

WWF Advice to inform a long term management plan for shrimp (*Crangon crangon*) fishery in the North Sea, along the coast of Belgium, the Netherlands, Germany and Denmark

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Purpose and context of WWF advice

This document and its content is meant to serve as an advice to the Dutch, Belgian, German and Danish shrimp fisheries, as organized in Coöperatieve Visserij Organisatie (CVO), to inform the shrimp fishery management plan that is being drafted in the Summer of 2015. It reflects the components that WWF would like to see incorporated in an ecosystem-based longterm fisheries management plan. Considering the short time-frame within which this advice was drafted, additional insights and advice may follow, and this document is to serve as a first and more general input into the management plan.

The Dutch North sea shrimp fishery has been trying to achieve MSC certification since 2006 but for various reasons – among which the absence of a management plan, harvest control rule, and non-compliance with the protection goals valid for large parts of the area fished - have not been successful. WWF has now (July 2015) been informed that the Dutch, German and Danish North sea shrimp fisheries (referred to as 'joint shrimp fisheries') have joined forces and will re-enter MSC full assessment together in the second half of 2015. The joint shrimp fisheries are going to apply for certification based on the new MSC standard 2.0. The approximately full fleet needs to join (90%) since there is no quota set for the fishery. A German consultant is preparing a management plan for the shrimp fishery in the summer of 2015, as this is a key requirement for the fishery to enter MSC full assessment.

WWF Netherlands has been asked to provide input for the project- and management plan for the Northsea shrimp fishery; key requirements, components and concerns that need to be addressed; both in general as part of any sustainable fisheries management plan and specific to the shrimp fishery.

This WWF input is sent to the joint fisheries on behalf of WWF Netherlands, WWF Germany, WWF Denmark and WWF Belgium.

1. Sustainable (shrimp) fisheries management

What constitutes a sustainable fisheries and a sustainable fisheries management plan? WWF advocates for fisheries management plans that are long term and ecosystem-based. WWF has published a number of key documents to guide the development of sustainable (long-term) ecosystem-based fisheries management plans. These documents provide clear guidance, a stepwise approach and clear examples to implementing long term ecosystem-based fisheries management. We highly recommend that these are consulted for the development of a management plan for North Sea brown shrimp fisheries.



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- Landman, J., McLachlan, H. 2009. 2012 Common Fisheries Policy Reform Long Term Management Plans and Regionalisation of EU Fisheries <u>http://wwf.panda.org/what_we_do/how_we_work/policy/wwf_europe_environment/initiat</u> <u>ives/fisheries/publications/?179101/2012-Common-Fisheries-Policy-Reform-Long-Term-</u> Management-Plans-and-Regionalisation-of-EU-Fisheries

A fourth key resource document is more specific to implementing sustainable shrimp fisheries. It is a journal article that culminated from research on tropical shrimp fisheries worldwide initiated and funded by WWF. This article provides a blueprint to a sustainable shrimp fishery.

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Tropical shrimp trawling: Developing a management blueprint and adapting and implementing it in specific countries and fisheries

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ARTICLE INFO ABSTRACT

A B S T R A C T Around 1.3 million tonnes of tropical shrimp are caught annually throughout the world, primarily using bottom travk. There are many concerns about the sustainability of these catches and the ecosystems impacts of tropical shrimp travel fisheries. This paper describes ageneric tropical shrimp travel blueprint fisheries and consideration of best practice in fisheries management. The generic blueprint is intended country-specific needs, and to result in courty-or fisheries-specific shrimp travel management plans. This process of adaptation has already taken place in Suriname. India, Malaysia, and Indonesia. Work in these four countries has affirmed the usefulness of the contents and structure of the generic blueprint, as well as the importance of country-specific adaptations. The adaptation workshop, a their completion, and post-workshop activities. Of particular note is that long-term improvements in sustainability are critically deependent on effective and concerted follow-up after the adaptation workshops, their completion, into other national and project planning frameworks and developments. e 2013 Elsevier Ltd. All rights reserved. Article history: Received 1 October 2012 Received in revised form 18 December 2012 revised 15. rr 2012 2 December 2012 rd 18

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1. Introduction
Around 1.3 million tonnes of tropical shrimp are caught annually throughout the world¹, primarily using bottom travis. Countries in the South East Asian and Australian region account for 46 per cered of the total annual tropical shrimp catch, with Indonesia and Vietnam accounting for 57 per cent of this region's voltal. The Indian sub-continer (India, Pakistan and Bangladesh) accounts for 30 per cent of the total actach, with india accounting for 54 per cent of this region's total. The America (All countries in North, Central, and South America) account for 16 per cent of the total catch, and the stand East Africa and the Middle East for Annual 420,000 repical in himp travlers from 65 countries generate employment for around 900,000 fishers. Industrial travelers over 18 m in length dominate the fleets in Africa and the Middle East, semi-industrial 12-20 m vesels tend to predominate in the Indian sub-continent and in the Americas, while smaller-scale travelers of around 8-12 m are more common in the

South East Aeian region. In addition, there are hundreds of thousands of coastal fishers around the world using a variety of gears, e.g., small travits, trammel nets, bag nets and seines, but antial actor catches represent less than 5 per cent of global annual actores. Both the sustainability of catches and eco-systems impacts of tropical shrimp trawf fisheries, WWF commis-sioned Poseidon Aquatic Resource Management Limited (fisheries consultaris?) to (1) identify and understand the critical problems found in tropical shrimp trawf fisheries and their causes, and (1i) create, based on examples of best practice and potential solutions, a blueprint which can be used to support a transition of tropical shrimp trawf fisheries to more sustainable practices. The blue-print [2] is generic and applicable to all tropical shrimp trawf fisheries, and the intention is for stakeholders to review it, and to amend and adapt it to meet the specific needs and conditions in a particular county or shrimg fishery. This process of 'adaptation' has been completed in Suriname, India, Malaysia and Indonesia during 2011 and 2012. This paper describes the development of the tropical shrimp trawf blueprint and its generic structure and content, and the

² www.consult-poseidon.com

4. Macfadyen, G., Banks, R., Davies, R. 2013. Tropical shrimp trawling: Developing a management blueprint and adapting and implementing it in specific countries and fisheries. Marine Policy 40:25-33

The research by Macfadyen et al (2013) describes a number of benchmarking findings which are also applicable to cold water shrimp fisheries.

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Table 2

Sustainability of the target stock	Impact of tropical shrimp trawl fisheries on the ecosystem
enchmarking findings.	

- Many stocks are in decline
- Harvest Control Rules (HCR) are often not appropriately designed or poorly linked to stock assessment
- Poor information monitoring is typical
- A precautionary approach is often lacking

Governance and policy performance

- Governance is generally characterised by
- Poor governance, centralized management with weak decentralized structures, and poor stakeholder interaction
- Limited enforcement and compliance
- Lack of effort control and technological progress leading to increases in real effort
- Open access regimes leading to overcapacity

- The ecosystem based approach (EAF) to fisheries management is not in wide use
- There is an increase in reliance on bycatch, leading to multi-taxa fishing
- There is typically poor application of technical measures e.g., bycatch reduction devices (BRDs)
- There is often poor information monitoring

Economic and social framework

- Subsidies are artificially supporting fleets and leading to overcapacity in many countries
 Falling market prices and Catch Per Unit Effort (CPUE), coupled with rising fuel costs, are leading to reduced profits, wages and employment
- The poor financial positionin many fleets is leading to bad practices in crew behaviour e.g., reduced selectivity, and a reduction in investment with crew safety implications
- Many fisheries would like to engage with certification (with resulting market benefits) but are unable to do so

These benchmarking findings were used to develop a blueprint for a sustainable shrimp fishery, which in turn can be used to define a set of management guidelines. A blueprint for sustainable shrimp fishery is structured around four results:

- To create a management framework which ensures the setting of appropriate harvest control rules and implementation of marine protected areas, fisheries closures and other spatial measures that support the sustainability of the target species and supporting ecosystems;
- 2. To provide a system of strong compliance and facilitate industry participation in all aspects of decision making;
- 3. To facilitate development of positive business drivers linked to improved fishing practices and market incentives;
- 4. To create a monitoring and evaluation framework to assess results of blueprint implementation (Macfadyen et al., 2013).

Although this research is based on tropical shrimp fisheries, several of the findings, concerns and guidelines can also apply to cold water shrimp fisheries. WWF hence refers to the blueprint by Macfadyen et al. (2013) for advice on specific activities and outputs that support these four results.

Due to time and resource limitations (including the request being within the holiday period), WWF focuses its input to CVO for now and in this document mainly on

• To create a management framework which ensures the setting of appropriate harvest control rules that support the sustainability of the target species and supporting ecosystems;

However, WWF also considers the inclusion of other issues, particular ecosystem effects (as described in the last chapter of this document) as central to the certification process and the development of a management plan.

Overall, WWF recommends the shrimp fishery improves fishing practices that contribute to a sustainable, long term and ecosystem-based management plan that is viable from an ecological,

economic and social perspective. This should in particular include practices that are in line with the protection of habitats and conservation needs of the protected areas where presently a large proportion of the brown shrimp fishery takes place, as well as bycatch and discard levels of non-target species.

WWF highly recommends investing in a workshop (for example as described by Macfadyen et al. 2013) lead by an international expert, where key stakeholders give input to the management plan of North Sea shrimp fishery including the more specific aspects of this and of the area where it takes place, thus leading to a coherent and complete shrimp fisheries management plan. It should be considered to involve the entire brown shrimp fishery (not just the Dutch) in this workshop. WWF offers to participate in the workshop as a key stakeholder representing conservation interests.

2. General shrimp fisheries management plan requirements

According to the FAO (Gillett 2008), most shrimp fisheries -cold and tropical- throughout the world face similar problems. The stocks are fully exploited, with little opportunity of increasing total catches. Fishing effort continues to increase, giving rise to serious economic or social problems even when the stocks themselves may be in no danger. The FAO report discusses the issues encountered in a number of countries that are reflective of the whole array of issues characterizing fisheries management today: overfishing, including ecosystem overfishing, a situation widespread in shrimp fisheries, which occurs when the species composition and dominance are significantly modified by fishing, with reductions of large, long-lived, demersal predators and increases of small, short-lived species at lower trophic levels; open access; effort creep; fishing capacity control; low economic returns; insufficient research and management aggravated by low compliance; unsustainable management costs; bycatch reduction and other multispecies concerns; and conflicts between smalland large-scale fisheries for shrimp. In addition, the conflict between national and foreign fleets; conflicts with aquaculture; and the impact of pollution and other coastal developments on shrimp production, particularly in heavily urbanized estuaries and deltas. A number of lessons learned from the shrimp fisheries management in various regions throughout the world can be found in Chapter 12 'Management of shrimp fisheries' in Gillett (2008).

To address these issues, an ecosystem-based and longterm management plan is vital for any fishery that is seeking both ecological and financial sustainability. The key components of such a management plan are described by the Shrimp Fisheries Blueprint (Macfadyen et al., 2013) and printed below.

Objective and outcomes	Outputs	Activities	Objective verifiable indicators ^a
Objective: To ensure shrimp resources are ma communities	naged in a sustainable eo	cosystem-based manner, to ensure the long-term	sustainable livelihoods of fishers and fishing
 To create a management framework which ensures the setting of appropriate Harvest Control Rules (HCRs) that support the sustainability of the target species and make adequate provision for safeguarding the supporting ecosystems 	1a. Governance system strengthened	 Strengthen governance policy objectives by giving priority to sustainability and the ecosystem approach to fisheries management Create a fishery-specific Management Advisory Council (MAC) with clearly defined roles Strengthen the capacity of the fisheries administration to service the MAC Establish community fisher organizations to provide input into the MAC Determine the annual real costs of management, research, and compliance for the fishery Prepare fishery Management Plan 	 Fisheries Acts amended to incorporate ecosystems-based approaches Legislation adjusted to confirm the independence, powers, and duties of the MAC Fishery managers and MAC participants provided with training on MAC functionality and service delivery Community organizations strengthened for small-scale travul and artisanal fisher groups Long-term financial support systems established Annual budget efficiency exercises undertaken and approved Management Plan prepared
	1b. Shrimp biomass exploited at sustainable levels	 Prepare a research plan to generate inputs necessary for the fishery Management Plan Develop regional centres of excellence for stock assessment and gear technology Strengthen stock assessment models to ensure consistency and implementation of scientifically acceptable standards (0.5–0.6 B_{Attry}) Collect fishery-dependent information through landing records (sex and size) Collect appropriate data to aid assessment Agree on a set of measures that can support the restructuring of the fishery. These will include: Removing redundant licences Industry buy-back Setting input and output management measures: Total Allowable Catches (TACs), gear Statutory Fishing Rights (SFRs), supported by a Rights Based Management system. Establish input management restrictions which incorporate provision for scientific advice into the stakeholder orientated decision making process. This will include: The setting of Target and Limit Reference points Determining the appropriate input and output limits (quotas, effort or gear) Determining temporal and permanent closed areas Developing demarcation zones for specific fisheries Formulating or revision of technical measures: Minimum mesh sizes >45 mm Minimum size limits for shrimp and other retained species interactions On-deck hoppers to reduce mortalities for discarded crustaceans and finfish (which may be required by law) Transition of artisanal fishing methods to alternative selective fisheries 	 Research plan prepared with funding provided from each MAC Regional centre of excellence confirmed with agreed MoUs with national research organizations and the MAC Stock assessment parameters established and adjusted for regionally specific fishery characteristics Environmental risk assessment parameters established for bycatch species Common data collection systems agreed and established Activities specified in Management Plans TST capacity adjustment strategy agreed with government Financial support for buy-back secured Legislation in place to confirm restricted entry licensing conditions, gear SFRs, a facility to charge closed season parameters (that ensure protection of juvenile species), TACs, minimum landing sizes, gear parameters Training curricula established with ongoing support programmes provided by the regulatory authority

Objective and outcomes	Outputs	Activities	Objective verifiable indicators ^a
		 Introduce ongoing training and awareness programmes Develop spatially and temporally explicit (closed areas) harvest strategies for periods to protect spawning aggregations and environmentally sensitive zones. Vessel Monitoring Schemes (VMS), or strong co-management system, must be introduced to support this 	
	1c. Fishery impacts on bycatch and ecosystems minimized	 Establish technical measures: Turtle Excluder Devices (TEDs) and other Endangered, Threatened, Protected (ETP) species selectivity devices Maintain a limit on the amount of gear used in the fishery to minimize benthic impacts Develop spatially and temporally explicit (closed areas) harvest strategies for an appropriate period to protect environmentally sensitive zones; Vessel Monitoring System (VMS) or strong comanagement system must be introduced to support this Undertake continuous risk assessment to determine the vulnerability of bycatch and byproduct species to overfishing Continuously develop management measures to avoid interactions with ETP species Provide a system of education and training for skipper and crews which can extend to a participatory observer scheme Collect appropriate environmental data to aid ecosystem-based approach 	 Activities specified in management plans Risk assessment species established Bycatch action plan prepared and published Closed areas established and gazetted by law BRDs installed with supporting training for fishers and crew Gear parameters reviewed to ensure minimal impact on the benthos On-board participatory observer schemes operational Training provided Data required for ecosystem-based approach collected and used to inform management decisions
	ld. Measures introduced to support and control artisanal fishers	 Create community organizations Secure demarcation zones, but including coastal no-go areas Empower fishery authorities at district level Set gear parameters Establish market control mechanisms to prevent sale of juvenile species 	 Activities specified in management plans Funding support secured (e.g., NGOs and donor organizations) Definition of a typical district structure and organization, with a clear definition of the attributes and powers of the administrator, the district structure responsible for fisheries administration, and the role of the community organizations Training of fishery administration and inspection staff at district level

management bodies at district level

 Gear application parameters set and promoted at district level

The following stepwise approach is strongly recommended to come to a longterm, ecosystem based management plan:

- Identify what the plan should cover; For example, identify the appropriate management unit for LTMPs – this should be the fishery (ie. set of fishing vessels with a similar fishing pattern, using similar gear, targeting similar set of species and operating in the same area) or a fishing area (a well defined geographical area usually supporting the activity of several fisheries or operational units).
- Identify partners and their interests & responsibilities. Establish effective stakeholder group, with good representation from all sectors to develop, implement, monitor and review plan(s). We appreciate the opportunity to provide input for the management and intend to continue to do so, and recommend that other relevant organisations and institutions are also

consulted.

- 3. Description of the fishery and provide a detailed description of the management unit. Including, but not limited to, the number and size of participating vessels; number of people employed; area (delineate the practical boundaries of the shrimp fishery ecosystem inland and at sea); identify, describe and map any essential fish habitat, as well as critical habitat (identify critical habitats, e.g. lagoons, mangroves, seagrass beds, mudflats, spawning grounds), their state and existing threats (agriculture, urbanization, etc.); type, weight and quantity of gear; the species of fish involved and their location and status (target and non target); identify the species assemblage and information available on it, predators and prey; the cost likely to be incurred in management, actual and potential revenues; management and control costs. The description should include the legal framework within which the fishery is operating, including the compliance with EU, trilateral and national nature regulations and also cross-country issues.
- 4. Identify High level objectives: The overall objective of the Common Fisheries Policy is to deliver a fishery which is ecologically, economically and socially sustainable. Given the commitments Member States currently have under the Marine Strategy Framework Directive and Natura 2000, WWF advocates environmental integration of community policies and therefore the target Good Environmental Status (GES) for the marine environment by 2020 be included in plans. This commits fisheries management to address wider ecosystem impacts as identified under the assessment of the fishery. This will improve overall ecosystem health which in turn will benefit the health and well being of the fish stocks and those exploiting them. A specific example for the brown shrimp fisheries is to take into account the recovery of sharks, rays, seagrass, shellfish, Sabellaria and other species, which contribute to ecosystem health, to respect the objectives and regulations of marine protected areas such as in particular the Wadden Sea with its guiding principle to allow natural processes to proceed in an undisturbed way as much as possible, and to reduce the high level of bycatch of fish and other species.
- 5. Undertake impact assessment and capacity assessment applying sound science. Applying sound science is essential for undertaking initial impact and capacity assessments, as well as establishing, assessing and reviewing targets and informing stakeholders when making decisions within the plan. Both dedicated country or community scientific research as well as data generated by science and industry partnerships should be included. Where fisheries are data poor risk assessments can be used to generate precautionary catch allocations and Productivity and Susceptibility Analysis (PSAs) can be used to identify the need for more data collection. Analysis of capacity in relation to available resources should be undertaken at this stage. Important is to identify state of stocks; impacts on target species; identify potential external drivers such as climate oscillations, rainfall and market forces, etc. Identify potential sources of threats such as pollution sources, competing sectors, etc, identify patterns of variability and change. In other words, all potential sources of mortality should be assessed for major species and the impact of the fishery on target as well as non-target species (including

elasmobranch species, shellfish and other benthic species, marine mammals, birds etc) and critical (fish or other) habitats. It is important to note that the shrimp fishery is obligated to do an impact assessment according to Natura 2000 regulations.

- 6. Identify Target(s) and reference points; It is critical that these are clearly set out within an established timeframe and that they are measurable. Identify targets for target species; discard mitigation; essential fish habitat protection strategy; sensitive area impact mitigation, minimum size of no-take-zones (in the case of the Wadden Sea mainly on the basis of tidal basins); capacity reduction etc. As is one of the objective of CVO, it is important to set unambiguous harvest control rules. Set clear reference points (limit and precautionary), as well as trigger level(s) for plan to move from 'normal' to 'recovery' mode. It is very important that limit reference points are precautionary enough to ensure that the measures taken under the plan stand a high chance of succeeding. If plans are to be ecosystem based, ecosystem based targets need to be identified. These need to be consistent with related descriptors and indicators for good environmental status (GES) and other relevant ecosystem recovery and protection targets, such as biodiversity, quality and occurrence of habitats, and sea floor integrity. These should be at a level that ensuring the structure and functions of the ecosystems are safeguarded and that benthic ecosystems, in particular, are not adversely affected and allow for recovery of species, habitats and ecological processes.
- 7. The next step is that it is important to agree on strategies for achieving these targets, for example a discard reduction strategy, a habitat protection strategy etc.; to be integrated into one management plan. Risk analysis is part of this step, where stakeholders, partners and interested parties identify, and agree estimates of high, medium and low risks of the fishery [fisheries] to the ecosystem. These might include risks to protected species, habitats, species and genetic diversity.
- 8. Deploy Effective Management Tools: There will be a range of tools which can be deployed by the management body in order to meet targets. The most appropriate should be deployed and it is likely that any one fishery will require a mix of tools. These could include technical measures (selectivity, minimum mesh size, gear restrictions), capacity management, spatial measures such as time/area closures and other effort management.
- 9. Ensure effective Compliance, Monitoring and Control; Effective monitoring and control will be key for the success of any plan and again could be achieved in a number of ways (designated landing areas, radioing ahead landings, electronic logging, onboard observers, onboard cameras etc.). Preparation of education and training packages for fishermen are important to ensure compliance. Stakeholder participation and agreement over targets is key to achieving compliance with any management plan. Incentives (such as greater effort allocation in return for use of more selective gear) can also be a means of improving compliance. For persistent offenders higher more punitive penalties and fines need to be adopted.
- 10. Agree on the timeframes for all these steps

- 11. Agree on the review period; no management plan should be considered to be a set of regulations set in stone. It is important that they are regarded as dynamic entities: as new information becomes available they can be adapted and the plans improved. In other words, the plans support adaptive management, though within the limitations e.g. set by the conservation goals and rules for large parts of the fished area in the case of the brown shrimp fishery. Review timelines should be built into plans. Any management plan will benefit from establishing recurrent audit and evaluation processes to guarantee adaptive improvements; and programs of stakeholder awareness raising and education to ensure a common platform of understanding.
- 12. Desirables additions: WWF strongly believes that an effective marketing strategy should form a key component of sustainable fisheries management. This should maximize economic return and factor in continuity of supply resulting in the much desired end point of removing less from the sea but achieving more money for what is removed.

3. Specific issues

A number of concerns are especially relevant to the North Sea brown shrimp fishery. These include – but are not limited to - the following points, which should be addressed in the certification process and the management plan.

3.1 Data and knowledge

In general there is a lack of data on and lack of knowledge of ecosystem impacts; in general there is limited data available on the ecosystem impacts of the shrimp fishery, among which impacts on non-target species and habitats. At present there is no clear information what would be the right measures and right catching equipment to reduce bycatch (though there are at least some promising results showing the possible direction, e.g. combining fleet size reduction, sieve nets, pulse trawl gear and avoidance of areas with high bycatch proportions). Also, there is a clear lack of research on the influence the shrimp fishery may have on the sea bottom (in the short as well as long term) and on the species composition of the areas where it takes place (including the protected areas). This means, for a certified fishery there must be more research both on catching equipment and on the influence the fishery has on the ecosystem and its components. We recommend that a management plan contains an elaborate research plan to fill the data and knowledge gaps, as well as a communication strategy to ensure all fishermen fully support and participate in data collection and ensuing research. For example fishermen trawled through closed areas set up for research of shrimp fishery effects on the seabed, which makes drawing of conclusions problematic.

3.2 Fishing capacity and intensity

The current fishing capacity and intensity has increased in the last decades and it appears there is an overcapacity due to economic and ecological overfishing. There is a trend towards a higher fishing effort with bigger vessels, more frequent trawling and heavier gear, and this with a fleet which is simply too large for the target species (also in the sense of an economic over-capacity). This makes it hard to come to an ecologically effective management of the fishery, and also there is a direct relationship between the effort and the resulting impact on the ecosystem. This issue must be dealt with in the certification process, clearly requiring an overall reduction of the size of the fleet, a reduction in the amount of fishing effort including a considerable reduction of the number of vessels operating in the shrimp fishery, a considerable reduction in the number of licenses or permits, and also limits on gear weight. Effort reduction should be done on the input (e.g. number of vessels) and

output side (e.g. amount of shrimp harvested). Limits on capacity should be contained in legally binding measures. Particularly fishing pressure and intensity needs to be reduced in Natura 2000 areas. Overall, when combining all these reduction measures with the efficiency improvements which may take place anyway, there must be in the end an overall reduction in effort compared with the situation today.

3.3 Ecosystem Effects

Any fisheries management plan must include effects on biodiversity, species, habitats and ecological processes. For example, if the abundance of key species is reduced as a result of bycatch, major and unpredictable changes may occur in food chains. This impact is similar whether the removal results from targeted catch or bycatch. One aspect of this issue is the removal of shrimp predators by trawling that can result in profound changes in the food chain, such as increased abundance of prey, including squid and shrimp. This has been observed in both warm- and cold-water shrimp fisheries (Gillett 2008).

3.3.1 Bycatch and Discards

Bycatch and discards in the shrimp fisheries are very high. Particularly juvenile shrimp, juvenile and small fish, and other crustaceans are caught, but also other invertebrates and larger fish such as sharks and rays (which more or less disappeared already from the Wadden Sea), ETP species (endangered threatened and protected species). The amount of bycatch needs to be several times lower than it is today. See e.g. the 2006 Pre-Assessment Report, and also with a view on solutions the 2009 WWF report (Fischer 2009) on bycatch in the Brown Shrimp fishery. It seems that there are solutions available, though there is not one solution that fixes the bycatch and discard problem. For example just to use sieve nets does not bring enough reduction in bycatch. It is necessary to combine a number of measures to be reasonably effective in reducing the bycatch. There must be environmental impact assessments before new catching methods (e.g. pulse fishing) are implemented on a large scale (see Lüdemann and Koschinski 2014). If catching methods are effective and implemented, which appears to be the case for the so-called 'zeeflap', which allows for escape of fish, effective implementation and application needs to be monitored, effectively controlled and enforced. Also a higher proportion of the bycatch (which remains even after implementation of the reduction measures) needs to survive and access of birds to the remaining bycatch needs to be avoided. An appropriate reduction of bycatch might only be achieved with a set of steps over a defined time frame.

With regard to monitoring of bycatch, WWF suggests to implement a uniform bycatch monitoring protocol in all countries, which includes effort monitoring / spatial monitoring / independent observers.

3.3.2 Impact on seabed / protected areas

Particularly disconcerting is the effect that trawling has on benthic habitats. There is relatively high impact of shrimp fishery on species, habitats and ecological processes within and outside of marine protected areas (in particular in the Wadden Sea), having negative impact on e.g. the sea floor and on the species composition there. This prevents that these areas achieve their protection goals. Luckily, there are also solutions for this, though - depending on which part of the fishery is involved - the necessary changes might only be achieved with a set of steps over a defined time frame, as suggested in this advice for the fisheries management plan to contribute to.

The management plan needs to define objectives to address the various types of physical effects of fishing gear in general on benthic habitats (Johnson 2002):

- 1. Alteration of physical structure. Physical effects of fishing gear can include scraping, ploughing, burial of mounds, smoothing of sand ripples, removal of stones or dragging and turning of boulders, removal of taxa that produce structure, and removal or shredding of submerged aquatic vegetation.
- 2. Sediment suspension. Resuspension of sediments occurs as fishing gear is dragged along the seafloor. Effects of sediment suspension can include: reduction of light available for photosynthetic organisms; burial of benthic biota; smothering of spawning areas; and negative effects on feeding and metabolic rates of organisms.
- 3. Changes in chemistry. Fishing gear can result in changes to the chemical makeup of both the sediments and overlying water mass through mixing of subsurface sediments and interstitial water. This could facilitate the remobilization of contaminants.
- 4. Changes to the benthic community. Benthic communities are affected by fishin gear through damage to the benthos in the path of the gear and disturbance of the seafloor to a depth of up to 30 cm. Many kinds of epibenthic animals are crushed or buried, while infauna is excavated and exposed on the seabed, often damaged.
- 5. Changes to ecosystem. The use of some types of fishing gear can affect benthic community composition and habitat. It is possible that these changes at the community level in turn result in effects on harvested populations and ecosystems.

The defined objectives including spatial management of the fleet are required to respect existing and future fishery closures, marine reserves, marine protected areas and other spatial measures to protect species (including the issue of return of lost species), habitats and ecological processes.

For example in the Wadden Sea, shrimp fisheries are currently not restricted spatially to allow for recovery. Although the whole Wadden Sea is a high-level protected area, except for Denmark only very small parts of it are also fully protected against impacts of fishery (no-take-zones). Actually, not even one of the tidal basins in the German and the Dutch part is protected completely. Such protection would be a prerequisite for restoring lost ecosystem functions and species.

WWF recommends that a considerable part of the Wadden Sea, including a number of complete tidal basins, and across all regions, being fully protected from all kinds of fisheries as part of the management plan and the MSC certification process

Along the Dutch North Sea, the closures agreed under VIBEG should be respected, as well as any spatial management that is implemented for recovery of particular species, habitats and ecological processes. This includes but is not limited to important areas for the recovery of sharks, rays and shellfishbanks.

3.4 Control and Enforcement

In general, monitoring of the shrimp fishery in the North Sea and Wadden Sea is inadequate: There is no information where fishery takes place for vessels below 15 m length, and for the others this information (from the satellite tracking, which is as such also too limited with just one data point every two hours) seems to be not in all countries publicly available. However, a WWF Report about the spatial distribution of the German shrimp fishery within the German waters based on the satellite data is already drafted, providing important new insights). There is poor information on the geographical positions where the bycatch information originates from. So far there is no independent observer programme. More and better monitoring is needed and the relevant data must be made publicly available to ensure transparency of the fishery. Enforcement of regulation and legal management is inadequate: The fishery operates within protected areas (including Natura 2000) without proper assessments of its impacts. This seems to be due also to the fact that some countries/some administrations ignore legal requirements from European Birds and Habitats Directives (among them proper impact assessments). This must clearly be changed for any part of the fishery which seeks certification. Also illegal fishery in closed areas must be addressed as soon as possible, as this is a serious threat to any fishery seeking to become MSC certified.

4. WWF support

WWF supports fisheries that aim to become sustainable and we therefore welcome this opportunity to provide input for the shrimp fisheries management plan. We welcome any additional opportunity to be a stakeholder in the development of the shrimp fisheries management, as well as help find resources to achieve a longterm, ecosystem-based fisheries management plan that leads to an socio-economic and ecologically healthy fishery.

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