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IJmuiden, the Netherlands

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Contents

Executive summary

The Working Group on Crangon Fisheries and Life History (WGCRAN) 2011 meeting was held at IMARES, IJmuiden, The Netherlands in May 2011. The meeting was chaired for the third and final year by Ingrid Tulp (the Netherlands). Members from Germany, the Netherlands and Belgium were in attendance. Unfortunately, Denmark, the UK, France and Portugal could not be represented, partly due to budget cuts. Marc Hufnagl, Germany was proposed as the new chair.

Because of the lack of a management in this fishery and requests from EU or governments on formal advice, the contents of the meeting strongly depend on the activities and interests of the scientists attending the meeting. With a long list of Terms of Reference, and little work carried out intersessionally, not all Terms of Reference were addressed at the meeting (update on VMS maps and proceed on issue of best models for biomass analyses).

The effort and landings statistics for the Crangon directed fleets were updated for 2010. Germany and the Netherlands continue to dominate the fisheries, with total landings around 12 000–16 500 tonnes in 2010. The 2010 Dutch landings were the record in the series. Denmark, the UK and France together landed the remaining 5000 tonnes, thus totalling nearly over 36 000 tonnes landed from the North Sea.

At the time of the meeting measurements on the efficiency of the electric shrimp trawl were carried out in The Netherlands near the island of Texel. Only preliminary data were presented and are therefore not yet included in this report.

The swept area estimate was updated for 2010 based on the Dutch survey data. Taking catchability of the gear into account the total stock of commercial size in autumn was estimated at approximately 25 000 tonnes (commercial size only) in the area covered by the survey. In the 2010 report an analysis was made of densities measured by German and Dutch survey in overlapping areas showing consistently higher densities in the Dutch data. In order to combine the Dutch and German survey data, a gear correction factor is needed. The gears used in the Dutch survey and German survey were compared in a field study operating in the same area and showed that standardized biomass density of Crangon caught by the Dutch gear was significantly higher than that caught by the German gear. Correction factors varied between 1.4 (inside Wadden Sea) and 3.3 (outside Wadden Sea). Given the low number of hauls a follow up study will be carried out, after which the work on a swept area estimate can be published.

Mortality estimates were updated for 2010, showing a slight increase in total mortality to 5.5 [y^{-1}]. Furthermore a study on connectivity was presented investigating the spatio temporal origin of summer and winter eggs in different regions of the southern North Sea. The final results of a study on the efficiency of "the letterbox", a device to decrease discards, showed that discards of flatfish were reduced compared to the sievenet (the traditional bycatch avoiding net adjustment), while commercial catches remained the same. In view of the MSC certification processes, sustainable fishing and the fishermen's voluntary obligation to limit the shares of "crushed shrimp", existing German landing data from 2010 have been analysed. Depending on season, the goal of less than 20% of "crushed shrimp" in German landings was not met in several months in 2010, especially in August, when more than 40% of the landings contained more than the proposed amount.

Finally the management plan proposed by the Dutch Shrimp fisheries producers organisation (www.crangon.nl) was evaluated and several issues especially regarding the catch control rule, new fishing techniques and bycatch were criticised.

Shrimp fisheries are currently experiencing severe difficulties with the German, Danish and Dutch fleets striking for several weeks during the spring of 2011 because of extremely low prices offered by the producers. The industry perceives that Marine Stewardship Council (MSC) accreditation of the shrimp fisheries and the implementation of a prerequisite management plan will help to improve the situation in the sector. Proposals by the industry to cap fishing effort and landings are illegal according to the Dutch Competition Authority (NMA). WGCRAN was unanimous on the need for a management plan for the previously unregulated shrimp fisheries. The fact that the fishery takes place with highly unselective gear in ecologically important nursery areas, of which a large proportion falls under Natura2000 and in some cases additional protection status should be enough reason for a management. A summary was made on the current state of knowledge on the impact of the fisheries to the environment and suggestions were made on possible routes to arrive at a management plan. The key objective should be to identify a strategy that minimises discards and bottom impact while maximising or stabilising yield. During the meeting also the potential for a management based on the reference points for target species such as MYS and F0.1 was discussed.

Altogether the WGCRAN continues in its tradition as a small but highly active and innovative working group.

1 ToR a) Update landing and effort

1.1 Germany

German landings include consumption shrimp (excluding undersized shrimp) landed by German vessels in German and foreign harbours. German landings have slightly increased again from 12 567 tonnes in 2009 to 13 476 in 2010 according to official data on the active shrimpers. After very low landings in winter due to harsh winter conditions the landings from spring to August followed the standard pattern. Obviously due to high stocks and low prices landings did not peak in September or October because of an effort reduction. In combination with unusual high stock sizes of shrimp (LPUE values in 2010 were highest in November) landings increased even further in November showing the highest landings ever observed at that time and similar annual landings as in 2005. Legal sieving size of 6.5 mm ashore has been increased voluntarily to 6.8 mm in order to increase product quality and to improve the difficult economic situation by reducing the overall production of consumption shrimp. Concerning the numbers of shrimpers in Germany there have been 228 vessels actively contributing to the landings (2009). Several further vessels contributing only by about 1 ton p.a. are considered part time fishermen and were excluded.

1.2 The Netherlands

The Dutch data from landings (excluding undersized shrimp) and effort are derived from the VIRIS (Visserij Registratie en Informatie Systeem) database which contains logbook data from all Dutch vessels landing both in Dutch and foreign harbours. Catches are registered by the fisherman in logbooks. These data are sent to the national inspection service (AID) and stored into the VIRIS data-base. Landings only include commercial sizes. Because the registration of ICES rectangles is not mandatory for Crangon fisheries, no trip specific information on rectangle is available. Days at sea for the Dutch data were calculated as arrival date minus departure date resulting in days at sea. Trips with identical dates of departure and arrival were included as one day.

Total Dutch landings in 2010 were 16 684 tonnes, which is the record for the series. Effort was similar to previous years. Effort and LPUE followed the regular seasonal pattern with a peak in September–November. Due to high stocks and low prices an effort reduction in combination with a limitation on the size of the landings was implemented in September and October.

1.3 Denmark

Danish landings include landings by Danish vessels in Danish and in foreign harbours. The total Danish landings for 2010 amounted to 3139 tonnes almost at the same level as in 2009 where 3096 tonnes were landed. Based on vessels register, logbook and sales slip information on the reported catch, effort and LPUE for the Danish fleet is given. In 2010, 27 Danish vessels fished and landed Crangon. Total fleet effort (hp-days) for 2010 decreased by 13% compared with the 2009 from 1199797 hp-days in 2009 to 1047282 hp-days in 2010. The LPUE for the previous 10 years was on average 3.49 Kg/hp-day and the value for 2010 was 3.0 kg/hp-days which is below the last 10 years average value. The fishery in the autumn of 2010 was at a level where the industry was having difficulties in selling the catches of Crangon. This resulted in a volunteering arrangement where the participating vessels agreed on a limitation of the size of the landings per day fishing.

1.4 The United Kingdom

UK data contain landings from UK vessels into UK and foreign harbours. The majority of fishing record data for vessels landing shrimps into the UK is stored on official databases held by English and Scottish authorities. Historically these data have been combined but since 1997 Scottish landings have been zero or negligible and for some records implausible capture methods have led to doubts about their validity. As such UK landings presented in recent working group reports and for recent years (post 1997) have consisted exclusively of those by English and Welsh vessels. With improvements in reporting procedures from 1988 landings data are considered to provide a reasonable account of fishing activity by UK vessels and data prior to this year are considered less reliable.

Improvements in reporting have also led to most landings since 1988 being accompanied by corresponding effort information in the form of the engine power of the vessels and the days fished (rounded to the nearest whole day). Indeed since 2007 all landings have appropriate engine power and days fished information enabling computation of hp-days for each landing and corresponding summation to month and year.

The Wash fishery in the North Sea is the source of typically around 90% of the recorded landings for the UK with ICES squares F034 and F035 the most important areas for the UK Crangon fishery. Annual landings of Crangon have been variable over time with the highest reported landings (1865 t) in 2001 and the lowest in 1984 (132 t). Low annual reported landings of around 500 t with periodic good years in excess of 1000 t are typical of this fishery and are thought to be influenced by environmental factors. Good recruitment in late summer can often provide a productive autumn fishery and high catch rates which can be sustained into the following spring (e.g. 1999/2000, 2001/2002 and 2007/2008 fishing seasons). The reported annual landings for the latest two years (2009/2010) are typical or higher than those for other recent years.

Since 1990, effort information in terms of hp-days is available for most of the reported landed shrimps (from 63% in the early years increasing to 100% in 2007 to 2010). Total effort was estimated from the ratio of total landings to observed LPUE. Estimated total effort has fluctuated between 252 000 hp-days in 2006 and 914 000 hp-days in 2001. Catch rates and prices of Crangon and other fishing opportunities (e.g. cockle fisheries, *Cerastoderma edule*), influence the levels of effort directed in any one year. Annual estimated fishing effort in 2009 and 2010 were the highest values in the last seven years, but they are not atypical for the series.

Since 1989 the number of UK vessels reported as fishing for brown shrimps has varied between 44 and 91, depending on market forces and other fishing opportunities. Although this value is likely to be an underestimate of the true numbers of vessels operating in England and Wales it is considered a reasonable estimate of the size of the fleet. The recent high prices and landings of the main UK fishery have led to moderately high numbers of vessels (69 in 2010) prosecuting the fishery.

1.5 Belgium

Landings and the related efforts and LPUEs into Belgian and foreign ports are presented. Belgian landings and effort data were recalculated for 2001–2010 and now include Belgian shrimp landings in foreign ports. The Belgian shrimp trawling fleet consisted of 31 active vessels, of which 12 vessels landed exclusively in Dutch harbours, compared to 14 vessels in Belgian harbours. Belgian shrimpers are rather small

(engine power 104–221 kW) and perform short daily trips to provide daily fresh unpeeled cooked shrimp each morning. In contrast to the other national fleets, Belgian shrimp fisheries lack an intensive winter fishery. During January–July shrimp abundance in the Southern Bight is low but then increases rapidly to reach a peak in October.

Total annual landings from Belgian shrimp trawlers increased with 4% to 1649 tons compared to 2009. Landings in Belgian ports increased with 41% to 783 tons (61% in Oostende, 38% in Nieuwpoort and 1% in Zeebrugge). Shrimp landings of Belgian trawlers into foreign ports decreased with 16% to 867 tons (97% in the Netherlands, 3% in Germany).

The total effort further decreased from 80.8 x 10^5 hp-fishing hours to 70.0 x 10^5 hp-fishing hours but followed a normal monthly trend as observed in the previous years, with the lowest and highest efforts during February and October, respectively. The contribution of the local (i.e. Belgian ports) to the total Belgian effort further decreased from 44 to 42%.

Total LPUE for 2010 was 0.236, an increase with 20% compared with 2009. Since 2007, the LPUE has gradually increased with 191%, which reflects an usually high and increasing abundance of shrimp during August-December. As a result, the 2010 LPUE is the highest observed since the first recordings in 1973.

1.6 France

French vessels are small (8–14 m), those more than 10 meters fill logbook, the others monthly fishing declarations. All the declarations are computed by the French fishing administration and Ifremer has access to the database.

The landings concern only French vessels working in national coastal waters. The landings concern only commercial size. Total landings in 2010 were estimated at 231 tonnes with 88 coming from the areas VIId,IVc. For this same year, the total number of boats involved was respectively 185 and 37; these include a majority of boats fishing part time on brown shrimp. After an increase of the landings in 2006, the recent production remains low, particularly in the Northern part.

1.7 Total EU landings of Crangon

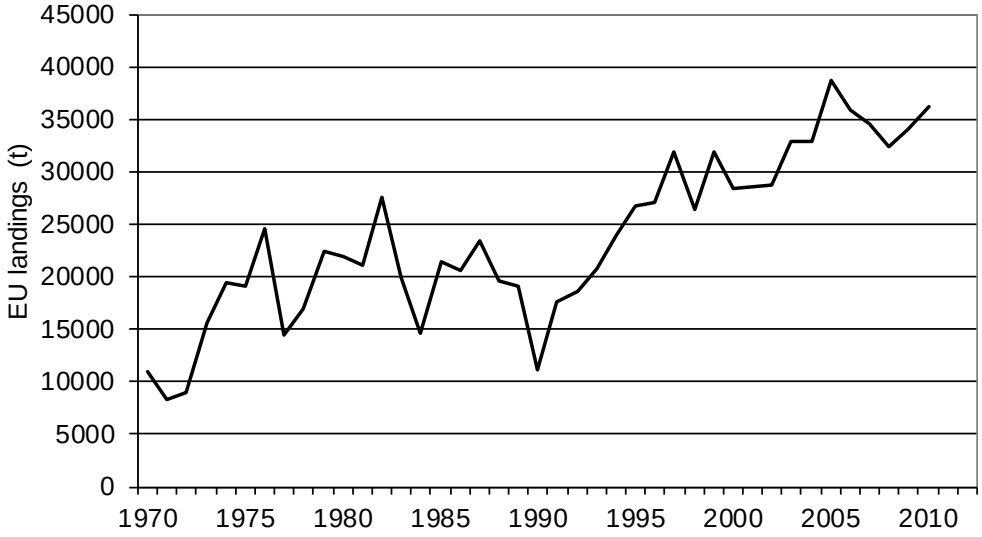

Figure 1.1. Landings of Crangon from the North Sea [t].

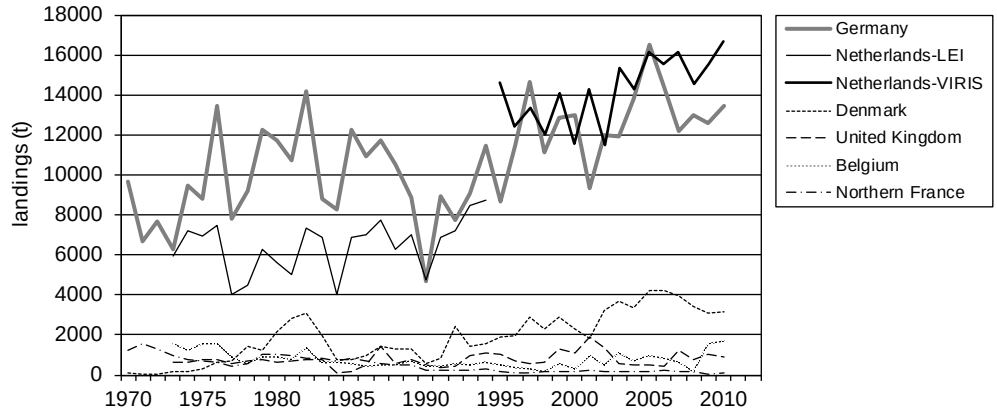

Figure 1.2. Landings of Crangon from the North Sea [t] by country.

1.8 Seasonal EU landings of Crangon

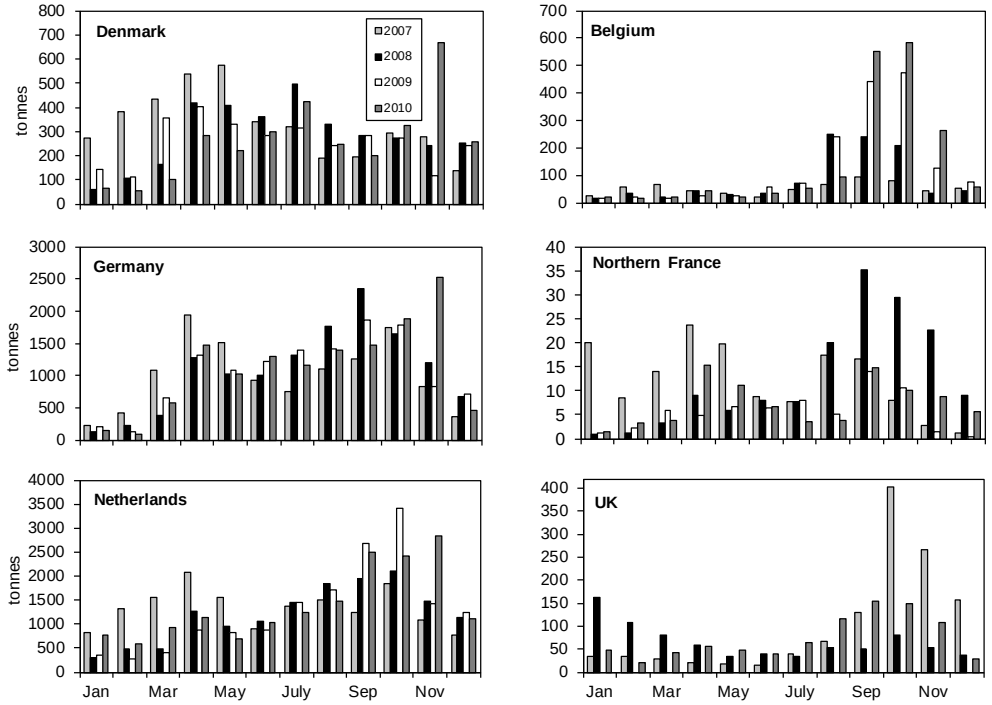

Figure 1.3. Landings of Crangon from the North Sea [t] by country and month.

1.9 Total fleet effort in the EU Crangon fishing fleets

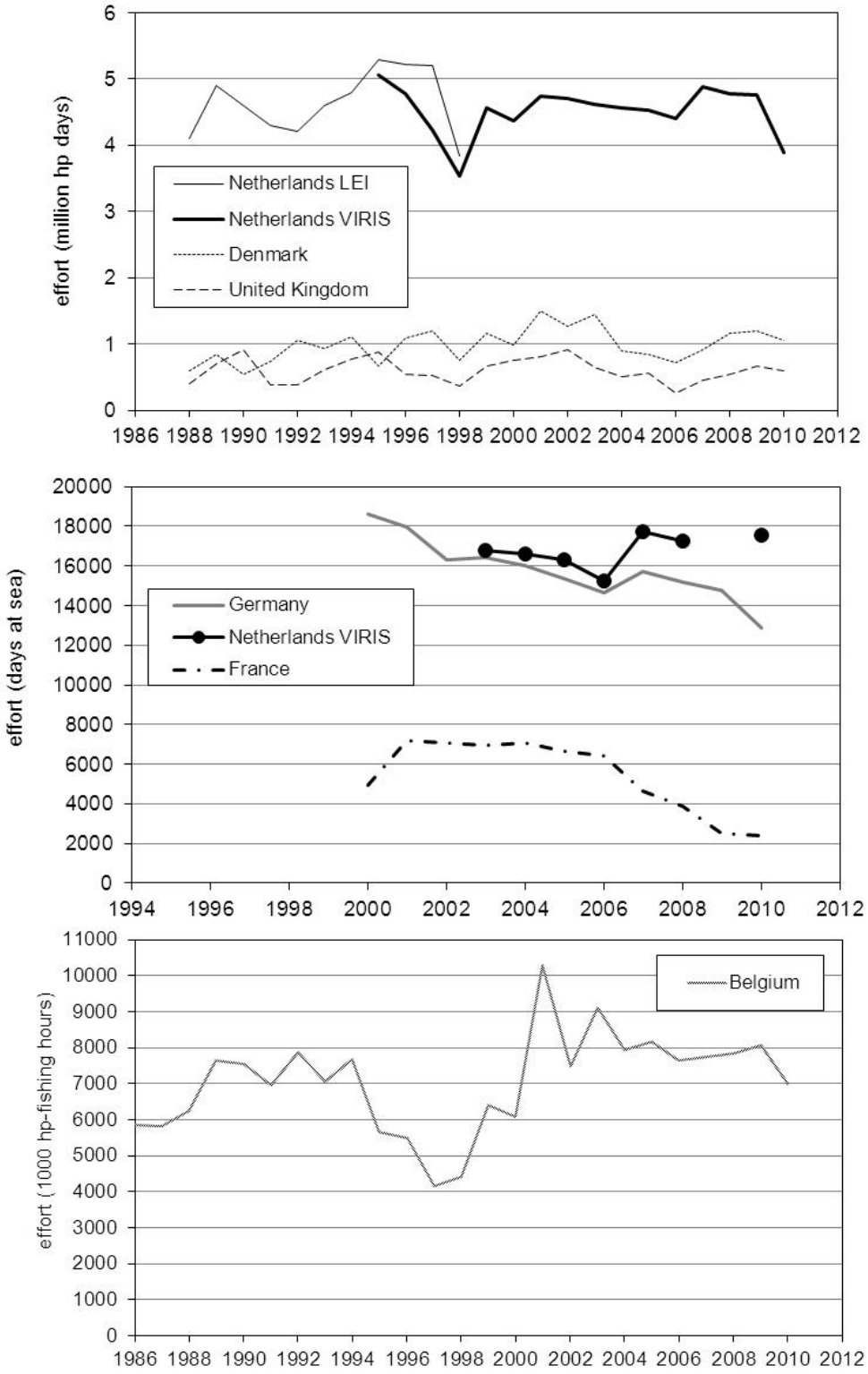

Figure 1.4. Effort in the EU fishing fleets. Netherlands LEI based on data collated by LEI institute; Netherlands VIRIS based on VIRIS data. The upper graph represents the data for the Netherlands, Denmark and the UK in the unit hp-days. The middle graph presents the German, Netherlands VIRIS and French data in days at sea. The lower graph presents the Belgian data in 1000 hp fishing hours.

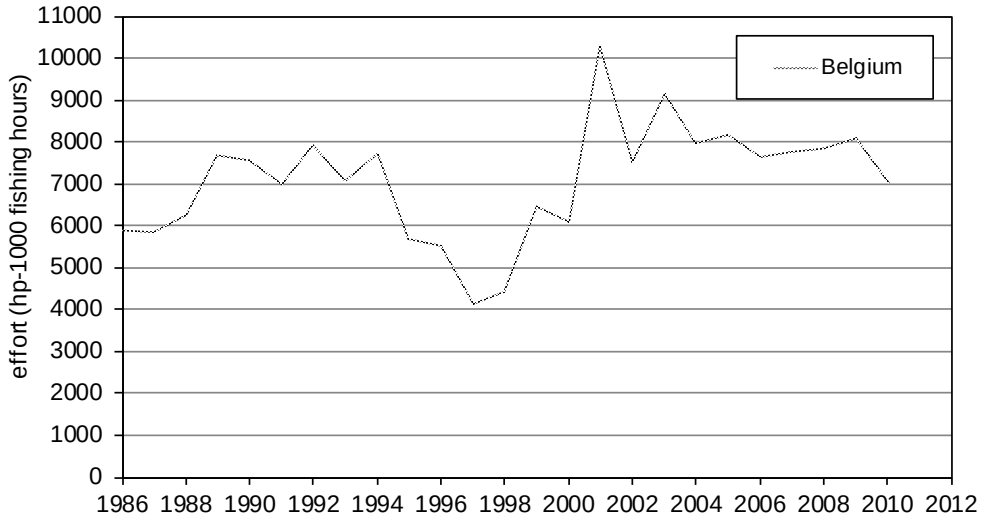

Figure 1.5. Belgian effort in 1000 hp-fishing hours.

1.10 Seasonal fleet effort in the EU Crangon fishing fleets

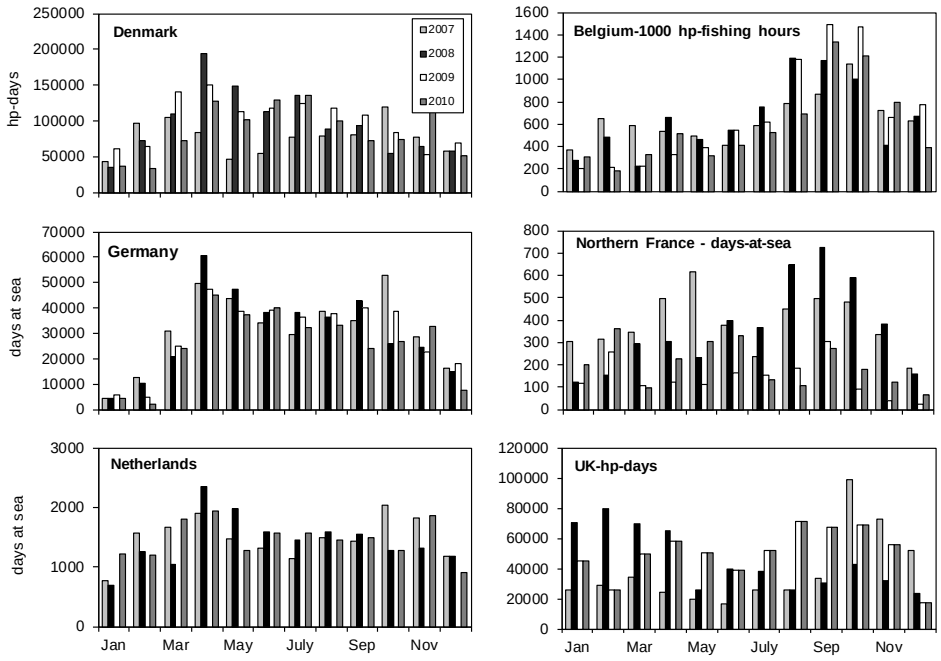

Figure 1.6. Effort by country and month (Dutch effort for 2009 is lacking).

1.11 Landings per unit effort in the EU Crangon fishing fleets

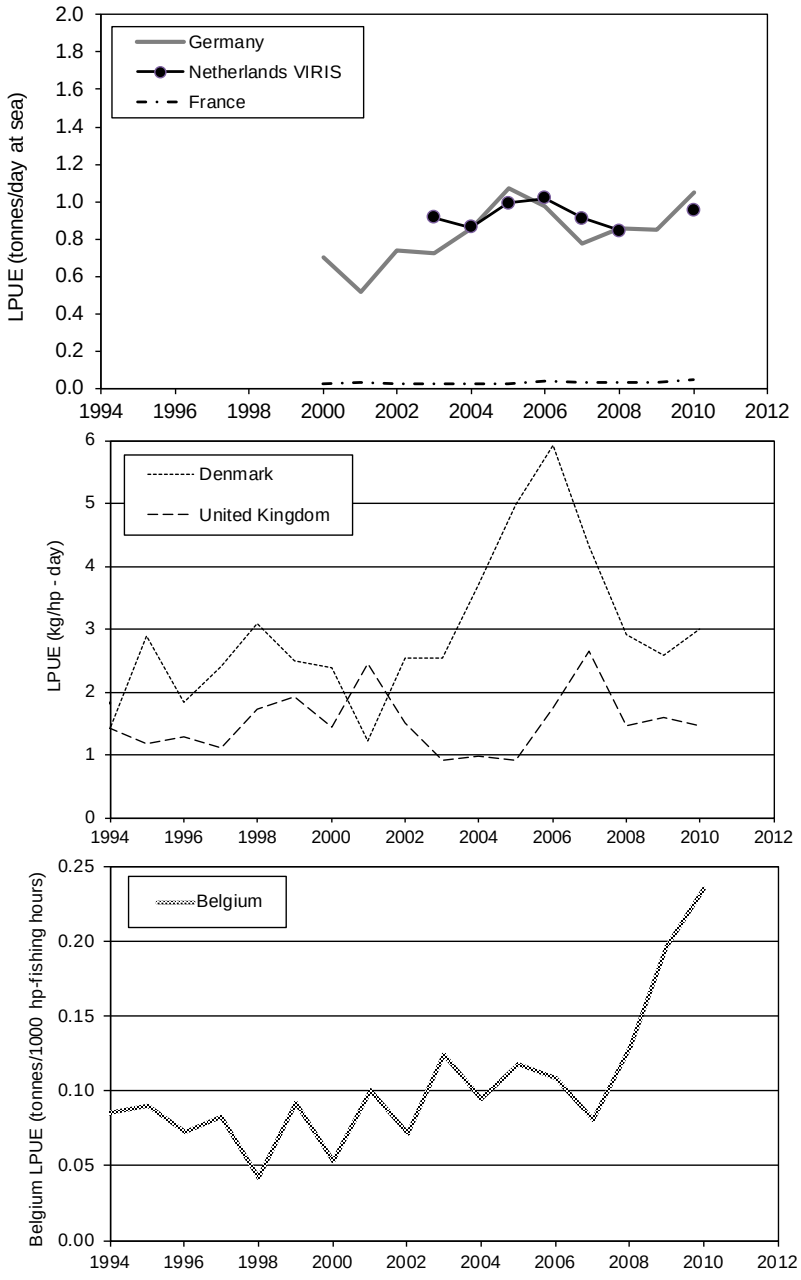

Figure 1.7. Landings per unit of effort in the EU fishing fleets. Note the different units for the different countries (Dutch LPUE for 2009 is lacking).

1.12 Seasonal landings per unit effort in the EU C. Crangon fishing fleets

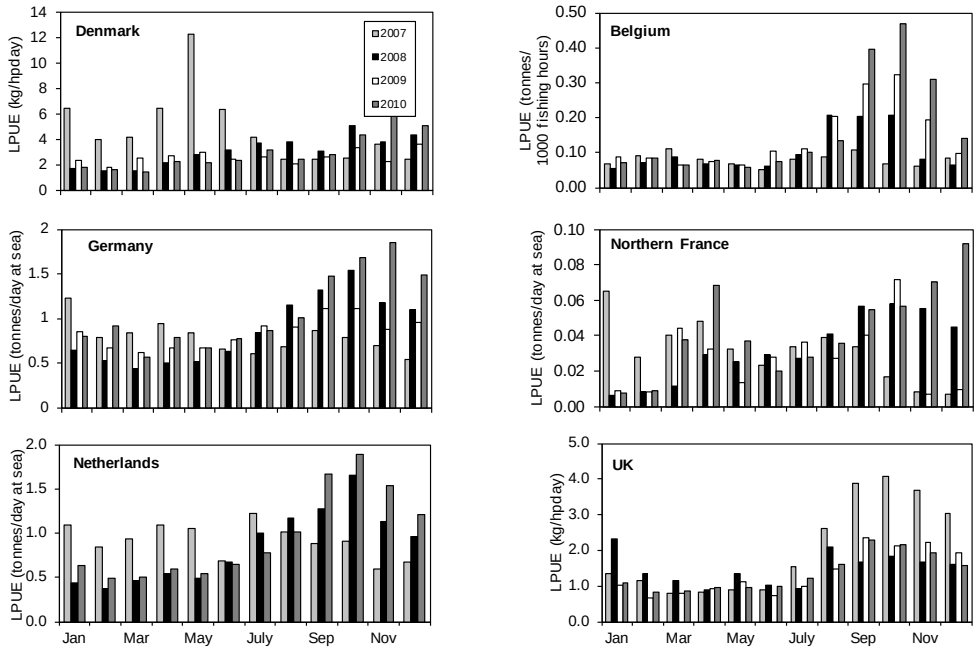

Figure 1.8. Seasonal landings per unit of effort in the EU fishing fleets. Note the different units for the different countries.

2 ToR b) Update VMS maps

No update on VMS maps was performed as not all national VMS data were updated.

3 ToR c) Proceed on issue of best models for biomass analyses

Since last meeting no progress was made on new or more advanced models for biomass analyses. Such developments in the near future are only foreseen in response to requests.

4 ToR d) Update on mortality

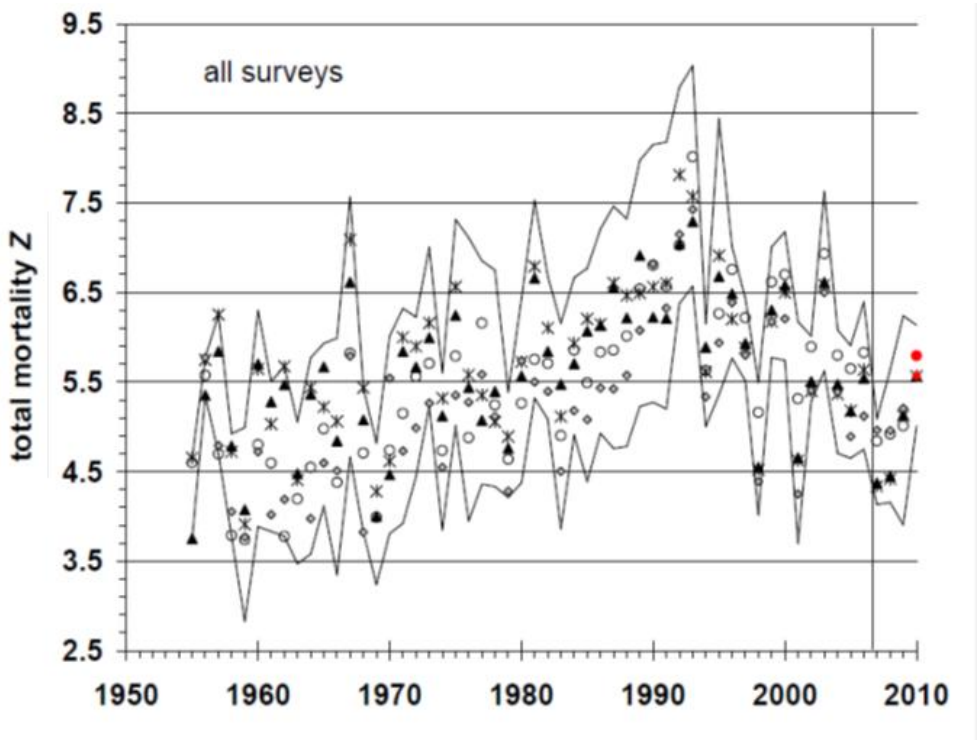

Figure 4.1. Update on total mortality (Hufnagl *et al.* 2010).

Total mortality values were calculated for 2010, revealing values between 5.6 and 5.9 [y^{-1}] for the Dutch survey data and between 4.8 and 5.5 [y^{-1}] for the German survey data, depending on the method applied. These levels indicate that the decreasing trend in total mortality since 1990 has been stopped and reversed in recent years (Figure 4.1). The corresponding L^{∞} values varied between 78 and 83mm.

5 ToR e) Review the report on electric beam trawl research

The report on electric beam trawl fisheries by Bart Verschueren is still not finished, due to a delay in field experiments. During the meeting the group was updated on the experiments with the electric beam trawl currently taking place in The Netherlands. During the meeting the group was updated on the experiments with the electric beam trawl (or Hoovercran) currently taking place in The Netherlands on board of the TX25.

One of the preliminary result of the field experiments was an increase of maximum of 50% of catch of commercial shrimp when the Hoovercran was combined with the bobbin rope. In the discussion following the presentation the following issues were raised:

- Given the increase of efficiency this gear (hoovercran in combination with the bobbin rope) should only be used under strict regulation of catches. Increased efficiency could be an advantage (in terms of less bycatch and bottom contact per kg of shrimp caught), but only when there is a limit in total catches per year (e.g. quota). Otherwise the catch is likely to increase.
- The preliminary results of the hoovercran in combination with the bobbin rope showed limited or no advantage in terms of less by-catch and less

bottom contact. There is a need for improvement. Next step is remove the bobbin rope or if necessary come up with an alternative. Depending on the fishing ground, type of sediment.

- Also, most probably the efficiency of the hoovercran device decreases without the use of bobbing rope (results from former experiments in Oostende). However within the current regulation the bobbin rope can be used in combination with the hoovercran. The system is meant to be an alternative for the use of the bobbins, because of a reduction of by-catch and bottom contact. However, if the gears are used in combination, the positive effects of the hoovercran on less bottom contact and bycatch will be less.
- And finally the question was raised whether fishers alter the gear themselves in such a way that efficiency is even increasing more. This needs to be taken into account during R&D of the gear.

6 ToR f) Review management plans suggested by fisheries with regard to the MSC process and discussion on the need of a management plan

6.1 Review management plan

The group evaluated the North Sea Brown Shrimp fishery Management plan for the shrimp fishery (version 10 February 2011). The latest version of the proposed management plan for Dutch Shrimp Fisheries is available on the website: www.crangon.nl. Amongst others the plan contains the following elements that were discussed in the Working Group.

6. MANAGEMENT OF FISHING EFFORT

6.2. Catch control rule

"The indicator for the status of the stock is Landings Per Unit Effort (LPUE). The LPUE is the landings in kilogrammes, including undersized shrimp, divided by the number of fishing hours."

Reaction of the WG:

The method for controlling catches is valid, however, a justification for the now set LPUE's is lacking. The WG proposes a more thorough study of (critical) LPUE's. In order to do so, the fishers should register their effort. Complete registration of catches is still lacking and a necessity for the implementation of this traffic light rule. To conclude: the proposed catch control rule can be implemented, an evaluation of the proposed LPUE's is however necessary. This could be done after several years. It also seems necessary to train the fishermen in proper and comparable data recording before the LPUE system can properly work.

Also in the German management plan a traffic light system is proposed. The set LPUE's are different. The WG concludes that in different areas densities of brown shrimp and thus LPUE limits can vary. However, also here a justification of the set LPUE's is lacking.

7. BYCATCH

7.2. Non-marketable, living organisms other than brown shrimp

"In order to reduce the bycatch volume of non-marketable, living organisms other than brown shrimp, the following measures are established. ….. "

Reaction of the WG:

The WG thinks that the proposed measures are not sufficient for the reduction of bycatch of juvenile flat-fish species. The sieve net is a proven measure for the reduction of bycatch in shrimp fisheries. However, juvenile fish species smaller than 10 cm are not effectively released by the sievenet (Catchpole *et al.* 2008). Therefore, additional measures (technical or other) for this group of juvenile fish are recommended.

9. HABITAT AND ECOSYSTEM

9.3. New fishing techniques

"When a participant would like to apply a new fishing technique that according to the CVO will lead to a greater degree of impact of habitat and ecosystem and/or to a higher bycatch level than existing techniques with a given number of fishing hours, he/she can only continue to participate in this management plan when the number of fishing hours is reduced to compensate for the impact on habitat, ecosystem and bycatch."

Reaction of the WG:

New fishing techniques should be extensively studied on the effect of (unwanted) bycatch and the effect on the bottom, habitat and ecosystem and monitored once in place. If the effect turns out to be adverse the technique should not be allowed according to the WG.

6.2 Reflection of discussion on the need of a management plan

Background: Shrimp fisheries are currently experiencing severe difficulties with the German, Danish and Dutch fleets striking for several weeks during the spring of 2011 because of extremely low prices offered by the producers. The industry perceives that Marine Stewardship Council (MSC) accreditation of the shrimp fisheries and the implementation of a prerequisite management plan will help. Proposals by the industry to cap fishing effort and landings are illegal according to the Dutch Competition Authority (NMA). In contrast, however, the Dutch NMA ignores the fact the two main buyers of shrimp act in concert to decrease the landing prices.

Independently of the price issue fishermen organisations in the Netherlands, Germany and Denmark have started an MSC audit process to get the MSC label. For this shrimp fisheries need to establish management plans, but all agreements on fishing effort or landings made in their proposed management plans are not acceptable to the Dutch Competition Authority (NMA).

WGCRAN was unanimous on the need for a management plan for the previously unregulated shrimp fisheries. The reasons for this are as follows:

- Shrimp fisheries takes place in ecologically important nursery areas, using highly unselective gear as mesh sizes are amongst the smallest used (20 mm cod end) in any fisheries.
- It is unlikely that under the new Common Fisheries Policy the current situation of no management will persist.
- Most of the fisheries occur within Natura2000 sites and internationally recognised nature areas such as the Wadden Sea.
- In addition the Dutch and German parts of the Wadden Sea have been assigned as a World Heritage Site by UNESCO in June 2009, and this should be acknowledged in the management plans.

Even if scientific evidence is lacking or insufficient, the precautionary approach should be adopted. Scientists should not bear the burden of proof for the sustainability of these fisheries and cooperation from the fishing industry is essential.

Below we shortly summarise the scientific evidence justifying a management plan and subsequently a first draft with possible routes towards an integrated management.

Is there a need for management? What scientific evidence is available?

Major issues in the shrimp fisheries that could be a cause for management are:

Stock: Until recently the general belief was that the brown shrimp stock could not be easily overfished and that natural mortality was significantly higher than fishing mortality (i.e. exploitation is low). This belief was based on the observation that after the absolute low of 1990 the stock rebuilt itself within one year thereafter (WGCRAN reports) and on the evaluation by (Welleman & Daan 2001) who quantified that the magnitude of the total annual shrimp landings amounted to 5 to 10% of the total mortality caused by cod and whiting. However gadoid stocks have since declined as demonstrated by the total annual landings which are much lower (ca. 5–10 000 tonnes, versus 16 000 tonnes). At the same time the total annual brown shrimp landings have increased from approx. 20 000 tonnes to 36 000 tonnes. If the gadoid stocks would rebuild, total natural mortality on brown shrimp would increase. It is thought that the stock-recruitment relationship for this species is particularly weak based partially on the observation that the lowest observed stock in 1990 was able to rebuild itself by the next year. If a very poor stock-recruit relationship is typical for brown shrimp fisheries the possibility of recruitment overfishing is reduced. It can, however, be quite misleading to contrast the total predation with the landings, since both figures refer to different size ranges of the species. While most of the predation refers to sizes below the commercial size of approximately 50 mm, the landings refer to shrimp above this size only. On the other hand quite a large component of the landings are sieved out (the 'crushed shrimp') at the time of landing (up to 40%). A modified estimate is required that addresses this aspect directly. Welleman & Daan (2001) based their conclusions on data from 1981 and 1991, the only years with available information on predator stomach contents. The high predation figures of other years were then calculated based on the assumption that both the consumption and the share of Crangon in the consumed food remain constant. Given the lack of more recent stomach content data the working group has discussed an alternative way to estimate the ratio of F/M, using independent information on the total mortality, the total commercial catch and a swept area biomass estimate. The swept area estimate requires a standardisation between Dutch and German data as well as a number for the gear efficiency. On both issues good progress was made during the WG and this sets the foundation for an application of a Crangon specific yield per recruit (Y/R) model, which was developed in the frame of a national German research program. Depending on the finally estimated F/M (fishing mortality/natural mortality) ration either a MSY strategy or the F0.1 approach can be applied to the Crangon stock. (The value of F0.1 equals the fishing mortality rate when the increase in yield per recruit from adding a single unit of effort is only 10 percent of the increase achieved by going from zero to one unit of effort).

Bycatch of undersized flatfish: Fish (especially flatfish), undersized shrimp and other benthos are taken by the gear. An overview of all discard studies is presented in (Doeksen 2006). In 1996 an European project (RESCUE) was carried out (van Marlen *et al.* 1998, van Marlen *et al.* 2001) during which bycatches were analysed in

the German, Belgian, UK and Danish fleet. Germany has a long tradition in bycatch data (since the 1950s), Neudecker and Damm 2010) which have been published in several studies (Tiews 1983, Berghahn & Purps 1998). In the UK several studies have been carried out and bycatch rates reported (Revill *et al.* 1999, Revill & Holst 2004). Since 2002 the use of sieve nets (a net with a mesh size of 5 to 6 cm fitted inside the shrimp trawls) to prevent larger fish from entering the cod end is mandatory under certain circumstances. This works well in reducing the bycatch of fish >10cm and invertebrates but not for fish <10 cm (Polet 2003, Catchpole *et al.* 2008). Since 2008 discard monitoring has become part of the Data Collection Framework (DCF EC no. 199/2008) and a discard program has been put in place in The Netherlands and Germany (ICES 2009, Tulp *et al.* 2010). At this point of the discussion WGCRAN did not sum up the different reported bycatch rates, however, in general bycatch rates of undersized Crangon and juvenile fish are quite variable although notably much higher in spring and summer (Neudecker & Müller 2011). This especially applies to those segments of the fleet that operate in the shallow coastal and estuarine areas which fulfil a nursery function, especially in the spring and summer seasons (and maybe less so to the fisheries around Sylt in winter. Fish bycatch in the shrimp fisheries has been estimated to reduce plaice, sole, cod and whiting spawning stock by 10%, 1%, 1% and 1% (Revill *et al.* 1999).

Effect on the bottom: A shrimp beam trawl has relatively light gear and is operated without tickler chains (different to the gear used in the flatfish fishery), exerting relatively low pressure on the sea bottom. In addition brown shrimp prefer to inhabit relatively mobile substrates which are prone to natural disturbance. Nevertheless, the passage of a beam trawl and the net may alter the topography and structure of the seabed by displacing sediment and potentially damaging biogenic and biological substrata, ultimately smoothing and flattening the seabed. In addition direct and indirect effects on benthic organisms could be expected. However, the number of studies actually measuring the effect of shrimp trawling on the bottom and benthos is limited, but Doeksen (2006) provides an overview. In essence there is no scientific based agreement on the effect of shrimp trawl on the bottom due to the fact that the few studies that have been carried out in the relevant habitat have looked at different time scales and different T-zero situations (not fished versus recently fished (Riesen & Reise 1982, Berghahn & Vorberg 1997)).

For both the discard rates as well as the bottom impact, any reduction in effort would directly translate into a reduction of the negative impacts. Therefore, a management strategy should target at the lowest fishing effort that still allows a profitable fishery.

Towards an integrated management of the shrimp fisheries

The working group discussed what options might provide an effective management plan. Accepting the given arguments as a justification for the need of a fishery management, in the view of WGCRAN there are three possible options:

1) Stock management:

In addition to last year's advice (ICES 2010) an additional possibility could be: as explained above, once the F/M ration is calculated, the Y/R model could be applied to explore the possible use of maximum sustainable yield (MSY) or F0.1 strategies. In any case the model can be used to estimate the likely loss of landings in relation to seasonal closures to minimise flatfish discards in summer. Likewise the model can address scenarios of increases in mesh sizes of cod ends and sorting devices to minimise the discard of the target species.

2) Food web based management:

This route has been successfully applied to shellfish fisheries management in The Netherlands, where a calculation is made of the ecological food requirements of shellfish eating birds, and this quantity is subtracted from the total stock, to arrive at the quantity available for fisheries. That amount is still difficult to quantify for brown shrimp. Shrimp are an important food source for many fish and other species, including those for which we have no information on e.g. population size or food requirements. To compare total shrimp consumption to the standing stock a reliable stock estimate is required, the calculation of which is prone to large uncertainties (high turnover, P/B ratio of 4–8). Potentially this could be a very useful route and this research topic could be one of the priority tasks on the list of WGCRAN's agenda.

3) Habitat:

Current information for effects of shrimp trawls on the habitat is scarce but these effects are also largely unexplored. However, given the protection status of the areas involved, this route might be an important one and deserves further exploration. We recommend that more study on the effect of shrimp fisheries on the bottom sea bed is carried out. New fishing techniques as e.g. electric beam trawls may be very useful in that direction. However, such new techniques might also increase the efficiency of the gear and this will lead to a higher fishing mortality at the same nominal effort levels. The effects of such efficiency changes should also become a research priority prior to the permission of such gear in the commercial fishery.

Suitable management should take into account the above mentioned routes, as they represent important components related to these fisheries. Previously requests for management advice have rarely been sent to WGCRAN which may change in near future due to current developments in the shrimp fishery.

7 ToR g) Review the assessments made by MSC certifiers

Since the last assessment report in June 2009 there has been no new assessment of the Dutch nor German shrimp fisheries. Therefore we did not carry out this ToR. A new full assessment of the Dutch shrimp fisheries has taken place in June 2011.

8 ToR h) Review recent *Crangon* related Research & Development activity

8.1 Reducing discards in shrimp fisheries with the letterbox.

During field experiments two different gear adjustments for reducing discards in brown shrimp fisheries were compared; the sievenet and the letterbox (Steenbergen *et al.* 2011). Sievenets are already used in the Netherlands since 2002 and are cone-shaped nets inserted into standard trawls, which direct unwanted by-catch to an escape hole in the body of the trawl. The letterbox is a new gear adjustment for reducing unwanted bycatch in shrimp. The letterbox consists of a release hole transversely over the net. Flatfish (mainly juvenile plaice) can escape through this release hole. A guiding panel is placed in the net to lead the fish to the release hole.

A total of 6 research trips were conducted in 2 different periods in 2010: 1) May/June and 2) September/October. During the trips the vessel was fishing with the sievenet at the starboard side and the letterbox at the portside of the ship. Data was collected on bycatch of fish and benthos, also landings of commercial shrimp per haul/ side

were recorded. In this way paired comparisons could be made between the letterbox and the sievenet. The following research questions were addressed:

- Is the letterbox is at least equally effective as a sievenet in reducing discards juvenile flatfish in shrimp fisheries?
- How does the letterbox perform compared to the sievenet with regard to by-catch of (round)fish and benthos?
- Is there a difference in landings of commercial shrimp between sievenet and letterbox?

The first period there was also a relative large loss of marketable shrimp, which needed to be solved. A small gear adjustment was successful: in the second period there was no significant difference in catches of commercial shrimp between the two gears. The letterbox performed well with regard to plaice bycatches; they were significantly less in the letterbox as compared with the sievenet. For the other by-catch species the results were variable; the letterbox was for some species at least equally effective as a sievenet in reducing several other discards, but for other species the letterbox was not as effective in reducing all discards.

We could conclude that the letterbox is at least equally effective as a sievenet in reducing discards of juvenile plaice. Also we have reasons to believe that the letterbox performs better than the sievenet in reducing discards of juvenile flatfish. However the effects of net modification and period are confounded, which made comparison of results between period 1 and 2 rather difficult. Therefore it was recommended to conduct another experiment in spring 2011 when high abundances of juvenile plaice are present, using the newest net design.

The letterbox can be a good alternative for the sievenet, especially in spring, when there is high abundance of juvenile plaice in the Wadden Sea. It should be taken into account, however, that the adjustment is not as effective as the sievenet for all species.

Reaction of the WG:

The WGCRAN sees this innovation as promising and agrees that the letterbox could possibly be an alternative for the sievenet. Especially in times and areas when there are many seaweeds around. However the group recommends more testing of the gear:

- Test the modified gear in spring;
- Test the gear on other vessels;
- Test the gear in different areas.

8.2 Biomass estimates and gear comparison

At the 2010 meeting of WGCRAN results were presented on annual Crangon biomass estimates. Data were obtained from Dutch and German DFS and DYFS long-term time series. The Dutch survey is routinely carried out with 6m-beamtrawls (BT6) in the areas outside the islands and with a 3m-beamtrawl (BT3) in the Wadden Sea, while the German survey is using a 3m-beamtrawl only. Results indicated that estimates of biomass from the BT6 survey were on average higher than from the German survey by a factor of 2 to 3, although all catches were standardized to 1000 m^2 swept area.

Furthermore, published results on distribution of Crangon densities showed higher Crangon densities in shallower waters where the German survey effort is concen-

trated. This would have led to the expectation that biomass estimates from German BT3 survey data should be higher than calculated.

A second analysis for the 2009 and 2010 German BT3 survey resulted in biomass values which were of the same order of magnitude as the Dutch BT6 estimates for the same years and area (see WGCRAN report 2010).

Two potential problems were identified and which were investigated further in the intersessional period:

i) differences in the two procedures how biomass was calculated;

ii) discrepancies arising from differences in gear type.

i) A thorough examination of the biomass estimation procedures used by Dutch and German colleagues revealed one major difference in the way how the data analysis was carried out. Differences in biomass estimates for 2009 and 2010 arose from different GIS shape files used for the extrapolation of biomass to depth strata. It turned out that the 0–5m depth strata used by Dutch scientists – and which is the officially adopted data set by WGBEAM – was much smaller in size than the GIS file used by German scientists. The definition of the 0-m depth contour is different ("mean sea level" versus "high tide mark"). This resulted in a larger depth stratum size for the German biomass estimate and consequently explains the higher Crangon biomass estimated from the 2009 and 2010 surveys.

ii) However this did not explain the differences between German BT3 and Dutch BT6 survey biomass results when using the same estimation process for the two long-term data sets. In this case an initiative was established for a net comparison between the BT3 and BT6. In August 2010 a commercial shrimp trawler was chartered for four days by the Institut für Seefischerei Hamburg and a direct comparison of the two types of gear was carried out in East Frisian waters. Sampling and data collection procedures were carried out according to DYFS standards. Beamtrawl catches were sorted and analyzed on board to the species level including fish. Due to technical difficulties and bad weather conditions only 15 valid stations could be sampled, 10 stations outside the islands in 6 to 15 m water depth and 5 stations on the inner side of the islands in 2 to 11 m depth.

First results indicated that standardized biomass density of Crangon in the BT6 was significantly higher than in the BT3 (Figure 8.1). Factors for biomass correction of BT3 were as follows:

All samples:	1.8
Samples from outside (= area 405):	3.3
Samples from inside (= area 414):	1.4

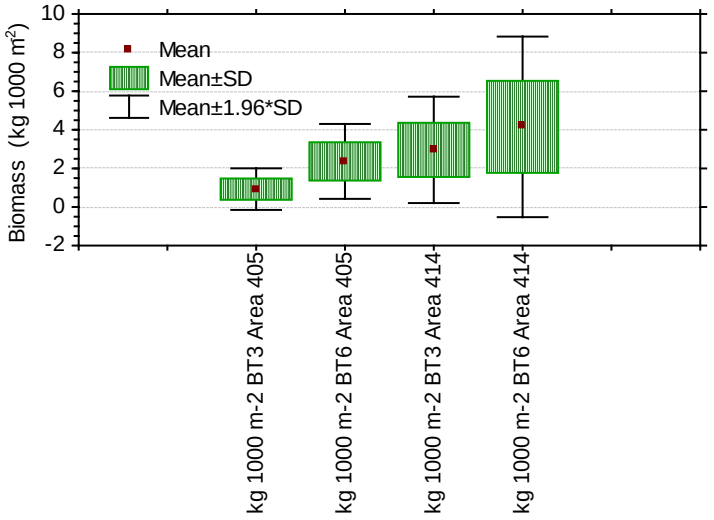

Figure 8.1. ***Crangon crangon*** **biomass densities (standardized to kg 1000 m^{-2}) for 6m- and 3m-beamtrawl samples in East Frisian waters during August 2010; Area 405 = outside the islands, area 414 = in the Wadden Sea).**

Analyses of Crangon length frequency distributions also resulted in significant differences between BT3 and BT6 (Figure 8.2). In the area outside the islands the difference in length composition was much more pronounced than in the Wadden Sea with higher overall densities as well as with a higher proportion of smaller shrimp in the BT6 trawl.

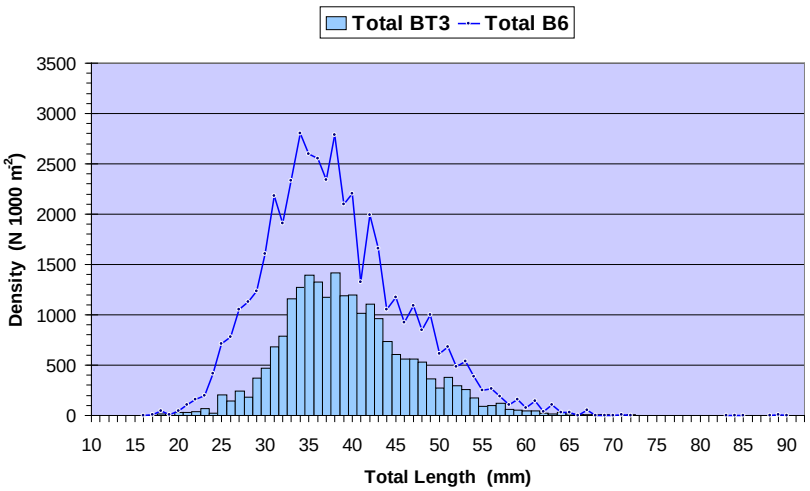

Figure 8.2. Comparison of ***Crangon crangon*** **length frequency distributions collected by BT3 and BT6.**

WGCRAN welcomed the German/Dutch initiative as a first step to standardize data and obtain better biomass estimates for the Crangon stock. Due to the relatively low number of valid stations sampled in 2010, WGCRAN recommended that another campaign should be carried out preferably in August 2011 to obtain a sufficient level of data for a robust estimate of the biomass correction factor for 3m/6m-beamtrawls. These data can also be analyzed for commercially exploited fish species and another gear comparison study was therefore formulated as an "additional request" to WGBEAM.

8.3 Distribution and abundance of brown shrimp (*Crangon crangon*) within the German Bight in winter 2011 (WCS)

Germany conducts a nationally coordinated and financed survey on the distribution and abundance of *C. crangon* annually in January and February named the Winter Shrimp Survey (WCS). That survey uses FRV "SOLEA", principally able to fish at all depths and regions of the North Sea with one or two 7.2-m beam trawls provided wind speeds do not exceed 7 to 8 Beaufort and waves do not exceed approx. 2 m in height. Winter conditions often exceed these conditions limiting fishing days and operational area.

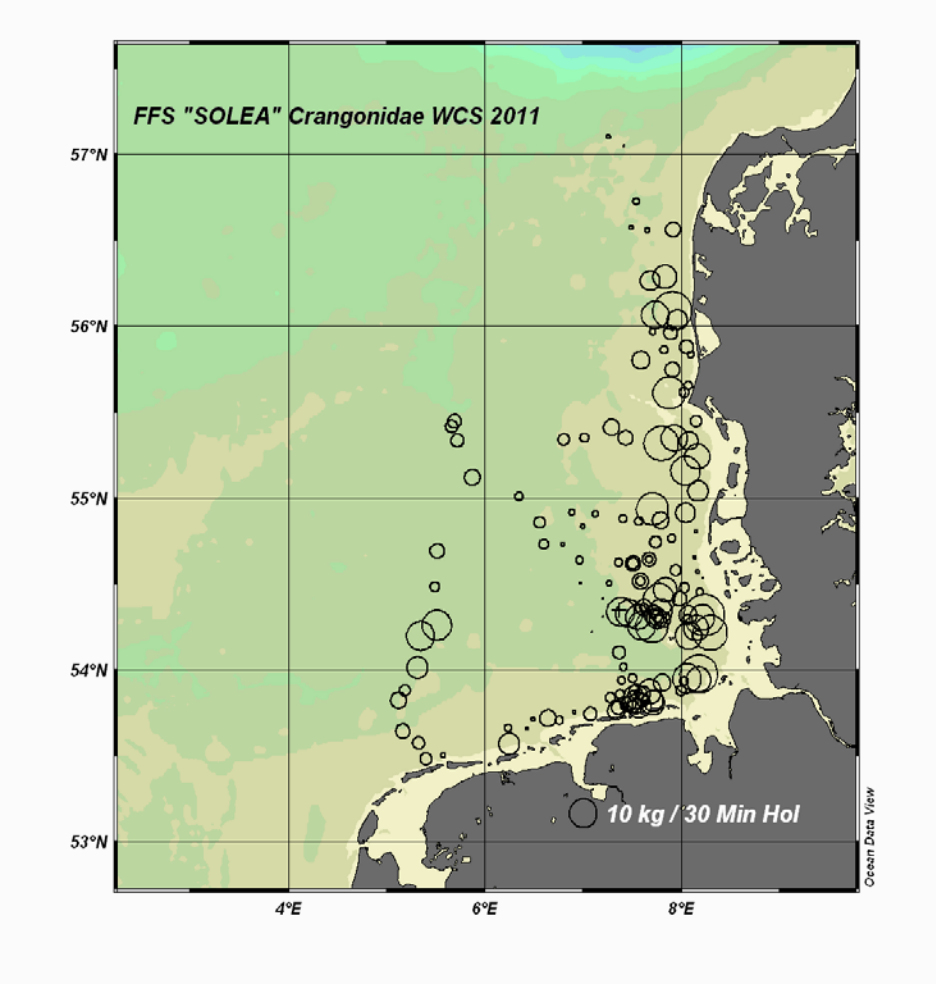

Figure 8.3. Densities of Crangon in the stations sampled in winter 2011.

As previous surveys had shown that Crangon is predominantly distributed along the coasts and not within the central North Sea the survey area was planned to be limited in January and February 2011 to a depth range between 8 to approx. 40 metres. In 2011 the survey consisted again of two parts, "SOLEA" cruises no. 632 and 633. The first survey was leading mainly along the coast of Germany while the second one started in Danish waters and further stations of the German Bight.

Due to low catches along the coast in cold water and comparatively higher ones than normal at the deeper stations, the fair weather situation allowed to add to the original plan stations in the outer German Bight north of the Netherlands in water down to 50m depth.

A total of 144 stations were fished between 04.01.2011 and 03.02.2011 giving a very good coverage of the area.

Figure 8.3 shows the positioning of the stations and the catch results in kg/30 minute hauls representing the abundance of crangonids, almost entirely *C. crangon*. Only in rare cases some *C. allmanni* were present in the more northern and deeper stations, hardly influencing the results.

Preliminary results i.e. observations from the 2011 survey are:

- Commercially fishable densities were found again in the Danish area west of Jutland after absence the year before.
- Active shrimpers were seen in the traditional AMRUM BANK winter fishery area.
- Water temperatures were about 2°C lower than in previous years with minus degrees in the near shore areas of the eastern German Bight.
- Extremely low catches were observed at these "cold water stations", which had given higher catches in previous years, resulting in the hypothesis that minus degrees may cause temperature related immobility in shrimp. That will be experimentally dealt with at the University of Hamburg as it might seriously affect biomass estimates.
- Contrary to earlier surveys brown shrimp were more spread out into the deeper and off shore waters.
- Some uncertainty of the winter distribution of *C. crangon* remains due to the lack of survey coverage towards the western Dutch coast and Channel region as weather conditions again hindered extending the survey to more westerly waters.

8.4 The problem of "crushed shrimp" in brown shrimp fishery

Along with consumption shrimp, brown shrimp fisheries also land some shrimp too small for human consumption which are sieved out on land and have to be degenerated ("crushed shrimp"). That share is recorded in German official statistics besides a third fraction called "industrial shrimp". In view of the MSC certification processes, sustainable fishing and the fishermen's voluntary obligation to - in future - limit the shares of "crushed shrimp", existing landing data from 2010 have been analysed. Depending on seasons the goal of less than 20% of "crushed shrimp" in German landings was not met in several months in 2010, especially in August, when more than 40% of the landings contained more than the proposed amount (Table 8.1). The processing procedures aboard the vessels were shortly discussed and the proposal is made to rather increase net selectivity than use wider sieves for the cooked fraction before landing. Cooking and processing small and later rejected shrimp is uneconomic. Reducing the share of "crushed shrimp" is therefore not only an ethical matter but also serves the idea of sustainable use of shrimp stocks as well as of sound economics.

Table 8.1. Listing of numbers of monthly landing records of German shrimpers, the number of records giving more than 20% of "crushed shrimp" and their share in the recorded landings in 2010.

month	n records	n records > 20% crushed shrimp	% of landings with >20% crushed shrimp
January	67	11	16.4
February	43	8	18.6
Mar	607	20	3.3
April	1790	15	0.8
May	1596	51	3.2
June	1849	38	2.1
July	1802	202	11.2
August	2000	836	41.8
September	1526	177	11.6
October	1630	38	2.3
November	1414	8	0.6
December	179	1	0.6
Year 2010	14503	1405	9.7

8.5 Update swept area estimate and trend analyses

The update of the Dutch biomass estimate based on data from the Dutch Demersal Fish Survey (DFS) was presented to the working group. The total stock abundance was estimated by the sum of the stratified arithmetic means of the catch weights (by 5 m depth strata) multiplied by the surface of each depth stratum for areas indicated in Figure 8.4. The catchability of the gear is assumed to equal 35% (ICES 2008). Missing values were estimated based using extrapolation using the program TRIM (TRends and Indices for Monitoring data).

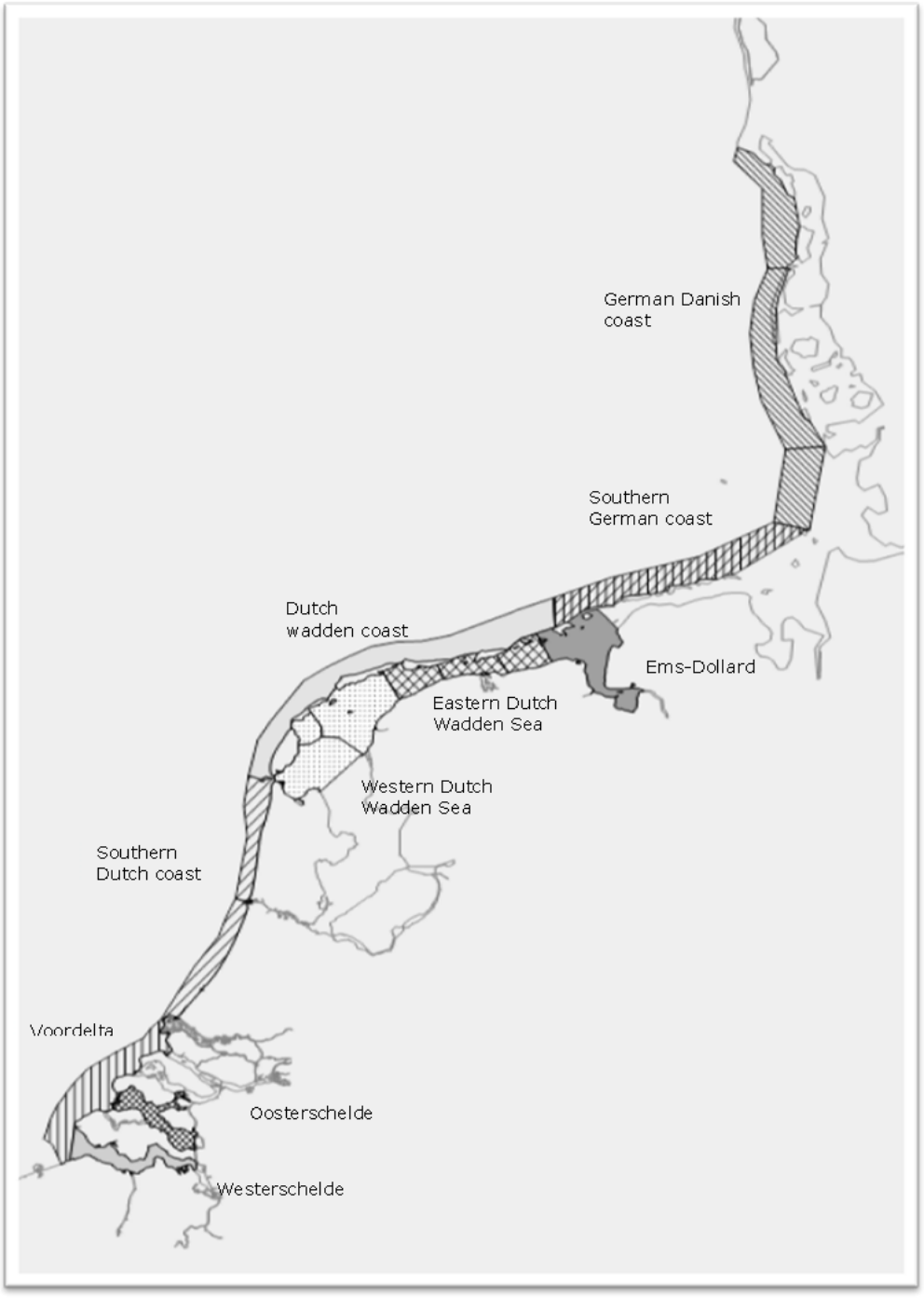

Figure 8.4. Areas included in swept area estimate (Dutch DFS data).

The swept area estimate resulted in total biomass similar to that in 2009 and slightly above the long-term average of 19 000 tonnes (commercial sizes, Figure 8.5).

Trend analysis using Trendspotter (Visser 2004) showed uncertain trends for most subareas, but a significant overall increase in the Western Dutch Wadden Sea as opposed to a significant decrease in the Eastern Dutch Wadden Sea (Figure 8.6, Tulp *et al.* in prep.). Periods of significant decrease were identified for the Wester- and Oosterschelde.

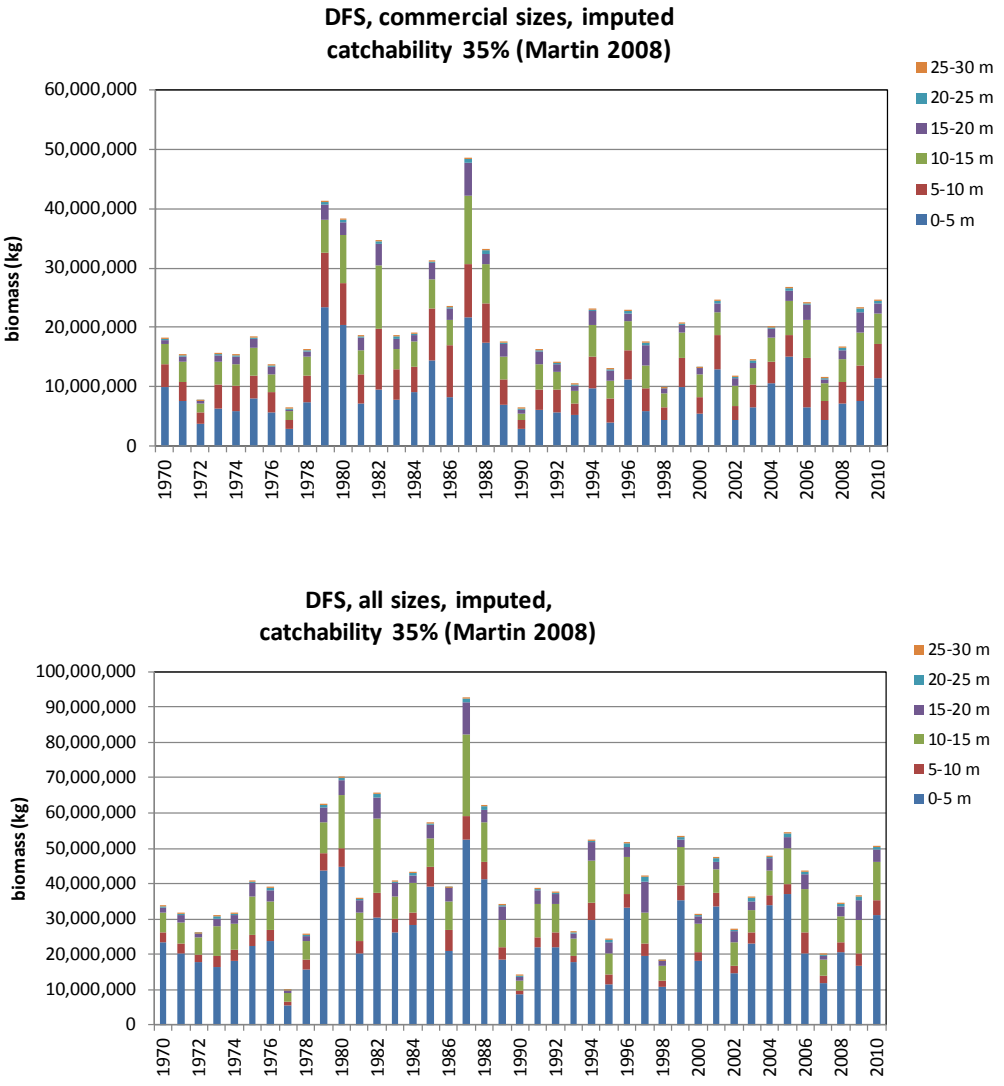

Figure 8.5. Swept area estimate for all size classes and size classes >54 mm. A catchability of 35% was used after Martin (2008) in (ICES 2008).

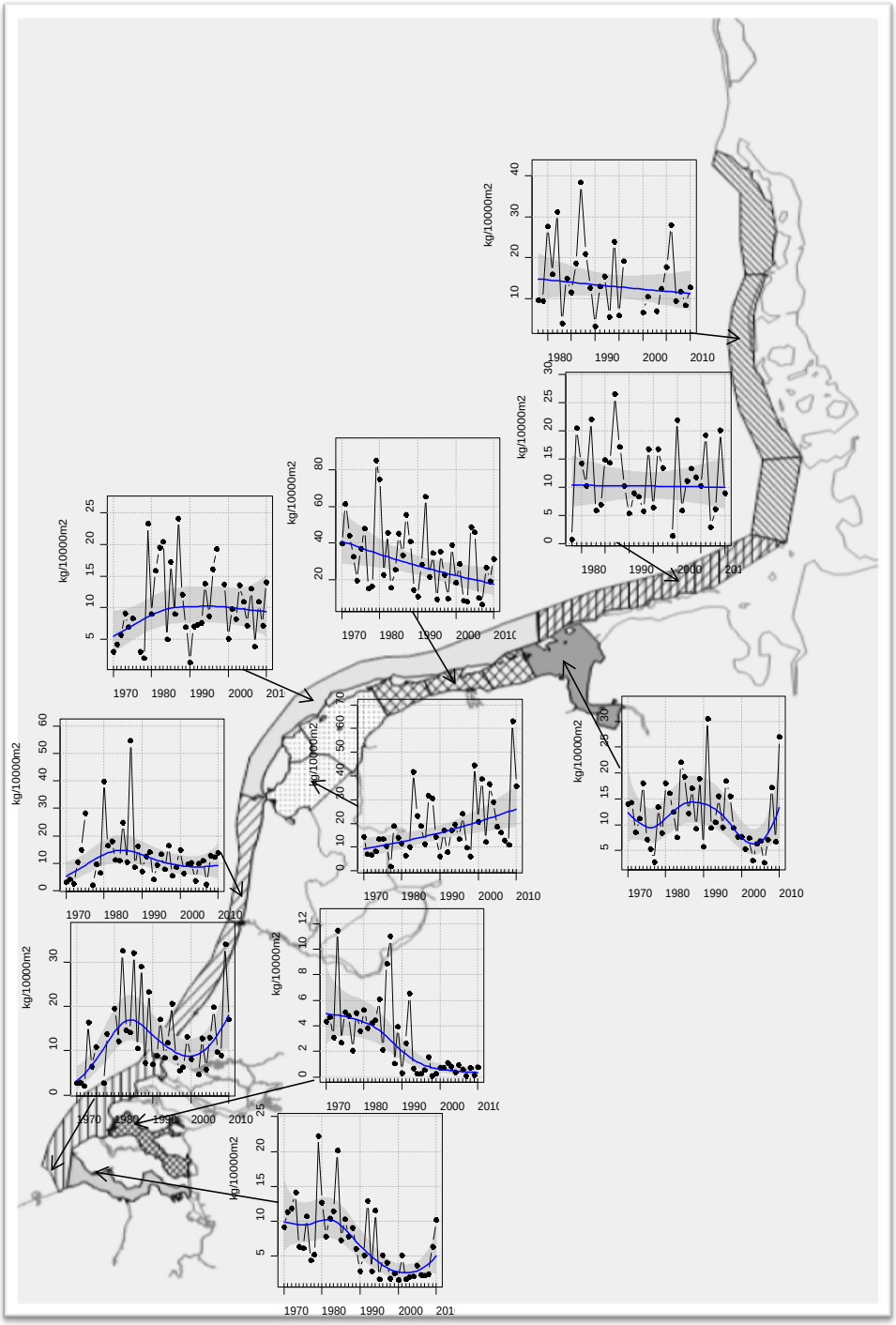

Figure 8.6. Trends of Crangon in the different subareas in late summer caught in the DFS survey.

8.6 Nuclear receptors in Crangon

The aim of this PhD study carried out by Ruben de Wilde is to characterise the nuclear receptor diversity present in Crangon. Nuclear receptors (NRs) are a class of transcription factors regulating many reproductive, developmental, and metabolic processes in eukaryotes. Usually they are controlled by small lipophilic molecules, such as steroidal hormones, retinoids, and free fatty acids, even though many have no confirmed ligand ('orphan' receptors). Basically, these receptors enable a feedback loop of the organism's status with environmental and nutritional parameters, allowing for the dynamic adjustment of various physiological processes in response.

Future applications include an assessment of the NR expression profile to deduct the animal's health status (from field samples or even from aquaculture) and the influence of various pollutants (ecotoxicology).

To allow for a reproducible and reliable production of all developmental stages, the Crangon lifecycle will be closed under laboratory conditions, this in cooperation with Dr. K. Anger and Ángel Urzúa (Biological Institute Helgoland, Germany).

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9 ToR i) Identify elements of the EGs work that may help determine status for the 11 Descriptors set out in the Commission Decision and provide views on what good environmental status (GES) might be for those descriptors, including methods that could be used to determine status

This topic belongs to the additional Terms of References requested by the Marine Strategy Directive Framework Steering Group (MSFDSG).

Descriptor 1: Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climate conditions.

The surveys record the species composition and epibenthos. This could contribute to the monitoring of the biodiversity (community).

Descriptor 2: Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystem.

Due to the biodiversity monitoring those effects would be detected.

Descriptor 3: Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock.

In order to qualify the state of the *Crangon Crangon* stock, the size distribution is monitored. It would also be recommendable to examine the share of eggbearing females (per size class) preferably in winter and spring. The status of the fishery will be assessed using a Y/R simulation model that was specifically developed for the *C.Crangon* fishery. This new tool will be used to explore the potential of the MSY and F0.1 concepts. Alternatively the potential of seasonal effort reductions to maximise the reproductive out will be investigated.

Descriptor 4: All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity.

Survey data provide information on the diversity of the species. Those data can be used by WGBIODIV. Using those data spatial and temporal patterns in the distribution of the shrimps can be analysed and trends could be detected. From the commer-

cial fishery VMS data are available. From those LPUEs are calculated. A trend within the LPUEs might also give evidence for changes in the shrimps' abundance.

To specify the role of the shrimps within the food web an intensified examination of stomach analyses is aspired. Due to a modelling approach, conclusions on a population level might be deduced from the stomach analyses. The abundance of shrimps in space and time is monitored by surveys. From the fisheries activities LPUEs are calculated.

Descriptor 5: Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algal blooms and oxygen deficiency in bottom waters.

This descriptor is not applicable for WGCRAN.

Descriptor 6: Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.

As shrimp-fishes' activities are monitored due to VMS data, the quantity of the disturbance of the Sea-floor can be approximated by the analysis of those data. Additionally WGCRAN may contribute strategies to minimize the impacts on the Sea-floor.

Descriptor 7: Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems.

This descriptor is not applicable for WGCRAN.

Descriptor 8: Concentrations of contaminants are at levels not giving rise to pollution effects.

Working on contaminants is not the part of the core business of the WGCRAN. Though scientists of the working are currently working on contaminants WGCRAN cannot guarantee any everlasting contributions.

Descriptor 9: Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards.

This descriptor is not applicable for WGCRAN.

Descriptor 10: Properties and quantities of marine litter do not cause harm to the coastal and marine environment.

This descriptor is not applicable for WGCRAN.

Descriptor 11: Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.

This descriptor is not applicable for WGCRAN.

10 ToR j) Provide information that could be used in setting pressure indicators that would complement biodiversity indicators currently being developed by the Strategic Initiative on Biodiversity Advice and Science (SIBAS) and identify spatially resolved data, for e.g. spawning grounds, fishery activity, habitats, etc.

Additional Terms of References requested by the Strategic Initiative on Area Based Science and Management (SIASM):

> Take note of and comment on the Report of the Workshop on the Science for area-based management: Coastal and Marine Spatial Planning in Practice (WKCMSP).
>
> Provide information that could be used in setting pressure indicators that would complement biodiversity indicators currently being developed by the Strategic Initiative on Biodiversity Advice and Science (SIBAS). Particular consideration should be given to assessing the impacts of very large renewable energy plans with a view to identifying/predicting potentially catastrophic outcomes.
>
> Identify spatially resolved data, for e.g. spawning grounds, fishery activity, habitats, etc.

Due to large renewable energy plans no catastrophic effects are expected for shrimps. Spatially resolved data on the distribution of shrimps are available by various surveys. The fisheries activities can be approximated using the VMS data. Additionally spawning ground maps could be provided.

11 GAPs in knowledge and future work

During the week the group has identified several gaps in knowledge that needs attention in the coming years:

Study of sievage percentages in Germany:

- Percentages of auction-sievages in other member-countries besides Germany;
- Loss of shrimp after second sieving on board (after cooking);
- Study square messes for selectivity of small shrimp under water.

Compare DFS surveys in Netherlands and Germany: exercise on net-comparison of 3m and 6m beam trawl.

- Repeat the exercise in Dutch waters with possibly another vessel (make an additional request to WGBEAM)

Draw the potential for the Y/R simulation model to use it for MSY management in Shrimp fisheries.

- New biomass estimates per DFS defined area with DFS data (swept area estimate);
- Estimate the mean biomass over the year (use model);
- Investigate gear selectivity of DFS gear.

Gear selectivity projects:

- Performance of the hovercran without the bobbin rope, or an alternative of the bobbin rope;
- Performance of the newest model of the letterbox gear in spring.

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Annex 2: Agenda

Monday 16 May		arrival of participants	
Tuesday 17 May	09:30	Ingrid Tulp	opening, agenda and Terms of reference
		landings and effort	
	10:00	Ingrid Tulp	Update swept area estimate & trends
	10:30	Thomas Neudecker	Winter Crangon survey, DYFS 2010
	11:00	*coffee break*	
	11:00	Thomas Neudecker	crushed shrimp, EP study, case study Ems
	12:00	Bart Verschueren	fresh from the field experiments with electric beam trawl on board the TX25 consequences of further distribution of the HOVERCRAN in the shrimp fleet
	12:30-13:30	*lunch*	
		fleet related subjects	
	13:30	Volker Siegel	net comparison between 3 and 6 m beamtrawl
	14:00	Josien Steenbergen	bycatch results
	15:00	*tea break*	
Wednesday 18 May		**Research and development**	
	09:00	Axel Temming & Marc Hufnagl	connectivity of regions through larval drift and STST of adults
	10:15	*coffee break*	
	10:45	Axel Temming & Marc Hufnagl	progress work at the university of Hamburg (Zaki, Stefen and Students); Z-updates from Marc
	11:30	Ruben De Wilde	nucleair receptors of brown shrimp
	12:00	Josien Steenbergen	update MSC process
	12:30-13:30	*lunch*	
	13:30-14:00	Ingrid Tulp	update landings and effort
	14:30-16:00	discussion	towards management for shrimp fisheries
	16:00-17:00	Ingrid Tulp	Ongoing work in the Netherlands: effects of shrimp fisheries on bottom ecosystem

Thursday 19 May	09:00	writing report	extra terms of reference
	10:30	*coffee break*	
	12:30-13:30	*lunch*	
	13:30	meeting 2012	terms of reference recommendations new chair location 2012
	17:00	closure of meeting	

Annex 3: WGCRAN Terms of Reference for the 2011 meeting

a) Update landing and effort. Make an effort to improve the data (from hp-days to hours at sea or fishing hours). Standardise the landings (every country should report landings from their nation vessels into own harbours but also into foreign harbours.
b) Update VMS maps and quantify patterns and differences between seasons, years and countries (include BE and UK, FR)
c) Proceed on issue of best models for biomass analyses (including swept area estimate). Contrast models: biomass vs Y/R models or other suitable models
d) Update on mortality
e) Review the report on electric beam trawl research by Bart Verschueren;
f) Review management plans suggested by fisheries with regard to the MSC process
g) Review the assessments made by MSC certifiers
h) Review recent *Crangon* related Research & Development activity

Additional Terms of References requested by the Marine Strategy Directive Framework Steering Group (MSFDSG):

i) Identify elements of the EGs work that may help determine status for the 11 Descriptors set out in the Commission Decision. Provide views on what good environmental status (GES) might be for those descriptors, including methods that could be used to determine status.

Additional Terms of References requested by the Strategic Initiative on Area Based Science and Management (SIASM):

j) Take note of and comment on the Report of the Workshop on the Science for area-based management: Coastal and Marine Spatial Planning in Practice (WKCMSP). Provide information that could be used in setting pressure indicators that would complement biodiversity indicators currently being developed by the Strategic Initiative on Biodiversity Advice and Science (SIBAS). Particular consideration should be given to assessing the impacts of very large renewable energy plans with a view to identifying/predicting potentially catastrophic outcomes. Identify spatially resolved data, for e.g. spawning grounds, fishery activity, habitats, etc.

Annex 4: WGCRAN draft resolution for the 2012 meeting

The **Working Group on Crangon fisheries and life history** (WGCRAN), chaired by Marc Hufnagl, Germany, will meet in Porto, Portugal, 5–7 June 2012 to:

a) Update landings and effort (effort expressed both in days at sea, hours at sea);

b) Update VMS;

c) Update mortality;

d) Review electric beam trawl study and/or other gear selectivity studies;

e) Review assessments by MSC certifier;

f) Review and feedback on developments in shrimp management;

g) Overview of new national bycatch/discards data from DCR;

i. Fish

ii. not officially marketed shrimp (all fractions)

h) Aim for a common publication on biomass estimate;

i. Estimate adult/juvenile biomass

ii. Characterisation of population

i) Review recent Crangon related Research & Development activity.

WGCRAN will report by 1 August 2012 (via SSGEF) for the attention of SCICOM.

Supporting Information

Priority	Crangon fisheries are economically important with landings value that rank this species in the top three species caught from te North Sea. The Crangon fisheries is currently in the MSC process and requires information from the working group
Scientific justification	Justification for the ToRs is as follows: Despite the economic importance and regional dependencies of this species, we still have much to learn and understand on the natural history of this species, particularly in respect of its ecology, stock dynamics, distribution etc. We (WGCRAN) know much more about the fishery itself, how much is caught, who catches it, where and when etc. Such information, has limited utility however, and ICES will continue to have a retarded capacity to produce soundeffective management advice in relation to these fisheries, if we use such information in isolation. For the production of more robust and flexible managerial advice, which is currently becoming quite urgent in view of recent developments in the shrimp fisheries, we need to combine our current knowledge of fisheries landings, effort and fishing activity with a good supportive biological understanding of the Crangon stocks and their ecological interacions. Substantial progress has been made in the development of an integrated Crangon biomass estimate and combining survey data from different countries. Now the time is ripe to publish this. Further modifications to the trawl design and catching process may offer one

	way to reduce discarding, in particular through the development of the electric shrimp beam trawl design. A comprehensive series of sea trials using this method has determined its usefulness in reducing discards. The biology and behaviour of Crangon does not lend itself to conventional stock assessment techniques therefore other methods are required. Ongoing effort to investigate the application of models to arrive at a proper stock management is needed. An update on the mortality of Crangon is useful in this respect. The MSC process is still ongoing and the group thought it would be useful that the assessments made by MSC certifiers are reviewed by WGCRAN. It was also agreed that in addition to the landings, effort and number of active vessels, each Member State would provide VMS data from C. crangon vessels in order to identify areas affected by the fishery and spatial patterns in fishing activity. Such maps have been compiled for NL, GE and DK, but need to be updated and complemented with other member states.
Resource requirements	The research programmes which provide the main input to this group are already underway, and resources are already committed. There will be additional resource required to undertake additional activities in the framework of this group will if governments will ask questions regarding the management of the stock.
Participants	The Group is normally attended by some 10 members and guests.
Secretariat facilities	None.
Financial	No financial implications.
Linkages to advisory committees	
Linkages to other committees or groups	There is linkage to the WGBEAM
Linkages to other organizations	CWSS = Common Wadden Sea Secretariat; TMAP = Trilateral Monitoring and Assessment Programme; RCM –NSEA

Annex 5: Recommendations

RECOMMENDATION	ADRESSED TO
1. An international DFS manual should be written.	WGBEAM
2. Additional hauls for gear comparisons between 3 and 6m beam trawls with and without tickler chain are needed.	WGBEAM