none of the statements on guests or else trips was approved of.		
The construction phase would have no influence on my guests.		
The construction would have no influence on my angling trips.		

12. Do you think that the **operation of a bridge** across the Fehmarn Belt (from ca. 2018 on) would have influences on your business?

	Yes	No
Multiple answers possible		
more angling guests approaching from the bridge area if angling is restricted there		
more angling guests for Fehmarn will be better known due to the FFL		
bridge is a construction worth seeing which also attracts angling tourists		
more angling tourists because of better road and train connection		
more angling tourists because of less traffic jams during arrival and departure		
Others:		
constraints to angling tours if no access for anglers to the bridge area		
constraints to angling tours - detours if only small passage for ships		
less angling guests because of negative publicity of Fehmarn due to the bridge		
less angling guests due to hindrances from construction at the railway line		
less angling guests due to more traffic jams during arrival and departure		
less angling guests due to more traffic noise		
less angling guests due to loss of angling grounds		
less angling guests because former guests discovered other angling locations during the construction phase		
less angling guests due to Fehmarn losing its reputation as an island		
Others:		
Positive and negative effects would probably even themselves out.		
The following question can be approved of only if none of the statements on guests or else trips was approved of.		
The operation of a bridge would have no influence on my guests.		
The operation of a bridge would have no influence on my angling trips.		

13. Do you think that the **operation of a tunnel** under the Fehmarn Belt (from ca. 2018 on) would have influences on your business?

	Yes	No
Multiple answers possible		
more angling guests for Fehmarn will be better known due to the FFL		
tunnel is a construction worth seeing which also attracts angling tourists		
more angling tourists because of better road and train connection		
more angling tourists because of less traffic jams during arrival and departure		
Others:		
less angling guests because of negative publicity of Fehmarn due to the tunnel		
less angling guests due to hindrances from construction at the railway line		
less angling guests due to more traffic jams during arrival and departure		
less angling guests due to more traffic noise		
less angling guests because former guests discovered other angling locations during the construction phase		
less angling guests due to Fehmarn losing its reputation as an island		
Others:		
Positive and negative effects would probably even themselves out.		
The following question can be approved of only if none of the statements on guests or else trips was approved of.		
The operation of a bridge would have no influence on my guests.		
The operation of a bridge would have no influence on my angling trips.		



page 5 Questionnaire for commercial angling enterprises

14. Do you expect disturbances in your angling areas due to sediment drift?
 Yes
 No
 I can't estimate it.

15. Do you expect disturbances in your angling areas due to underwater noise?
 Yes
 No
 I can't estimate it.

If questions 14 & 15 were answered with 'no', go on with question 19 ->

16. If you are expecting disturbances due to sediment drift and/or underwater noise: What are you going to do if your angling areas in the Fehmarn Belt really got disturbed?

Multiple positive answers possible	Yes	No
Go to alternative fishing grounds	Easily possible/difficult	
Undertake less angling trips		
Undertake trips without anglers		
Others:		

17. Can you estimate the financial consequences of the actions from question 16 on your angling business?
 positiv
 neutral
 negativ
 I can't estimate it.

18. Can you give a quantitative estimate of the influence of the actions from question 16 on your business?

Please estimate in percent	I can't estimate it	less	the same	more
Number of trips		%		%
Number of guests		%		%

Business in general

19. How many people were employed in your angling business in 2008? (Employees and own or family labour)
 All-year full time:
 All-year part time:
 Seasonal full time:
 Seasonal part time:

20. Can you estimate in which percentages your guests are arriving directly from their home towns or from their holiday locations?
% from their home towns
% from their holiday locations

page 6 Questionnaire for commercial angling enterprises

21. Can you estimate in which percentages your guests are coming from the following regions?
% from the district Ostholstein
% from the remaining Schleswig-Holstein
% from Niedersachsen, Hamburg, Bremen, Nordrhein-Westfalen
% from the remaining Germany and abroad

22. What are the greatest challenges for your angling business at present and in the near future?

You have 5 votes to give to the greatest challenges for your business. The votes can all be given to one challenge or assigned to different challenges.	Voices
Decreasing fish stocks	
Increasing prices for fuel and maintenance	
Increasing environmental constraints	
Increasing security constraints	
Decreasing demand	
Increasing competition	
Increasing demands of the guests	
Construction phase of the Fehmarn Belt fixed link	
Operation of a bridge over the Fehmarn Belt	
Operation of a tunnel under the Fehmarn Belt	
Others:	

23. Which perspectives are most likely for your business in the next 10 years?
You have 3 votes to give to the greatest challenges for your business. The votes can all be given to one challenge or assigned to different challenges.

You have 3 votes to give to the greatest challenges for your business. The votes can all be given to one challenge or assigned to different challenges.	Voices
The marine angling business will continue in about the same way as now.	
The marine angling business is expected to decline.	
The marine angling business will probably be given up.	
The marine angling business is expected to increase.	
I will probably sell the marine angling business.	
A family member will take over the marine angling business.	
Others:	

24. For which reasons have you chosen the business perspectives given above?
You have 3 votes to give to the greatest challenges for your business. The votes can all be given to one challenge or assigned to different challenges.

You have 3 votes to give to the greatest challenges for your business. The votes can all be given to one challenge or assigned to different challenges.	Voices
Because of the challenges I gave my votes in question 22.	
Due to retirement	
For personal reasons	
Others, namely:	

Thank you for your time and your answers!



Other Sources of information

Danish interviews with members of fishing clubs, fishermen associations and individual fishermen.

Nykøbing and Region Recreational Fishermen Association – source Vice-chairman.

The association has approx. 100 members. Members fish primarily in the sea (saltwater). Several members fish after sea trout and garfish along the southern Lolland coast with waders. The club does not arrange fishing trips to Fehmarnbelt. Arranged tours include chartered trips to Gedser Reef with the vessel "Amigo" from Gedser and trips to Lollands NV coast (primarily Langelands Belt) from Onsevig.

Gulborgsund Sports Fishermen Association – source chairman.

Approx. 100 members, fish primarily in the sea. Several members fish after sea trout and garfish along the southern coast of Lolland. Arranged angling tours from Gedser with commercial angling vessel "Amigo". Several members have small boats in Rødbyhavn and fish in Fehmarnbelt.

Skipper/owner of commercial angler vessel "Amigo" with basis harbour in Gedser. Sails approx. 100 trips a year with anglers, 12 persons pr. tour, eighty percent (80%) of anglers are German. Target species is cod and periodically good catches of herring and garfish. Fishing activities primarily on "Gedser Reef" and east of Falster (also in "Kadetrenden"). No knowledge of other commercial angling vessels that sail with anglers from Gedser to Rødbyhavn.

Rødby Sports Fishermen Association. The association has 112 members. A large number of members (approx. 40 members) fish after sea trout and garfish from the southern coast of Lolland (between Hyllekrog and Nakskov/Langø). In earlier years (7-8 years ago) there was also a fishery after cod from the coast. Members also fish after flatfish (primarily flounder and dab) from the protective scour of Rødbyhavn harbour.

Danish Organization for Amateur Fishermen, local department for Lolland-Falster. No hobby fishery by their members along the southern coast of Lolland. Many fish in Nysted Fjord with fykenets after eel. Members have approximately 70 small boats in the local harbours of Errindlev, Lundehøje, Stubberup, Nysted etc.

Danish Sea Fishermen Association - chairman. No commercial angling vessels in Fehmarnbelt under this association.

Denmarks Sports Fishermen Association - environmental coordinator for West Zealand. Reference to local departments.

Denmarks Amateur Fishermen's Association - chairman. Reference to local departments.

Denmarks Amateur Fishermen's Association, environmental consultant. Reference to local departments.

Denmarks Sports Fishermen's Association, environmental consultant. Reference to local departments.

Rødbyhavn. Hobby fisherman. Fishes with gillnets (3 stk.) in the local waters west of the sailing channel from Rødbyhavn (within 3 nm from the harbour). Primary target species are flatfish (turbot and dab), and cod in earlier years. Fishing activities are from April-October.



Rødbyhavn Boat Club - chairman. In Rødbyhavn there are 4 hobby fishermen that fish with gill nets in the local area near the harbour. There 7 others that jig primarily after cod from small boats.

Commercial pound net fisherman, Rødbyhavn. There is some hobby fishing in Nysted Fjord after herring with nets from February-April and with longlines after garfish in April-Maj. The reason the fishery with stationary gear has decreased in intensity is because of large problems with seals which destroy the gear and eat the catch. Most of the hobby fishermen in Nysted Fjord target eel and only use fyke nets. Recent laws restricting the fishery after eel from the period 10 May - 1 August have been introduced (in accordance with an eel rehabilitation plan) and have restricted the fisheries considerably. This has further reduced this fishery as the summer period is the most active time for hobby fishermen. Furthermore, the increased presence of filamentous algae is also a problem - especially in the period from May-July. They do not have any knowledge of trolling in Fehmarnbelt.

Commercial fisherman, Kramnitze. In Kramnitze there are 2 hobby fishermen that fish with gill nets. There are no part-time fishermen. He mentioned that there was one fishermen who he knows that has tried trolling in Fehmarnbelt.

Sports fisherman/angler, Dannemare/Kramnitze. Generally he trolls in the area around Klintholm or Nakskov (salmon and sea trout are the target species). Has trolled a few times in Fehmarnbelt and has the impression that there are some possibilities here. Fishes around the 40-meter depth curves - but not as deep in Fehmarnbelt. Also fishes with jig from a boat in Fehmarnbelt (catches of cod up to 16 kg). Good sea trout fishery along the southern coast of Lolland. He also mentioned at least 3 anglers that fish from boats launched from Kramnitze harbour.

Naksov Sports Fishermen Association - chairman. The club has approximately 150 members. Considerable amount of coastal fisheries after sea trout along the western and southern coast of Lolland to Kramnitze. Organise trips with commercial angling vessel "Hanne" from Onsevig primarily targeting cod. Several members (15-20) have private boats and troll after sea trout and salmon primarily in Langelands Belt, Rugen - Germany, and in the coastal area around Klintholm, along the southern coast of Lolland on occasion.

Consultant from Danish Fishermens Association. Has much angling experience. Has no knowledge of any trolling activity in Fehmarnbelt. The majority of the recreational trolling he knows about suggests that the primary start point for trolling is from Klintholm harbour and the trolling fishery is generally southeast of Lolland at water depths of 40-42 meters.