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IFFO RS
Global Standard for Responsible Supply
of Marine Ingredients

IFFO RS Limited

T: +44 (0) 2030 539 195

E: Standards@iffors.com

W: www.iffors.com

Unit C, Printworks | 22 Amelia Street
London, SE17 3BZ | United Kingdom



Global Standard for Responsible Supply of Marine Ingredients Fishery Assessment Methodology and Template Report V2.0



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Fishery Under Assessment	Calanus finmarchicus (<i>C. finmarchicus</i>) Norway Economic Zone (NEZ)
Date	April 2020
Report Code	2020-61
Assessor	Jim Daly
Stock(s) Pass	Norway Economic Zone (NEZ)
Stock(s) Fail	

Application details and summary of the assessment outcome				
Name: Calanus AS				
Address:				
Country: Norway		Zip:		
Tel. No.:		Fax. No.:		
Email address:		Applicant Code		
Key Contact:		Title:		
Certification Body Details				
Name of Certification Body:		SAI Global Ltd		
Assessor Name	Peer Reviewer	Assessment Days	Initial/Surveillance/ Re-approval	Whole fish/ By-product
Jim Daly	Conor Donnelly	3	Surveillance 2	Whole fish
Assessment Period	2020			

Scope Details	
Management Authority (Country/State)	Ministry of Trade, Industry and Fisheries (Norway)
Main Species	<i>C. finmarchicus</i>
Fishery Location	Norway Economic Zone (NEZ)
Gear Type(s)	Calanus bespoke AS pelagic trawl
Outcome of Assessment	
Overall Outcome	PASS
Clauses Failed	NONE
Peer Review Evaluation	Agree with assessment determination
Recommendation	APPROVED
Assessment Determination	

C. finmarchicus is a large planktonic copepod (Zooplankton) whose chief diet includes diatoms, dinoflagellates, and other micro planktonic organisms. *C. finmarchicus* is a key component in the food web of the North Atlantic, providing sustenance for a variety of marine organisms including fish, shrimp, and whales. *C. finmarchicus* can be found living anywhere from the ocean surface down to about 4,000m depth, in waters from -2°C to 22°C .

C. finmarchicus is most commonly found in the Norwegian and North Seas as well as throughout the colder waters of the North Atlantic; off Canada; in the Gulf of Maine and in the Western and Northern Svalbard (**Figure 1**).

Together with other closely related species annual biomass production in the assessment area is in the range of 290×10^6 t (2016 data). The stock biomass of *C. finmarchicus* is estimated to be about 33×10^6 t in the Norwegian Sea. These species are of commercial interest as they are high in protein and also contain omega-3 fatty acids and antioxidants.

A trial license awarded to the Norwegian based Calanus AS (allowing extraction of a maximum 5,000 t of copepods annually in coastal waters from 2018 - 2022) is unaffected by the licensing of commercial harvesting which, when awarded, will have a duration of 10 years.

In May 2019 the Ministry announced a total commercial quota of 254,000 t annually, equivalent to 0.06% of estimated annual production. Tenders have been issued for 10 area-restricted vessel licenses. Under the regulations announced, no vessel quotas are currently set. Commercial licenses have yet to be allocated. There is also an appeals process.

In 2018 and 2019 Calanus AS harvested respectively 1,360t and 352t of *C. finmarchicus* using a bespoke pelagic trawl with a minimum mesh size of $2000 \mu\text{m}$ throughout the trawl that limits bycatch of fish fry and small fish. A maximum limit of 10% bycatch in volumetric samples was introduced by the Ministry in 2019. Fishing effort is limited by the physical construction of the fishing gear, by freezing facility, seasonal vertical migration of *C. finmarchicus* and the vessel's cargo capacity.

No analytical stock assessments are undertaken specifically for *C. finmarchicus*. However, acoustic survey activities cover a substantial part of the Nordic Seas at different seasons. Regular data collection from transects, located at the inflow and outflow regions of ocean basins serve as indicators of the biological and physical state of the basins. Data on *C. finmarchicus* is collected during these surveys. Estimates of *C. finmarchicus* production in the Norwegian Sea have formed the basis for commercial quota calculations.

There is a potential for the fishery to affect ETP species through accidental bycatch of larvae and juveniles. The extent of the fraction of ETP species within the total amount of bycatch is not yet estimated due to the reason that there is no visual way to separate larvae/juveniles belonging to ETP species from larvae / juveniles belonging to non-ETP species. In 2018 Calanus AS collected samples for genetic analysis by the Institute of Marine Research (IMR). Work is on-going on this project (Source IMR 2020).

A study undertaken by the Institute in 2017 looked at bycatch levels in the fishery. Bycatch consisted of eggs from 13 fish species/groups; and larvae and juveniles from 15 species groups. Eggs of cod, haddock and tusk accounted for 75% of all eggs retained; herring and cod larvae and fry were the most common larval bycatch.

Common redfish is a vulnerable stock in the assessment area. Redfish do not have egg and larval stages but are vulnerable in their youngest stages. A small portion of coastal cod will also be caught as bycatch in the

area between baselines and 4nm, along with common redfish in their youngest stages. For this reason, the commercial quota (when applied) for *C. finmarchicus* from baseline to 1,000m depth will be restricted to 3,000t annually. Other mitigation measures now in force include the attachment to the trawl of a by-catch sorting grid.

C. finmarchicus is not listed in the current CITES appendices of endangered species and is not listed in the current IUCN Redlist of threatened species.

C. finmarchicus is approved for use under the current IFFO RS Whole fish Standard v 2.0 to produce fish meal and fish oil.

Peer Review Comments

Agree with assessment determination

Notes for On-site Auditor

Note: This table should be completed for whole fish assessments only.

General Results

General Clause	Outcome (Pass/Fail)
M1 - Management Framework	PASS
M2 - Surveillance, Control and Enforcement	PASS
F1 - Impacts on ETP Species	PASS
F2 - Impacts on Habitats	PASS
F3 - Ecosystem Impacts	PASS

Species-Specific Results

Category	Species	% landings	Outcome (Pass/Fail)	
Category A	<i>C. finmarchicus</i> sp.	97.3*	A1	PASS
			A2	PASS
			A3	PASS
			A4	PASS

[List all Category A and B species. List approximate total %age of landings which are Category C and D species; these do not need to be individually named here]

** Average by-catch (eggs/larvae) from trials in 2017/18 2.7% by volume. Not possible to identify all by-catch species (source Client Calanus AS Pers. Comm 2020).*

HOW TO COMPLETE THIS ASSESSMENT REPORT

This assessment template uses a modular approach to assessing fisheries against the IFFO RS standard.

Whole Fish

The process for completing the template for a **whole fish** assessment is as follows:

1. ALL ASSESSMENTS: Complete the Species Characterisation table, to determine which categories of species are present in the fishery.
2. ALL ASSESSMENTS: Complete clauses M1, M2, M3: Management.
3. IF THERE ARE CATEGORY A SPECIES IN THE FISHERY: Complete clauses A1, A2, A3, A4 for **each** Category A species.
4. IF THERE ARE CATEGORY B SPECIES IN THE FISHERY: Complete the Section B risk assessment for **each** Category B species.
5. IF THERE ARE CATEGORY C SPECIES IN THE FISHERY: Complete clause C1 for **each** Category C species.
6. IF THERE ARE CATEGORY D SPECIES IN THE FISHERY: Complete Section D.
7. ALL ASSESSMENTS: Complete clauses F1, F2, F3: Further Impacts.

A fishery must score a pass in **all applicable clauses** before approval may be recommended. To achieve a pass in a clause, the fishery/species must meet **all** the minimum requirements.

By-products

The process for completing the template for **by-product raw material** is as follows:

1. ALL ASSESSMENTS: Complete the Species Characterisation table with the names of the by-product species and stocks under assessment. The ‘% landings’ column can be left empty; all by-products are considered as Category C and D.
2. IF THERE ARE CATEGORY C BYPRODUCTS UNDER ASSESSMENT: Complete clause C1 for **each** Category C by-product.
3. IF THERE ARE CATEGORY D BYPRODUCTS UNDER ASSESSMENT: Complete Section D.
4. ALL OTHER SECTIONS CAN BE DELETED. Clauses M1 - M3, F1 - F3, and Sections A and B do not need to be completed for a by-product assessment.

By-product approval is awarded on a species-by-species basis. Each by-product species scoring a pass under the appropriate section may be approved against the IFFO RS Standard.

SPECIES CATEGORISATION

The following table should be completed as fully as the available information permits. Any species representing more than 0.1% of the annual catch should be listed, along with an estimate of the proportion of the catch each species represents. The species should then be divided into Type 1 and Type 2 as follows:

- **Type 1 Species** can be considered the ‘target’ or ‘main’ species in the fishery. They make up the bulk of annual landings and are subjected to a detailed assessment.
- **Type 2 Species** can be considered the ‘bycatch’ or ‘minor’ species in the fishery. They make up a small proportion of the annual landings and are subjected to relatively high-level assessment.

Type 1 Species must represent 95% of the total annual catch. Type 2 Species may represent a maximum of 5% of the annual catch (see Appendix B).

Species which make up less than 0.1% of landings do not need to be listed (NOTE: ETP species are considered separately). The table should be extended if more space is needed. Discarded species should be included when known.

The ‘stock’ column should be used to differentiate when there are multiple biological or management stocks of one species captured by the fishery. The ‘management’ column should be used to indicate whether there is an adequate management regime specifically aimed at the individual species/stock. In some cases, it will be immediately clear whether there is a species-specific management regime in place (for example, if there is an annual TAC). In less clear circumstances, the rule of thumb should be that if the species meets the minimum requirements of clauses A1-A4, an adequate species-specific management regime is in place.

NOTE: If any species is categorised as Endangered or Critically Endangered on the IUCN Red List, or if it appears in the CITES appendices, it **cannot** be approved for use as an IFFO RS raw material. This applied to whole fish as well as by-products.

TYPE 1 SPECIES (Representing 95% of the catch or more)

Category A: Species-specific management regime in place.

Category B: No species-specific management regime in place.

TYPE 2 SPECIES (Representing 5% OF THE CATCH OR LESS)

Category C: Species-specific management regime in place.

Category D: No species-specific management regime in place.

Common name	Latin name	Stock	% of landings	Management	Category
Calanus	<i>Calanus finmarchicus</i> sp	Norway EZ	97.3%	Norway Ministry of Trade, Industry and Fisheries	A

MANAGEMENT

The two clauses in this section relate to the general management regime applied to the fishery under assessment. A fishery must meet all the minimum requirements in every clause before it can be recommended for approval.

M1	Management Framework – Minimum Requirements		
	M1.1	There is an organisation responsible for managing the fishery	PASS
	M1.2	There is an organisation responsible for collecting data and assessing the fishery	PASS
	M1.3	Fishery management organisations are publically committed to sustainability	PASS

	M1.4	Fishery management organisations are legally empowered to take management actions	PASS
	M1.5	There is a consultation process through which fishery stakeholders are engaged in decision-making	PASS
	M1.6	The decision-making process is transparent, with processes and results publically available	PASS
Clause outcome:			PASS
<p>Evidence</p> <p>M1.1:</p> <p>The management of fisheries in Norway falls under the jurisdiction of the Ministry of Trade, Industry and Fisheries (Department of Fisheries and Aquaculture). A Directorate of Fisheries and Aquaculture acts as the Ministry's advisory and executive body. A map of the Norwegian Economic Zone (NEZ) and surrounding areas is provided (Figure 1).</p> <p>Both Ministry and Directorate develop and apply fishery laws and regulations through an ongoing interactive process referred to as the Regulatory Chain (Figure 3), in place since the 1970's. Scientific advice takes key positions within the chain, ensuring understanding of fish stocks and broader ecosystem issues are considered.</p> <p>A Stock table, and a table of "Catches of data-poor species" constitute the system in Norway for monitoring management principles. Along with a Fisheries table, both establish a framework for developing an ecosystem-based fisheries management by providing a basis and tools for prioritising the needs of new and/or revised management measures.</p> <p>The Stock Table includes information on the status of stocks, exploitation level, management objectives and priorities for action. The Fisheries Table includes information for each fishery on species and size selectivity, discard problems, incidental mortality, effect on bottom habitats, etc. Elements of both tables are graded according to impact or importance and presented with traffic light colours (high (red), medium (yellow) or low (green)) to facilitate overviews.</p> <p>A Regulatory Council then debate on quota distribution and provide advice for the Ministry. The Ministry decide on final management strategies. The scope of the Regulatory Chain was broadened by provisions of the new Marine Resources Act (2009) to include ecosystem and biodiversity related issues (see also M1.5).</p> <p>The Department is responsible for matters related to fisheries, the fishing fleet and aquaculture industry. The Department manages, <i>inter alia</i>:</p> <ul style="list-style-type: none"> • Quota negotiations with the European Union and others. • International fisheries agreements including those with the Regional RFMO (NEAFC North East Atlantic Fisheries Commission) • Prevention and deterrence of IUU fishing. • Fishing regulations and fishing rights including licensing for Norwegian flagged and Third Country vessels wishing to fish in Norwegian waters. <p>The Directorate of Fisheries and Aquaculture's role is, <i>inter alia</i>:</p> <ul style="list-style-type: none"> • Provide analyses, statistics and advice in support of management decisions. • As an executive entity implement political decisions. • Process applications and appeals, when necessary. • Conduct monitoring and control of the fisheries. • Actively cooperate with trade and industry, the research community and other public services. 			

- Knowledge sharing with various stakeholders and the public.



Figure 1: Norway fishing zones (adapted from FAO Fisheries and Aquaculture-Country Profiles) **R3**

The Norwegian Sea (NWS) connects with the Northeast Atlantic Ocean to the southwest, the Icelandic Waters ecoregion and Greenland sea to the west along the edge to the shallower Iceland Sea between the Faroe Islands, and northwards to Jan Mayen (**Figure 1**). To the south it borders to the shallower North Sea along the 62°N parallel between Norway and the Faroe Islands, and to the northeast with the shallower Barents Sea (**Figure 2**):

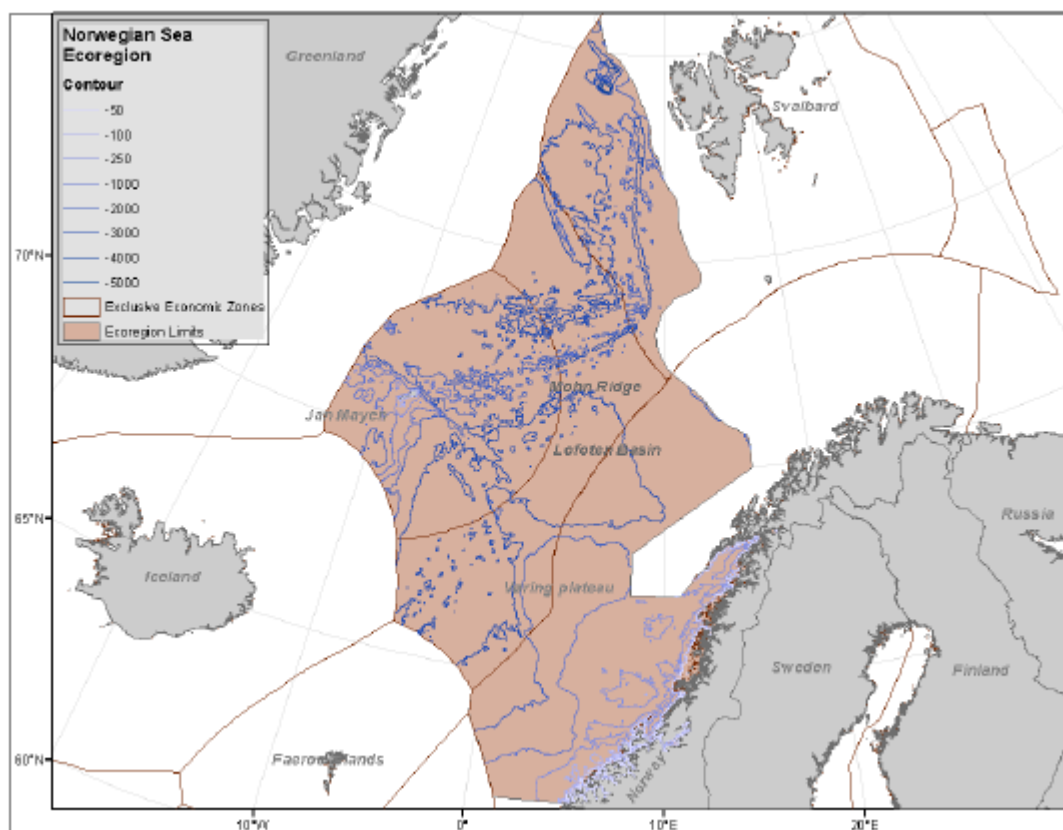


Figure 2: The Norwegian Sea ecoregion, showing EEZs and depth contours. **R6**

From 2017-2019 the Norwegian Sea has become markedly fresher due both to an Atlantic Inflow and an increase in influx of Arctic water from the East Icelandic Current. Data on Zooplankton biomass (May time-series from 1995 to the present) was presented in WGINOR's 2019 Report (**M 1.2**).

A national Management Plan (2016) for *C. finmarchicus* harvesting was developed, and a national hearing process amongst stakeholders completed at that time. The management area proposed is the Norwegian Economic Zone (NEZ) and outside 12nm in the Jan Mayen zone with most of the fishery occurring in an area deeper than 1,000m (**Figure 1,2**).

In May 2019 Norwegian authorities announced a total commercial quota of 254,000t annually and issued tenders for 10 area-restricted vessel licenses. There has been no decision yet on who will be granted a license; decisions when made are subject to appeal. There will be no vessel-specific quotas awarded.

The trial license awarded to Calanus AS allowing this Company to extract 5,000t of copepods annually in coastal waters up to 2022 is unaffected by the licensing of commercial harvesting.

References p 15:

R1-R9

References p 24:

R24, R27

M1.2:

The main research body is the Institute of Marine Research (IMR) with 1,000 employees; its main activities are research, advisory work and monitoring. In January 2018 IMR was merged with Norway's NIFES (National Institute of Nutrition and Seafood Research). IMR have an office in Tromsø and research stations in Matre, Austevoll and Flødevigen. IMR also have several laboratories that analyse samples taken through its monitoring and research programmes.

Fisheries advice is provided by the International Council for the Exploration of the Sea (ICES). Environmental issues are managed by Norwegian agencies, through OSPAR and ICES through Working Groups like (WGINOR) the Working Group on Integrated Ecosystem Assessments for the Norwegian Sea.

Ecosystem research surveys are conducted by IMR and international partners. Survey activities cover a substantial part of the Nordic Seas at different seasons. Regular data collection from transects, located at the inflow and outflow regions of ocean basins serve as indicators for the biological and physical state of the basins (Gimsøy, Svinøy, Fugløy).

The following surveys are conducted (multiple vessels, several nations):

- Ecosystem survey North Sea
- Ecosystem survey Norwegian Sea
- Ecosystem survey Barents Sea
- Winter survey Barents Sea
- Strategic Initiative Arctic

The following variables are collected:

- Juveniles and larvae of commercial species.
- Abundance of commercial demersal and pelagic fish species.
- Plankton (including *C. finmarchicus* sp.).
- Benthic organisms.
- Marine mammals and birds.
- Physical conditions and pollution.

IMR is an independent knowledge provider and publicises research results both in Norway and internationally.

A Scientific Advisory Board has been in place at NIFES since 2011. The Board contributes to ensuring professional quality and development within the scope of the Institute's objectives and limitations. Biomass and other data collected from regular ecosystem research surveys and transects are collated and added to fishery-dependent data generated for stock assessment purposes. A precautionary approach is adopted, only a marginal percentage is allowed for the fishery. The Fisheries Directorate calculated a total Norwegian annual quota (precautionary) of 50% of trigger level = 165,000t equivalent to 0.06% of estimated annual production.

Survey data on plankton is provided to the ICES Working Group on Integrated Ecosystem Assessments for the Norwegian Sea (WGINOR). This Working Group has a three-year work programme (2018-2021) which includes focussing, through modelling, on single vs. multispecies harvest control rules for the development of ecosystem-based advice, and on outstanding issues to facilitate the development of integrated ecosystem assessments (IEA's).

Survey data from IMR is also presented to the ICES Working Group of International Pelagic Surveys (WGIPS). The most recent report was published by ICES following a meeting in Jan 2019. The core objectives of this Working Group are to combine and review results of annual pelagic ecosystem surveys to provide indices for stocks of herring, sprat, mackerel, boarfish, and blue whiting in the Northeast Atlantic, Norwegian Sea, North Sea, and Western Baltic; and to coordinate timing, coverage and methodologies for upcoming surveys.

References p 15:

R2, R7-R8, R10-R12

M1.3:

The Ministry aids in coordinating efforts of various ministries to ensure a sound, unified, future-oriented industrial and seafood policy. Norway's fishing industry has developed from a 'free fishing' activity to a fully-fledged industry complete with quotas and concessions.

A 2009 Report outlined strategies in place to ensure the sustainable harvesting of all marine resources. Sustainable management and harvesting are based on best available understanding and scientific advice from both ICES and IMR. Norway has committed to international agreements on sustainable management for all fish stocks under its management; entailing defined exploitation rates and minimum limit for spawning stocks.

Section 1 (purpose) of the Marine Resources Act (MRA, **see M1.4**) outlines Norway's commitment to sustainability:

The purpose of this Act is to ensure sustainable and economically profitable management of wild living marine resources and genetic material derived from them, and to promote employment and settlement in coastal communities.

Section 7 (Principle for management of wild living marine resources and fundamental considerations) of the MRA gives power to the Ministry to evaluate which types of management measures are necessary to ensure sustainable management of wild living marine resources including the use of the precautionary and ecosystem approaches.

References p15

R5, R13

M1.4:

The Marine Resources Act (MRA, entered into force on 06 June 2008) describes a precautionary and sustainable management of marine resources used to adopt scientific recommendations. This law details, among other things, the structure of the management system, the obligation for sustainable, science-based management and ecosystem considerations. The MRA contains technical regulations for commercial and recreational fisheries and applies to all harvesting and other utilisation of wild living marine resources and the genetic material derived from them.

Chapter 1 (Introductory provisions) Section 3 provides a comprehensive scope of the MRA:

'all harvesting and other utilisation of wild living marine resources and genetic material derived from them. Wild living marine resources means fish, marine mammals that spend part or all of their life cycle in the sea, plants and other marine organisms that live in the sea or on or under the seabed and that are not privately owned.'

As part of the zooplankton food web found in the Norwegian and North Seas the management of *C. finmarchicus* harvesting is covered in the MRA.

Chapter 1 Section 7 notes that the application of the Ecosystem Approach to Fisheries Management (EAFM) is now mandatory in Norway. This Section gives the Ministry the power to:

‘evaluate which types of management measures are necessary to ensure sustainable management of wild living marine resources’

This includes looking at effective control of harvesting methods and the way gear is used consider the need to reduce possible negative impacts on living marine resources.

Chapter 3 (Catch quantities and quotas) Section 11 empowers the Ministry to prescribe:

‘maximum permitted quantities (national quotas) of wild living marine resources that may be harvested, expressed in terms of weight, volume, number of individuals, the number of days harvesting is permitted, or in other terms.

Chapters 6 (Arrangements for control and enforcement) & Chapter 7 (Control and enforcement) of the MRA specifies arrangements for facilitating vessel inspections, use of logbooks to record catches and powers of the Directorate of Fisheries Inspectors to issue orders to stop a vessel, haul in gear, seal gear and obtain documents, relevant information and objects if they suspect infringements of the fisheries legislation have occurred.

Chapter 8 (Measures against illegal, unreported and unregulated fishing) outlines measures in place to deter illegal, unreported and unregulated (IUU) fishing. **Chapter 11 (Coercive fines and infringement fines)** empowers the Ministry to impose coercive and infringement fines to ensure compliance with provisions made in or under the Act.

Norway ratified the UN Agreement on Straddling and Migrating Fish Stocks and the UN Convention on the Law Of the Sea in 1996.

References p15

R5

M1.5:

Representatives of the fishing industry and governmental authorities cooperate in the formulation of the Regulatory Chain (**Figure 3**). Scientific research and advice take key positions within the chain, ensuring understanding of the stock and broader ecosystem are considered.

The involvement of stakeholders in management decisions is achieved through Advisory Meetings for Fisheries Regulations representing fishermen’s associations, fishing industries, trade unions, the Sami Parliament, local authorities, environmental organisations and other stakeholders.

Both ICES (when available) and IMR advice are factored heavily into management decisions, and in turn direction and specifics of future research are guided by experiences within the fishery throughout the year.



Figure 3: Regulatory chain of Norwegian fishery management **R4**

M1.6:

Norway has a bilateral fisheries agreement with the European Union (joint management of shared stocks), trilateral arrangements with Iceland and the Faroe Islands and neighbouring agreements with other coastal states in the region. All meetings and key decisions are published online.

The Directorate's Communications office has overall responsibility for all external and internal information, including continuous development of strategic communication. Other main areas of responsibility are the maintenance and development of the Directorate's Internet and intranet pages, presentation of information material for public and tourists visiting Norway and providing advice of a professional nature within the organisation.

The Communication Office is also on the editorial board of the English-language website www.fisheries.no through which authorities provide information about Norwegian fisheries regulations and aquaculture management.

R4, R14-R15

References

- R1:** Ministry of Trade Industry and Fisheries-Norway
<https://www.regjeringen.no/en/id4/> (accessed 08.04.20)
- R2:** Directorate of Fisheries: Norwegian-Fisheries-Management
<https://www.fiskeridir.no/English/Fisheries/Norwegian-Fisheries-Management> (accessed 08.04.20)
- R3:** FAO Fisheries and Aquaculture Country Profile: <http://www.fao.org/fishery/facp/NOR/en>
- R4:** Regulatory Chain of Norwegian Fisheries Management: 20pp
<https://www.regjeringen.no/globalassets/upload/fkd/brosjyrer-og-veiledninger/folder.pdf>
- R5:** Department for Fisheries and Aquaculture (2009): Act relating to the management of wild living marine resources (Marine Resources Act) 17pp
<https://www.regjeringen.no/globalassets/upload/fkd/vedlegg/diverse/2010/marineresourcesact.pdf>

- R6:** ICES Ecosystem Overviews Norwegian Sea Ecoregion (17pp) Dec 2019
http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2019/2019/EcosystemOverview_NorwegianSea_2019.pdf
- R7:** Working Group on the Integrated Assessments of the Norwegian Sea (WGINOR 2019) 52 pp Vol 2 Issue 29
<http://www.ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/IEASG/2019/WGINOR%20report%202019.pdf>
- R8:** Ministry of Climate and the Environment (2017) White Paper Report to Parliament: Update of the integrated management plan for the Norwegian Sea; Meld. St. 35 (2016-2017)
<https://www.regjeringen.no/en/dokumenter/meld.-st.-35-20162017/id2547988/sec5?q=calanus#KAP5-5>
- R9:** Announcement 2019 Calanus quota: <https://www.mynewsdesk.com/no/calanus-as/pressreleases/press-release-norway-opens-for-commercial-harvesting-of-zooplankton-2854673>
- R10:** Institute of Marine Research (IMR) <http://www.imr.no/en> (accessed 08.04.20)
- R11:** ICES Homepage: <http://www.ices.dk/Pages/default.aspx>
- R12:** OSPAR Homepage: <https://www.ospar.org/>
- R13:** Norwegian Ministry of Fisheries and Coastal Affairs (2009) Strategy for an Environmentally Sustainable Norwegian Aquaculture Industry 38pp
<https://www.regjeringen.no/globalassets/upload/fkd/vedlegg/diverse/2009/strategy-for-an-sustainable-aquaculture.pdf>
- R14:** Fisheries Directorate Communications Unit:
<https://www.fiskeridir.no/English/About-the-directorate/About-the-departments/The-communication-Unit>
- R15:** DG MARE Fisheries agreements: https://ec.europa.eu/fisheries/cfp/international/agreements_en
- Standard clauses 1.3.1.1, 1.3.1.2*

M2	Surveillance, Control and Enforcement - Minimum Requirements		
	M2.1	There is an organisation responsible for monitoring compliance with fishery laws and regulations	PASS
	M2.2	There is a framework of sanctions which are applied when laws and regulations are discovered to have been broken	PASS
	M2.3	There is no substantial evidence of widespread non-compliance in the fishery, and no substantial evidence of IUU fishing	PASS
	M2.4	Compliance with laws and regulations is actively monitored, through a regime which may include at-sea and portside inspections, observer programmes, and VMS.	PASS
Clause outcome:			PASS
<p>Evidence</p> <p>M2.1:</p> <p>Enforcement is split into three branches:</p> <ul style="list-style-type: none"> The Directorate of Fisheries (Control Section): monitors and controls the entire value chain through quayside controls, sales inspections, post landing audits and inspections at sea. Quota control and compliance to regulations are the focus areas. Controls are conducted within Norwegian Economical Zone (NEZ) and the Fisheries Zones surrounding Svalbard and Jan Mayen (Figure 1). A Fisheries Monitoring Centre (FMC) ensures 24/7 monitoring of fishing activities. Inspectors may board vessels at any time when at sea. The Coast Guard (Ministry of Defence) conducts control of both Norwegian and foreign flagged vessels, performing more than 1,800 vessel inspections annually. Main areas of control are for resource, quota, and customs violations and to verify adherence to technical fishery regulations. Sales organisations (e.g. <i>Norges Sildesalgslag</i>, a pelagic sales organization) is a legal intermediary for settlement between buyer and seller for all first-hand landings. These organisations also perform landing controls, comply statistics and cooperate closely with the Directorate. <p>The Directorate performs annual strategic risk analyses which gives guidance for future focus areas and enforcement tactics. Catches of <i>C. finmarchicus</i> sp are reported daily to the Directorate from the harvesting vessel (one vessel harvesting in 2019). Total landings are additionally reported at port through a Landing Certificate.</p> <p>Fishing inside baselines is prohibited. Fishing inside 12 nm (Jan Mayen-zone, Figure 1) is also prohibited. The Directorate may also require that inspectors/observers are put on board vessels. Vessels must comply to the requirements of a standardized biological sampling system devised by the Directorate in association with the client company Calanus AS.</p> <p>References p 19</p> <p>R16</p> <p>M2.2:</p> <p>Norway has a landing obligation and to avoid discarding, small quota overshoots are landed. The value of the catch is then administratively withdrawn from the vessel and counts against the TAC. If more serious quota infractions occur, the Directorate can administer fines, withdraw quota or submit a police report, which will hand the issue over to the criminal system. Fishing license and a license to purchase fish may also be withdrawn as can the value of the catch.</p> <p>Chapter 11 (Coercive and infringement fines) of the MRA empowers the Ministry to impose fines to ensure compliance with provisions made in or under the Act. A coercive fine is a continuous fine that becomes effective from a specified deadline for complying with an order. The Ministry may in special cases reduce or</p>			

waive a coercive fine that has accrued. The Ministry may order any person that wilfully or through negligence contravenes provisions made in or under this Act to pay an infringement fine.

Chapter 12 of the MRA (Criminal Liability) notes that any person that wilfully or through negligence contravenes provisions laid down in specific Sections of the Act are liable to fines or to a term of imprisonment not exceeding one year, unless more severe penal provisions apply.

With respect to *C. finmarchicus* harvesting, the trial license to the client Calanus AS is provided by the Ministry, any violations of the license would be addressed by the Ministry. Appeals can be made to the Ministry and “Ombudsmann” appointed by the Norwegian Parliament to safeguard the rights of individual citizens.

The only commercial stakeholder in the fishery (Calanus AS) has never been sanctioned by Directorate inspectors. Calanus AS regularly have inspectors from the Fisheries Monitoring Centre (FMC) onboard during harvesting.

References p 15

R5

M2.3:

Norway adopted a Black List of vessels engaged in IUU activities in Northeast Atlantic waters in 1994 and banned such vessels from fishing in Norwegian waters. The concept of a black list was later adopted by several Regional Fisheries Management Organizations (RFMO's). Among the list are included vessels that have taken part in fishing outside quota arrangements in international waters for a stock subject to regulations in waters under Norwegian fisheries jurisdiction.

The Norwegian Black List was updated on 20.02.2020. No vessels have been added to the list since 2016.

The current IUU list is updated on the Directorate's website and is divided into 3 sections:

IUU-list 1: All vessels are covered by measures including prohibition of landing, transshipment, delivery of supplies, delivery of services and access to port. Vessels on this list are not granted the right to fly the flag of Norway nor a license to operate in the Norwegian EEZ.

IUU-list 2: Measures for vessels on this list include prohibition of landing, transshipment, delivery of supplies and delivery of services. These vessels can be granted access to port but will be inspected upon arrival.

IUU-list 3: This list identifies vessels involved in cases where a decision to lay down prohibitions is about to be made.

The current list (updated 21.03.2018) is populated by reference to actions undertaken by RFMO's worldwide to combat IUU fishing (NEAFC, IOTC etc). The Directorate's website (Control and Enforcement) does not have any record of vessel detentions or arrests for IUU fishing in 2019-20 to date.

References p 19

R17-R19

M2.4:

Chapter 7 (Control and enforcement) Section 47 (Placing inspectors and observers on board vessels) of the MRA obliges vessel owners, when requested, to provide board and lodging at the vessel's expense and use of communication equipment without charge. The Ministry may also adopt regulations relating to;

- The duties of an observer.
- Which vessel groups and how many vessels are to carry an inspector or observer on board.
- How these vessels are to be selected.

The Directorate (Control Section) monitors and controls the entire value chain through quayside controls, sales inspections, post landing audits and inspections at sea. Quota control and compliance to regulations are the focus areas.

VMS transmitters on Norwegian vessels must be approved by the Directorate and installed only by those authorized. Norwegian flagged vessels involved in fishing operations of overall length 15m and above are required to comply with position reporting. This also includes vessels of 12m (Norway and EU) when operating in the Skagerrak area.

Foreign vessels of overall length 24m or more (15m or more in the case of EU vessels) are subject to mandatory position reporting when operating in Norwegian waters outside Skagerrak. By January 2014 approximately 575 Norwegian vessels were subject to position reporting.

Norway is currently a signatory to agreements on electronic exchange of catch and activity reports from most of the waters where Norwegian fishing vessels operate. In 2013 a bilateral agreement on electronic exchange of catch and activity data was made between Norway and Iceland. Norway has also reached an agreement with Russia (October 2012). However, the date for entry into force is not yet decided (March 2015 update).

All data is stored by the Directorate and only accessible to authorized personnel who are subject to a duty of confidentiality.

References p 15: R5

References p 19: R20

References

R16: Norway Fisheries Directorate: Control and Enforcement

<https://www.fiskeridir.no/English/Fisheries/Control-and-enforcement>

R17: Norway Fisheries Directorate: Utøvelsesforskriften (Real-time fisheries management law):

<http://www.fiskeridir.no/Yrkesfiske/Regelverk-og-reguleringer/J-meldinger/Gjeldende-J-meldinger/J-125-2016>

R18: Norway Fisheries Directorate IUU List: <https://www.fiskeridir.no/English/Fisheries/IUU-list>

R19: Norway Fisheries Directorate Black list pdf 17pp:

<https://www.fiskeridir.no/English/Fisheries/Norwegian-Black-List>

R20: Norway Fisheries Directorate: Electronic Reporting Systems:

<https://www.fiskeridir.no/English/Fisheries/Electronic-Reporting-Systems>

Standard clause 1.3.1.3

CATEGORY A SPECIES

The four clauses in this section apply to Category A species. Clauses A1 - A4 should be completed for **each** Category A species. If there are no Category A species in the fishery under assessment, this section can be deleted. A Category A species must meet the minimum requirements of all four clauses before it can be recommended for approval. If the species fails any of these clauses it should be re-assessed as a Category B species.

Species Name		Calanus finmarchicus	
A1	Data Collection - Minimum Requirements		
	A1.1	Landings data are collected such that the fishery-wide removals of this species are known.	PASS
	A1.2	Sufficient additional information is collected to enable an indication of stock status to be estimated.	PASS
Clause outcome:			PASS
Evidence			
A1.1			
Fishing effort is measured through daily reports of catch, calculation of catch per hour and Landing Certificates presented to Directorate inspectors on landing. At present, Calanus AS is the only commercial participant in this fishery, with one vessel contracted for harvesting in 2019.			
Fishing effort is limited by the physical construction of the fishing gear, by freezing facility, seasonal vertical migration of C. finmarchicus and the vessel’s cargo capacity. The Company harvested 747t from a TAC of 165,000t in 2017, 1,360t in 2018 and 352t in 2019. There are currently no plans for harvesting in 2020 due to a planned commercial based reduction (Source Calanus AS Client Pers. Comm).			
A1.2:			
The following fishery-independent data is collected:			
<ul style="list-style-type: none">• ES70, EK80 echosounder acoustic data/haul.• Video recording of biomass transferred from trawl sack to vessel.• Total biomass, start-end position, duration of haul, fishing depth, weather and sea state/haul.• Bycatch in ml per 500 ml catch photographed and recorded.• Samples of bycatch eggs and bycatch taken/haul.• Every 4th haul has a triple sample taken and analysed rom various parts of the trawl sack for each haul (2018 only).• Total catch weighed and recorded at port during landing.• Genetic samples of selected species < 10 samples taken at sea.• Samples of frozen landings for analysis of fat, proteins, water and additional chemical properties.			
Acoustic data/haul are provided to the authorities for stock assessment purposes. All samples are analysed at IMR and reported when the analysis is complete. Work is usually completed within 6-8 months after the season has finished (early August).			
In 2017, the stock biomass of C. finmarchicus is estimated to be about 33 x 10 ⁶ t in the Norwegian Sea.			
References p 24			
R21-R24			
Standard clause 1.3.2.1.1			

A2	Stock Assessment - Minimum Requirements		
	A2.1	A stock assessment is conducted at least once every 3 years (or every 5 years if there is substantial supporting information that this is sufficient for the long-term sustainable management of the stock) and considers all fishery removals and the biological characteristics of the species.	PASS
	A2.2	The assessment provides an estimate of the status of the biological stock relative to a reference point or proxy.	PASS
	A2.3	The assessment provides an indication of the volume of fishery removals which is appropriate for the current stock status.	PASS
	A2.4	The assessment is subject to internal or external peer review.	PASS
	A2.5	The assessment is made publically available.	PASS
Clause outcome:			PASS
Evidence			
A2.1:			
<p>No analytical stock assessments are undertaken for <i>C. finmarchicus</i>. However, annual acoustic surveys cover a substantial part of the Nordic Seas at different seasons. Regular data collection from transects, located at the inflow and outflow regions of ocean basins serve as indicators of the biological and physical state of the basins. Data on <i>C. finmarchicus</i> is collected during these surveys. Estimates of <i>C. finmarchicus</i> production in the Norwegian Sea have formed the basis for commercial quota calculations (Figure 4).</p> <p>Annual surveys undertaken in the assessment area include:</p> <p>IESNS: International Ecosystem Survey in the Nordic Seas (since 1995) IESSNS: International Ecosystem Summer Survey in the Nordic Seas (July-August).</p> <p>Results of these surveys are submitted for discussion to ICES Working Group of International Pelagic Surveys (WGIPS).</p> <p>The IESSNS comprises a standardised pelagic trawl swept area method to obtain abundance indices and study the spatial distribution of Northeast Arctic (NEA) mackerel in relation to other pelagic fish stocks and ecological and environmental factors in the Nordic Seas. One of the main objectives is to provide abundance indices with uncertainty estimates for NEA mackerel applicable in the stock assessment. During these surveys' average concentrations of zooplankton (including copepods) are also measured.</p>			
A2.2:			
<p>The <i>C. finmarchicus</i> stock in Norwegian waters is viable and biologically in good or average condition (Source: Update of the integrated management plan for the Norwegian Sea, Meld. St. 35 (2016-2017) Report to the Storting (white paper). Norwegian Ministry of Climate and Environment. 17pp). Estimates of annual production of <i>C. finmarchicus</i> in the Norwegian Sea have been calculated at 290×10^6 t. Stock biomass of <i>C. finmarchicus</i> is estimated to be about 33×10^6 t in the Norwegian Sea.</p>			
A2.3:			
<p>Using the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) quota estimation method for Krill (<i>Euphausia superba</i>) an exploitation degree (10 % of estimated standing stock) would be 3.3×10^6 t. The IMR provided this TAC to the Fisheries Directorate on an advisory level.</p> <p>The Fisheries Directorate then determined a trigger level, based on a pre-cautionary approach, of 10% of the advisory TAC = 330,000t. The Directorate then calculated a total Norwegian annual quota (precautionary) of 50% of this trigger level = 165, 000t equivalent to 0.06% of estimated annual production (biomass).</p>			

The total Norwegian annual quota was then divided into two areas:

- **NEZ:** Area between baselines and 1000 m depth: 3,000t (max of 10 specific catch permits ca 350-500t/vessel)
- **NEZ, Jan Mayen:** Area deeper than 1000m and outside 12 nm in the Jan Mayen zone: 162, 000t (No restrictions regarding the participation of the fishery in this area). (**Figure 1**)

In May 2019 the Ministry announced a total commercial quota of 254,000 tons annually. Under the regulations announced no vessel quotas are set. Licenses have yet to be issued. The same area restrictions that applied under the original quota regime also apply to the 2019 quota.

A maximum limit of 10% bycatch in the volumetric samples was introduced in 2019. Average by-catch (2017-2018) for one contracted vessel was 2.7% of larvae and fry. Two echo sounders are employed at different frequencies in order to map *Calanus* sp more accurately. This allows the catch/bycatch ratio to be estimated before setting the trawl (source Client Pers. Comm 2020).

A2.4:

Representatives of the fishing industry and governmental authorities cooperate in the formulation of the Regulatory Chain (**Figure 3**). Scientific research and advice take key positions within the chain, ensuring understanding of the stock and broader ecosystem are considered.

The involvement of stakeholders in management decisions is achieved through the Advisory Meeting for Fisheries Regulations representing fishermen's associations, fishing industries, trade unions, the Sami Parliament, local authorities, environmental organisations and other stakeholders.

A2.5:

Biomass estimates from IMR are made available to Government and form part of Ministerial Reports to Parliament which are then made available to the public in the form of updated Management Plans.

A Regulatory Council debate on quota distribution and provide advice for the Ministry. The Ministry then decides on final management strategies. The scope of the Regulatory Chain was broadened by provisions of the new Marine Resources Act (MRA 2009) to include ecosystem and biodiversity related issues.

The Directorates Communication Office provide information about fisheries regulations and aquaculture management on their website.

References p 15: R4-R5, R9, R14

References p 24: R21, R23-R27

References

R21: Calanus AS website: <https://www.calanus.no/resource/>

R22: Kurt Tande, Snorre Angell, Morten Winje & Ole Petter Pedersen (NORUT). Annual Report (2016) Copepod Harvesting CALANUS pdf 14pp

R23: Calanus AS Ltd: Client Pers. Comm. Dr. Cecilie Broms, IMR. Planktologist Calanus AS Client Application to IFFO-RS (2018-2020) 18pp

R24: Update of the integrated management plan for the Norwegian Sea, Meld. St. 35 (2016-2017) Report to the Storting (white paper). Norwegian Ministry of Climate and Environment. 110pp.

<https://www.regjeringen.no/en/dokumenter/meld.-st.-35-20162017/id2547988/?ch=2>

R25: ICES Workshop on Scrutinizing of Acoustic data from the IESSNS Survey (WKSCRUT2) Volume 2 Issue 13 38p

<Http://www.ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/EOSG/2020/WKSCRUT2%20Report%202019.pdf>

R26 Commission for the Conservation of Antarctic Marine Living Resources CCAMLR: Krill fisheries

<https://www.ccamlr.org/en/fisheries/krill-fisheries-and-sustainability>

R27: Langard, L (2016): Norwegian management Plan for Harvesting C. finmarchicus 6th Zooplankton Production Symposium ICES/PICES 2016 pdf 17pp http://www.ices.dk/news-and-events/symposia/zp6/Documents/Presentations/W3/w3_wednesd_0955_langaard_norwegian.pdf

Standard clause 1.3.2.2, 1.3.2.1.2, 1.3.2.1.4

A3	Harvest Strategy - Minimum Requirements		
	A3.1	There is a mechanism in place by which total fishing mortality of this species is restricted.	PASS
	A3.2	Total fishery removals of this species do not regularly exceed the level indicated or stated in the stock assessment. Where a specific quantity of removals is recommended, the actual removals may exceed this by up to 10% ONLY if the stock status is above the limit reference point or proxy.	PASS
	A3.3	Commercial fishery removals are prohibited when the stock has been estimated to be below the limit reference point or proxy (small quotas for research or non-target catch of the species in other fisheries are permissible).	PASS
Clause outcome:			PASS
<p>Evidence</p> <p>A 3.1</p> <p>The Ministry issued an annual quota of 254, 000t in 2019. A total of 10 commercial licenses will be awarded. There has been no decision yet who will be granted a license. There will also be an appeals round.</p> <p>3,000t of the annual quota can be harvested between the 1000m contour line and Norwegian Baseline (Figure 2). The remainder must be harvested outside the 1000m contour line. There will be no vessel quotas. Commercial licenses will have a duration of 10 years.</p> <p>Fishing effort is limited by the physical construction of the fishing gear, by freezing facility, seasonal vertical migration of <i>C. finmarchicus</i> sp and each vessels' cargo capacity.</p> <p>A 3.2:</p> <p>In 2017 Calanus AS harvested 747t of <i>C. finmarchicus</i> sp, in 2018 1,360t and in 2019 352t. To date in 2020 there has been no harvesting. The trial license awarded to Calanus AS allows extraction of up to 5,000t annually up to 2022.</p> <p>A3.3:</p> <p>Catches of <i>C. finmarchicus</i> sp are reported daily to the Directorate from each vessel and total landings additionally reported at port through Landing Certificates. It is the responsibility of each commercial participant to adhere to individual licensing conditions.</p> <p>Chapter 1 Section 7 of the MRA notes that the application of the Ecosystem Approach to Fisheries Management (EAFM) is now mandatory in Norway. Section 7 gives the Ministry the power to:</p> <p>‘evaluate which types of management measures are necessary to ensure sustainable management of wild living marine resources’</p> <p>This includes looking at effective control of harvesting methods and the way gear is used considering the need to reduce possible negative impacts on living marine resources.</p> <p>Chapters 6 & 7 of the MRA specifies arrangements for control and enforcement including facilitating vessel inspections, use of logbooks to record catches and powers of the Directorate to issue orders to stop a vessel, haul in gear, seal gear and obtain documents, relevant information and objects if they suspect infringements of fisheries legislation have occurred. The Directorate also has the power to impose seasonal and geographic restrictions; total time-at-sea restrictions; gear restrictions and other effort restrictions if deemed necessary.</p> <p>References p15 R5, R9</p> <p>References p24 R23, R27</p>			

<i>Standard clause 1.3.2.1.3</i>

A4	Stock Status - Minimum Requirements		
	A4.1	<div>The stock is at or above the target reference point, OR IF NOT:</div> <div>The stock is above the limit reference point or proxy and there is evidence that a fall below the limit reference point would result in fishery closure OR IF NOT:</div> <div>The stock is estimated to be below the limit reference point or proxy, but fishery removals are prohibited.</div>	PASS
	Clause outcome:		PASS
<div>Evidence</div> <div>A4.1:</div> <div>The stock in Norwegian waters is viable and biologically in good or average condition (source Update of the integrated management plan for the Norwegian Sea, Meld. St. 35 (2016-2017). Report to the Storting (white paper). Norwegian Ministry of Climate and Environment .17pp). The Ministry issued an annual quota of 254,000t in 2019. A total of 10 commercial licenses will be awarded.</div> <div>The stock biomass of <i>C. finmarchicus</i> is estimated to be about 33x10⁶t in the Norwegian Sea. The annual quota awarded in 2019 is equivalent to 0.06% of estimated annual production.</div>			
<div>References p15 R9</div> <div>References p24 R24</div>			

FURTHER IMPACTS

The three clauses in this section relate to impacts the fishery may have in other areas. A fishery must meet the minimum requirements of all three clauses before it can be recommended for approval.

F1	Impacts on ETP Species - Minimum Requirements		
	F1.1	Interactions with ETP species are recorded.	PASS
	F1.2	There is no substantial evidence that the fishery has a significant negative effect on ETP species.	PASS
	F1.3	If the fishery is known to interact with ETP species, measures are in place to minimise mortality.	PASS
Clause outcome:			PASS
<p>Evidence</p> <p>F1.1:</p> <p>There is a potential for the fishery to affect ETP species through accidental bycatch of ETP larvae and juveniles. The extent of the fraction of ETP species within the total amount of bycatch is not yet estimated; due to the reason that there is no visual or straight forward way to separate larvae/juveniles belonging to ETP species from larvae / juveniles belonging to non-ETP species.</p> <p>The only way to determine this fraction is through genetic analysis in a laboratory. During the 2018 fishing season, Calanus AS collected a set of samples specifically for this purpose. These samples are to be analysed by IMR and will be a first step to determine any effect on ETP species (larvae and juveniles) from the fishery. Work on analysing larval by-catch is on-going (IMR Scientific Staff Pers. Comm 2020).</p> <p>Marine species listed as threatened, found in Norwegian waters include 8 fish, 8 birds, 4 mammals, 8 molluscs, 3 crustaceans, 2 annelids, 3 vascular plants and 9 species of algae. The overall number listed (2015) as threatened is two higher than in the previous edition of Norway's Red List. One species, the North Atlantic right whale, has been listed as regionally extinct since the first edition of the Red List was published in 1998.</p> <p>Statistics and biomass models show a population decline of 70-90 % of Golden redfish (<i>Sebastes norvegicus</i>) since 1990. Under criteria developed by IUCN this species is classified in Norwegian waters as endangered. Combining lists from several endangered species lists the following may also be found in Norwegian waters: Shark (spp); Atlantic Cod (<i>Gadus morhua</i>); Atlantic Halibut (<i>Hippoglossus hippoglossus</i>); European Eel (<i>Anguilla anguilla</i>); Long-nosed skate (<i>Dipturus oxyrinchus</i>); Porbeagle (<i>Lamna nasus</i>) and Rabbitfish (<i>Chimaera monstrosa</i>).</p> <p>Due to low towing speeds (approximately one knot/hr) adult fish, ETP species and mobile bycatch may also escape the trawl. This was confirmed through by-catch data provided by both the client and IMR (F1.2).</p> <p>References p 29 R29-R30</p> <p>F1.2:</p> <p>There is a monitoring programme inherent to the Fishery. This programme is designed in collaboration with IMR and the Directorate. For every haul a visual interpretation of bycatch can be conducted retrospectively; for all hauls there is a sample taken of the catch to assess the amount of eggs, larvae and juveniles. If the amount of bycatch during fishery (visual inspection) is deemed above acceptable limits (currently 10% of catch by volumetric sampling) fishing vessels relocate, and hunt for grounds with lower abundance of bycatch.</p> <p>A study undertaken by the Directorate in 2017 looked at bycatch levels in the Calanus fishery. Bycatch consisted of eggs from 13 fish species/groups; and larvae and juveniles from 15 species groups. Eggs of cod (<i>Gadus</i></p>			

morhua), haddock (*Melanogrammus aeglefinus*) and tusk (*Brosme brosme*) accounted for 75% of all eggs retained in the trawls; herring and cod larvae and fry were the most common larvae bycatch.

References p 29 R30

F1.3:

The bespoke Calanus trawl is a pelagic trawl employs an appropriately designed bycatch sorting grid (figure 4 & 5). The main purpose of this grid is to minimize bycatch of larvae and juveniles. If the amount of bycatch during fishery is deemed above acceptable limits, the fishing vessels relocate, and hunt for grounds with lower abundance of bycatch:



Figure 4: Calanus AS Bespoke Trawl sorting grid R23



Figure 5: Full scale test of a commercial zooplankton trawl **R30**

Authorities continue to develop a management plan for the stock based on long-term ecosystem-based management in line with the precautionary principle and other obligations under the MRA. Ongoing research will further define the important role of *C. finmarchicus* in the marine ecosystem and the effect of removals of this species on its role of supporting higher trophic levels (including ETP'S) in the ecosystem.

The Red List for Species has become an important tool for management of economically less important and endangered species. Management measures to avoid species found on this list may include not fishing in protected areas, gear restrictions and other measures laid down in the MRA.

Species on the official Red List or otherwise known to be in a precarious state, will be subject to evaluation according to **Section 7 (Principle for management of wild living marine resources and fundamental considerations)** of the MRA, giving power to the Ministry to evaluate which types of management measures are necessary to ensure sustainable management of wild living marine resources including the use of the precautionary and ecosystem approaches.

References p 15 R5, References p 24 R23, R28-R30

References

R28 Norway Red List <https://www.biodiversity.no/Pages/135380>

R29 Cecilie Broms, Espen Strand, Webjørn Melle: IMR (2017): Bycatch (eggs, larvae and fry) in the Calanus fishery. pdf 17pp (NO)

R30 Commercial Exploitation of Zooplankton in the Norwegian Sea: Eduardo Grimaldi and Svein Helge Gjøsund SINTEF Fisheries and Aquaculture Norway 18pp https://cdn.intechopen.com/pdfs/36250/InTech-Commercial_exploitation_of_zooplankton_in_the_norwegian_sea.pdf

Standard clause 1.3.3.1

F2 Impacts on Habitats - Minimum Requirements			
	F2.1	Potential habitat interactions are considered in the management decision-making process.	PASS
	F2.2	There is no substantial evidence that the fishery has a significant negative impact on physical habitats.	PASS
	F2.3	If the fishery is known to interact with physical habitats, there are measures in place to minimise and mitigate negative impacts.	PASS
Clause outcome:			PASS
Evidence			
F2.1			
<p>Pelagic fishing by multinational fleets is the major activity in the Norwegian Sea Ecoregion. The number of fishing vessels is declining while vessel size is increasing. The Norwegian commercial fleet has the highest fishing activity in the shelf area, particularly along the coast of Norway and the continental shelf edge (Figure 2). Bottom trawls are regulated along the Norwegian continental slope through closed areas to avoid extended damage on fragile and vulnerable benthic communities and reef-building organisms.</p> <p>The bespoke Calanus trawl is a pelagic trawl with minimal impact on the ocean floor. A bycatch sorting grid has been designed. The main purpose of this grid is to minimize bycatch of larvae and juveniles. Permits are awarded in the fishery on condition of a minimum mesh size of 2000 μ m throughout the trawl to limit bycatch of fish fry and small fish. If the amount of bycatch during fishery is deemed above acceptable limits, the fishing vessels relocate, and hunt for grounds with lower abundance of bycatch.</p> <p>The ICES Working Group on the Integrated Assessments of the Norwegian Sea (WGINOR) aims to conduct and further develop Integrated Ecosystem Assessments (IEA's) for the Norwegian Sea as a step towards implementing the ecosystem approach. It is WGINOR's role to develop an operational approach for integrated assessment of the Norwegian Sea ecosystem based on a common framework.</p> <p>The application of the Ecosystem Approach to Fisheries Management (EAFM) is now mandatory in Norway. The Ministry has power to:</p> <p>‘evaluate which types of management measures are necessary to ensure sustainable management of wild living marine resources’</p> <p>This includes looking at effective control of harvesting methods and the way gear is used to consider the need to reduce possible negative impacts on living marine resources, including marine habitats. Additional ecosystem considerations will be incorporated as new scientific knowledge becomes available concerning multispecies interactions, effects of fishing on benthic habitats and the effects of by-catch of fish, seabirds and marine mammals, where relevant.</p>			
F2.2:			
<p>Most commercial fish species living in the Norwegian Sea spawn on the Norwegian coast (Figure 1). Most fish species have pelagic eggs, within the top 50m of the water column. Exceptions include bottom spawning herring. Eggs, larvae and fry drift North with the coastal current, eggs spawned in the South will be found as larvae and fry further North later in the season. The bespoke Calanus trawl is a pelagic trawl with minimal impact on the ocean floor.</p>			

F2.3:

There is a monitoring programme inherent to the Fishery; designed in collaboration with IMR and the Directorate. The Directorate has the power to impose seasonal and geographic restrictions; total time-at-sea restrictions; gear restrictions and other effort restrictions if deemed necessary.

Chapter 7 (Control and enforcement) Section 47 (Placing inspectors and observers on board vessels) of the MRA obliges vessel owners, when requested, to provide board and lodging at the vessel's expense and use of communication equipment without charge. If the amount of bycatch during fishing is deemed above acceptable limits, the fishing vessels relocate, and hunt for grounds with lower abundance of bycatch. If the fishery is known to interact with physical habitats, these data would be captured in observer reporting.

References p 15 R5-R7; R31

R31: Gullestad, P et al (2017) Marine Policy Vol 77 pp104-110 Towards Ecosystem based fisheries management in Norway (2017) EN
<https://www.sciencedirect.com/science/article/pii/S0308597X16305383>

Standard clause 1.3.3.2

F3	Ecosystem Impacts - Minimum Requirements		
	F3.1	The broader ecosystem within which the fishery occurs is considered during the management decision-making process.	PASS
	F3.2	There is no substantial evidence that the fishery has a significant negative impact on the marine ecosystem.	PASS
	F3.3	If one or more of the species identified during species categorisation plays a key role in the marine ecosystem, additional precaution is included in recommendations relating to the total permissible fishery removals.	PASS
Clause Outcome:			PASS
<p>Evidence</p> <p>F3.1:</p> <p><i>C. finmarchicus</i> is important ecologically because it shows rapid responses to climate variability, including shifts in species' distribution and abundance. <i>C. finmarchicus</i> is a key component in the food web of the North Atlantic, providing sustenance for a variety of marine organisms including fish, shrimp, and whales. Calanoid copepods (especially <i>C. finmarchicus</i>) were the most important contributor to the overall diet of mackerel in years studied (2011-14 >70%, source WGINOR 2019).</p> <p>WGINOR research functional connections and linkages within the ecosystem, compiling time-series on absolute abundance of major components of the physical and biological ecosystem and look to develop models suitable for integrated ecosystem assessment.</p> <p>Two statistical methods were introduced (WGINOR 2019) as possible tools to develop food web assessment of the pelagic ecosystem in the Norwegian Sea, empirical dynamic modelling and modelling based on principles of chance and necessity. Future work involves evaluating both models and assessing whether they are useful tools to make short term forecast for food web status. Development of a framework for ecosystem warning signals was also reported on in the 2019 Report. Another goal of WGINOR is to utilize multispecies and ecosystem models to evaluate effects of single and multispecies harvest control rules on fishing yield and ecosystem state of the pelagic ecosystem (Norwegian Sea).</p> <p>WGINOR will report on these and other findings by 2021. One project will look at changes in the distribution of <i>C finmarchicus</i> and the effect on distribution of fish stocks.</p> <p>Reference p 15 R7</p> <p>F3.2:</p> <p>A study undertaken by the Institute in 2017 looked at bycatch levels in the <i>Calanus</i> fishery. Two vessels undertook 157 trawls (April-July) 2017 with a total capture of 747t eggs bycatch (rauâte) and 660t larvae/juvenile bycatch. A total of 135 trawls were analysed for the presence of larvae/fry; all 157 trawls were analysed for the presence of eggs.</p> <p>The first increase in egg bycatch was in early May; followed by an increase in larvae by-catch later. Toward end June bycatch levels dropped as eggs, larvae and fry drifted North, away from the fishing area (Figure 7):</p>			

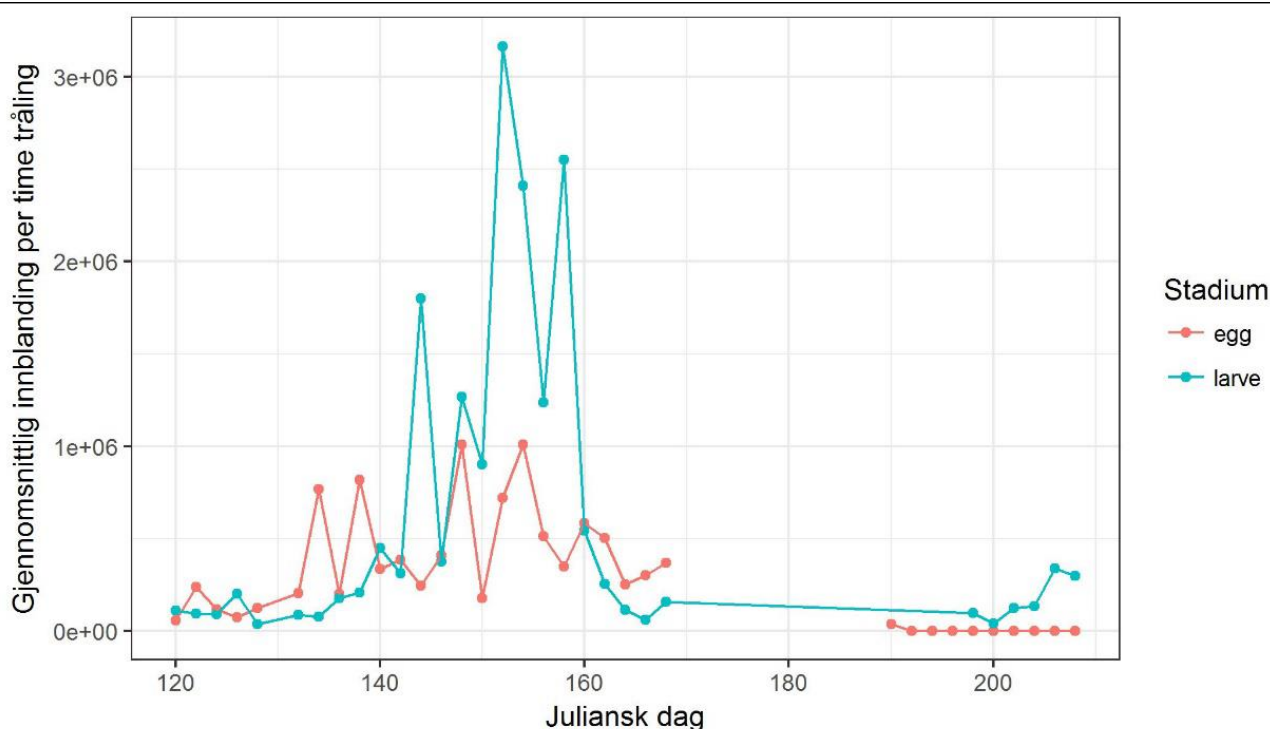


Figure 7: The average interference of eggs and larvae per hour trawling through the capture season (average over 2 days for both boats) **R29**

Bycatch consisted of eggs from 13 fish species/groups; and larvae and juveniles from 15 species groups. Eggs of cod, haddock and tusk accounted for 75% of all eggs retained in the trawls; herring and cod larvae and fry were the most common larvae bycatch. Other retained species are non-commercial. These included gelatinous forms (jellyfish) and zooplankton of similar size to *C. finmarchicus*. However, the amount of these species is highly insignificant due to low abundance.

The authors of the 2017 report concluded that bycatch levels of larvae and eggs reported in 2017 do not constitute any significant increases in mortality and considers that bycatch in the 2017 fishery had negligible effects on fish stocks.

The client Calanus AS reports (2020 Pers. Comm) that average bycatch for one contracted vessel was 2.7% by volume of catch (14 ml of 500 ml sample) of larvae and fry in both 2018 and 2019; representing a reduction (larva and fry) of the number of larvae and fry by 26% compared with 2018 and by 70% compared with 2017. Echo sounders at different frequencies have been deployed which map *C. finmarchicus* more efficiently and give information on catch/by-catch ratio before the net is deployed.

Reference p 24 R23, Reference p 29 R29

F3.3:

Golden redfish is a vulnerable stock in the assessment area. *S. norvegicus* is an ovoviviparous species, females are livebearers (R34) in winter females give birth to 50,000-350,000 pelagic larvae of 8 mm length. A small portion of coastal cod will also be caught as bycatch in the area between baselines and 4nm, along with redfish in their youngest stages. For this reason, the commercial quota (when applied) for *C. finmarchicus* from baseline to 1,000m depth will be restricted to 3,000t.

A bycatch sorting grid has been designed (**Figure 5**). The main purpose of this grid is to minimize bycatch of larvae and juveniles, during summer months. Grid dimensions are calculated to allow catches of *C.*

finmarchicus, while juveniles and larvae of fish and other species are directed out through the end section of the trawl.

The precautionary approach is applied to all fisheries in Norway, and this strategy has proven effective. Few stocks have been decimated below critical thresholds and there has been no major breakdowns or collapses of stocks. The precautionary approach is entailed within the MRA.

An update was provided (Client Pers. Comm 2020) on two projects, supported by Calanus AS, to minimise ecosystem effects of the fishery.

OASIS:

The objective of this project is to develop a new generation of harvesting equipment which will allow Calanus AS harvest on lower concentrations compared to previously, and to avoid areas with high presence of larvae and juveniles. The Oasis 2 floatation rig testing has been postponed until 2021. Testing of scale models of the rig in a flume tank showed promising results for full scale testing. The rig will include a net for selection/separation of incoming biomass to reduce bycatch levels.

Drones:

These could be used to provide for a better spatial mapping of the stock. The effect would be a reduction in time spent searching for *C. finmarchicus*; reducing fuel emissions and search costs. Calanus AS are continuing to examine this option.

Reference p 15 R7, Reference p 24 R23, Reference p 29 R29, R32-R33

References

R32: Drone fishing project (Calanus AS) pdf 20pp: EFFEKTIVISERING AV HØSTING ETTER RAUDÅTE VED HJELP AV DRONER (Annen).

R33: Calanus AS OASIS 2 - 2nd Generation Zooplankton Harvesting System (Feb 2018) 17pp
<https://www.calanus.no/resource/>

R 34: Wourms, J.P., 1991. Reproduction and development of *Sebastes* in the context of the evolution of piscine viviparity. Environ. Biol. Fish. 30:111-126.

Standard clause 1.3.3.3