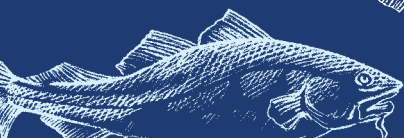
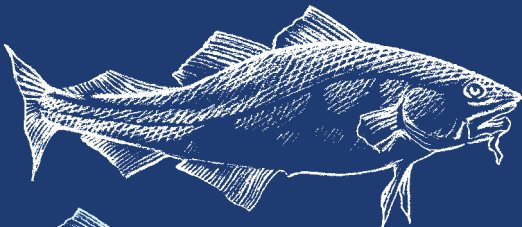
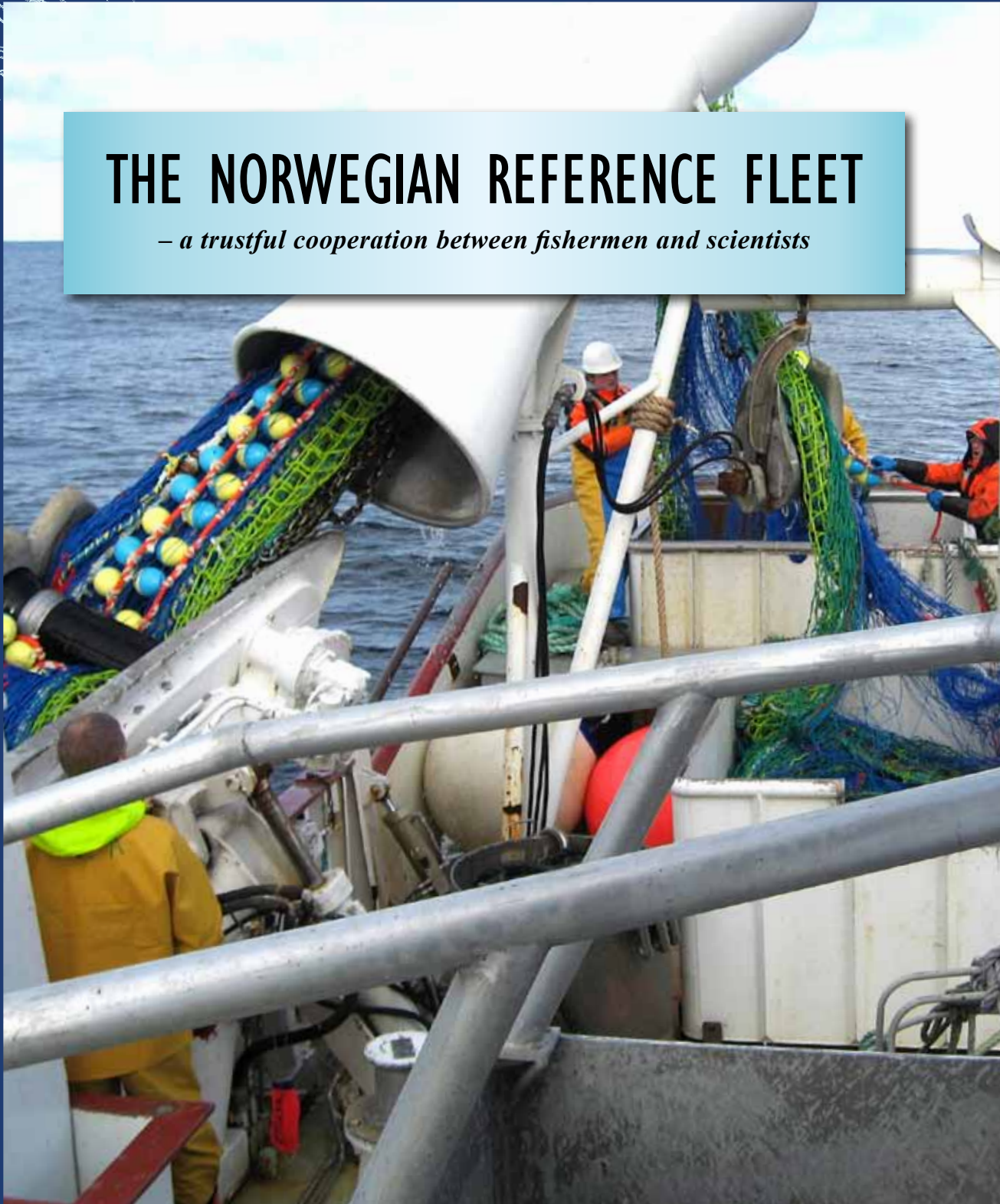


3-2013

FOCUS ON MARINE RESEARCH

THE NORWEGIAN REFERENCE FLEET

– a trustful cooperation between fishermen and scientists



INSTITUTE OF MARINE RESEARCH
HAVFORSKNINGSINSTITUTTET



THE NORWEGIAN REFERENCE FLEET

– a trustful cooperation between fishermen and scientists

It is very important that research scientists who give advice on fisheries management issues have sound knowledge about the different fisheries; how and where the fleets operate during the season, and what and how they fish. It is especially important to know how each age group is harvested since this is basic and necessary input data for many of the assessment models currently used to estimate fish stock sizes.

The Institute of Marine Research has always had a close and good cooperation with fishermen and the fishing industry. These contact and information flows have traditionally occurred by having institute personnel collect scientific samples on board fishing vessels or at ports, and on board commercial fishing vessels chartered for conducting scientific research surveys. The Reference Fleet aims to improve data collection and information flows both from and to the fishermen.



WHAT IS THE REFERENCE FLEET?

The Reference Fleet is a small group of Norwegian fishing vessels that provide the Institute of Marine Research (IMR) with detailed information about their fishing activity and catches on a regular basis. The sampling and data management procedures are similar to the system used on board IMR's research vessels. Data is used for management purposes including stock assessment.

A high-seas Reference Fleet was established in 2000 and consists of 19 vessels (see illustration on page 4). In autumn 2005 a similar coastal Reference Fleet was established along the entire Norwegian Coast from Varanger to Oslofjord (see illustration on page 6). This fleet is composed of 20 vessels (mainly gillnetters, 9–15 m long). Public announcement every fourth year opens up for replacement of the fleet and motivates fishermen involvement.

The administration and work done by the Reference Fleet is self-financed by the allocation of a minor part of the Norwegian fish quotas for research purposes. The vessel owner gets 50–60% of the quota value to cover the vessels expenses in catching, producing and selling the fish. The other 40–50% covers the administration and running costs, and payment to the fishermen to take biological samples and data deliveries according to protocol.

Public announcement makes fishermen express genuine interest to participate



Skagøysund – purse seine, Danish seine



Hermes – demersal trawl



Ramoen – demersal trawl



Kato – gillnet



Geir II – longline



Christina E – purse seine, pelagic trawl



Atlantic Star – demersal trawl



Herøyfjord – purse seine, pelagic trawl



Skjongholm – gillnet



Nybo – purse seine



Brennholm – purse seine, pelagic trawl



Vonar – longline, gillnet



Havdrøn – purse seine



Nesbakk – longline, gillnet



Cetus – industrial trawl, pelagic trawl



Atlantic – longline



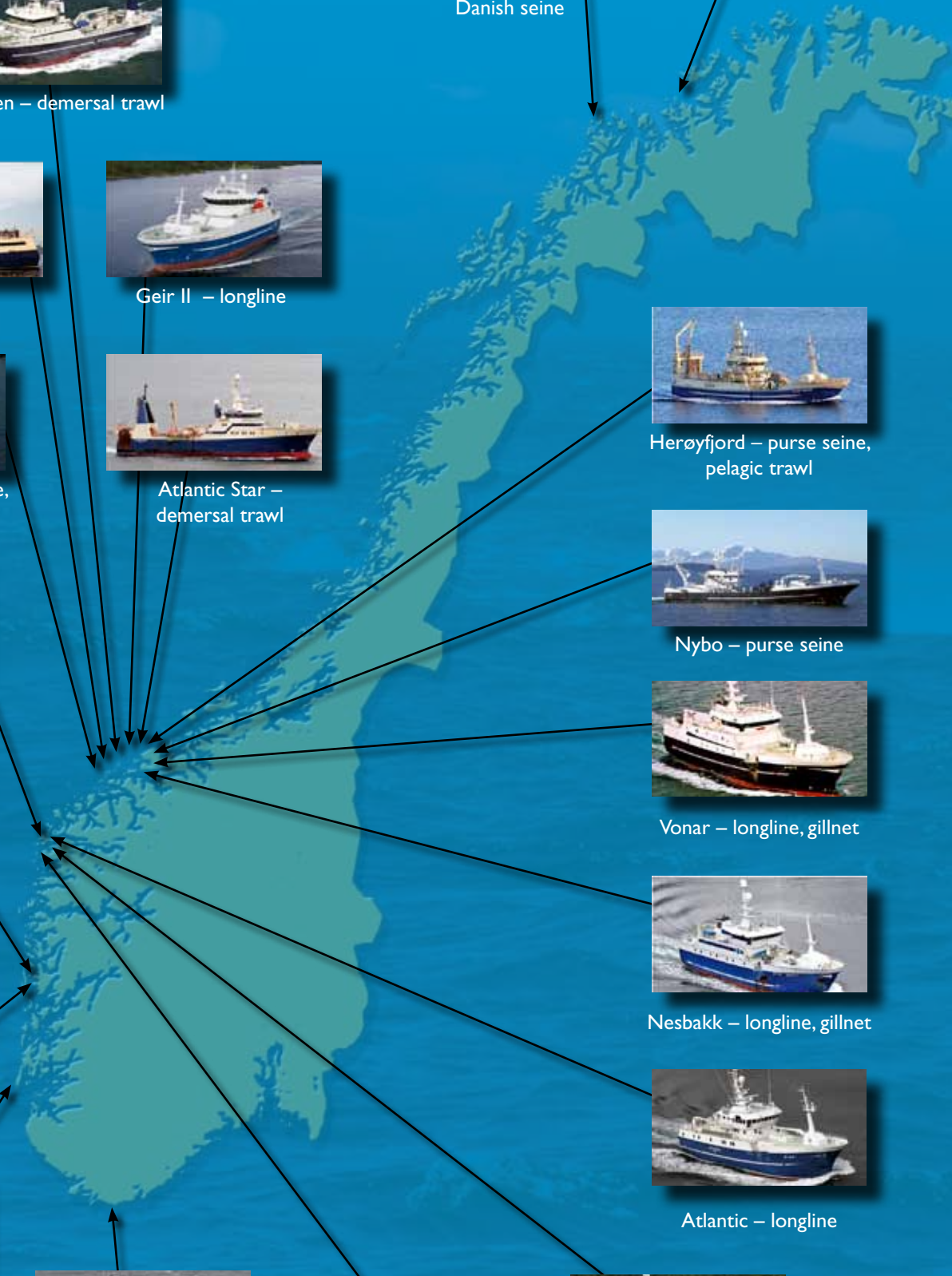
Nesejenta – gillnet



Hovden Viking – purse seine, Danish seine



Carisma Viking – longline



THE HIGH SEAS REFERENCE FLEET 2013

Vessel	Owner	Address	Reg.no.	Call sign	Length (m)	Gear
Atlantic Star	Rosund Drift AS	Ålesund	M - 111 - G	LMBG	60,4	Demersal trawl
Atlantic	Atlantic Longline AS	Måløy	SF-9-B	LIYX	44,9	Longline
Brennholm	Brennholm AS	Hjellestad	H-1-BN	LIWG	75,4	Purse seine, pelagic trawl
Carisma Viking	Carisma Viking AS	Raudeberg	SF-20-V	LLPZ	52	Longline
Cetus	Cetus AS	Vedavåg	R-94-K	LLYM	41,8	Industrial trawl, pelagic trawl
Christina E	Ervik og Sævik AS	Børlandet	M-150-HØ	3YVG	80,4	Purse seine, pelagic trawl
Geir II	H.P.Holmeset AS	Vatne	M-12-H	3YNB	51,3	Longline
Havdrøn	Havdrøn AS	Bergen	H-81-BN	LIRW	60,9	Purse seine
Hermes	Hermes AS	Sør-Tverrfjord	F-1-L	LLOP	48,4	Demersal trawl
Herøyfjord	Herøyfjord AS	Fosnavåg	M-10-HØ	LMHM	53	Purse seine, pelagic trawl
Hovden Viking	Hovden Senior AS	Selje	SF-4-S	JWLM	37,5	Purse seine, Danish seine
Kato	Fiskebåtredieriet Kato AS	Myklebost	M-192-SØ	LLJC	38,2	Gillnet
Nesbakk	Nesbakk AS	Godøya	M-72-G	LJZJ	44,8	Longline, gillnet
Nesejenta	Nesefisk AS	Lindesnes	VA-82-LS	3YWO	32,6	Gillnet
Nybo	Nybo Holding AS	Midsund	M-56-MD	LJBD	78,4	Purse seine, pelagic trawl
Ramoen	Ramoen AS	Ålesund	M-2-VD	LMLT	66,7	Demersal trawl
Skagøysund	Skagøysund AS	Sommarøy	T-23-T	LMUR	38,1	Purse seine, Danish seine
Skjongholm	Skjongholm AS	Barekstad	SF-7-F	LHSQ	34	Gillnet
Vonar	Finnøy Fiskeriselskap AS	Harøy	M-188-SØ	LMCJ	49,5	Longline, gillnet



Rubin – Danish seine, longline, pot



Charmi – Danish seine



Havørna – gillnet



Odd Yngve – gillnet



Anne Sofie – gillnet



Oddson – gillnet, pot



T Sivertsen – gillnet



Rånes Viking – gillnet



Hellskjær – gillnet



Vandsøyvåg – gillnet



Haldorson – gillnet



Tramsegg – gillnet



Haaværbuen – gillnet



Ramona – gillnet



Vester Junior – gillnet



Vesleper – gillnet, pot



Britt Evelyn – gillnet



Repsøy – gillnet



Skogsøyjenta – gillnet, handline



Brattholm – gillnet

THE COASTAL REFERENCE FLEET 2013

Vessel	Owner	Address	Reg.no.	Call sign	Length (m)	Gear
Anne Sofie	Hekkingen Fiskeriselskap AS	Botnhamn	T-141-LK	LK3697	14,99	Gillnet
Brattholm	Geir Even Lunde	Mandal	VA-71-M	LK7238	12,78	Gillnet
Britt Evelyn	Hallvard Godøy	Fusa	H-1-T	LK6966	9,3	Gillnet
Charmi	Nobø AS	Mehamn	F-7-G	LK3293	14,98	Danish seine
Haaværbuen	Haaverbuen DA	Sandøy	M-30-SØ	LM5498	10,6	Gillnet
Haldorson	Svein Tore Olsen	Lovund	N-58-L	LK4789	14,23	Gillnet
Havørna	Jonpe AS	Hammerfest	F-29-H	LK6531	14,96	Gillnet
Hellskjær	Runar Torsteinsen	Røst	N-25-RT	LM8308	12,83	Gillnet
Odd Yngve	PR Fagertun DA	Vannareid	T-44-K	LM2864	14,97	Gillnet, pot
Oddson	Odd Ingvald Lam	Varangerbotn	F-32-N	LK3860	13,15	Gillnet, pot
Ramona	Ørjan Mo	Nordheimsund	H-43-KM	LK6606	12,1	Gillnet, handline, fyke net
Repsøy	Repsøy AS	Vedavågen	R-72-K	LK3270	14,97	Gillnet, handline
Rubin	Straumskjær AS	Båtsfjord	F-3-BD	LK8820	14,04	Danish seine, longline, pot.
Rånes Viking	Rolf Rånes	Landegode	N-300-B	LK5016	12,32	Gillnet
Skogsøyjenta	Gunvald Aanensen	Mandal	VA-134-M	LK5485	12,52	Gillnet, handline
T Sivertsen	PR T. Sivertsen DA	Sennesvik	N-44-VV	LK5948	12,12	Gillnet
Tramsegg	PR Gjetøyfisk ANS	Vevang	M-20-EE	LK7141	12,98	Gillnet
Vandsøyvåg	Remi Hatland	Rørvik	NT-161-V	LM9649	12,01	Gillnet
Vesleper	Anders Paulsen	Tjodalyng	V-26-L	LM7915	9,65	Gillnet, pot
Vester Junior	Bjørn Andre Weltzien Årdal	Måløy	SF-210-V	LM5970	10,61	Gillnet



THE DESIGN AND IMPLEMENTATION OF THE SAMPLING SCHEME FOR THE NORWEGIAN REFERENCE FLEET IS BASED ON BEST PRACTICE PRINCIPLES

The Norwegian high-seas and coastal reference fleets are examples of at-sea sampling where vessels are the primary sampling units (PSUs). The sampling frame is based on a list of vessels in the high-seas and coastal fleets.

The selection of the reference fleet is constrained by law to follow a tender process. The goal of the tender specifications and the selection process is to approximate stratified random sampling. When multiple vessels satisfy all criteria asked for in the tender process, the selection of vessels is based on a random draw.

The PSUs are the individual vessels, and individual trips are the secondary sampling units (SSUs).

- For the coastal fleet, the sampling frame is restricted to vessels from 9.5 to 15 m length that fish with gillnets or Danish seine. The vessels in the coastal fleet are stratified by nine statistical areas based on home ports, and are restricted to the two predominant gear types.
- For the high-seas fleet, vessels are stratified into demersal and pelagic vessels. The demersal Reference Fleet is also stratified by gear and fishing pattern (e.g. North Sea versus Barents Sea).

The analysis of the catch composition data is conducted according to methods of stratified random sampling. The precision of the estimates of catch composition is primarily driven by number of PSUs (vessels) and number of trips, and less on the number of individuals/otoliths.

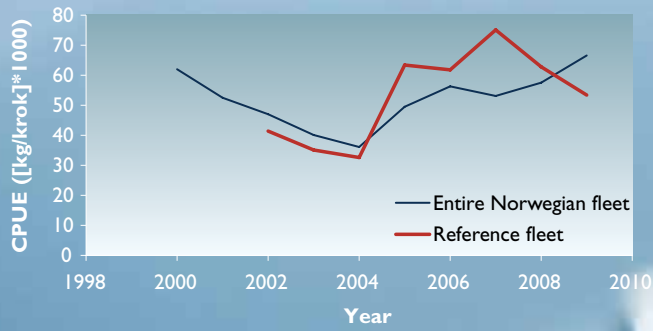
SAMPLING AND EQUIPMENT

The data are collected and delivered to the IMR according to a contract that secures a proper statistical coverage for a defined number of species in time and by area. Each vessel in the high-seas Reference Fleet is equipped with an electronic fish sampling board (Scantrol)¹⁾, scales¹⁾, tools for sampling otoliths, a PC¹⁾ with specialized software for satellite communication, and other equipment for various research purposes. Most of the smaller vessels in the coastal Reference Fleet have only been equipped with conventional fish-length measuring boards. IMR personnel instruct the responsible contact persons on each vessel, provide training and support, visit the vessels, and update the scientific equipment when necessary.

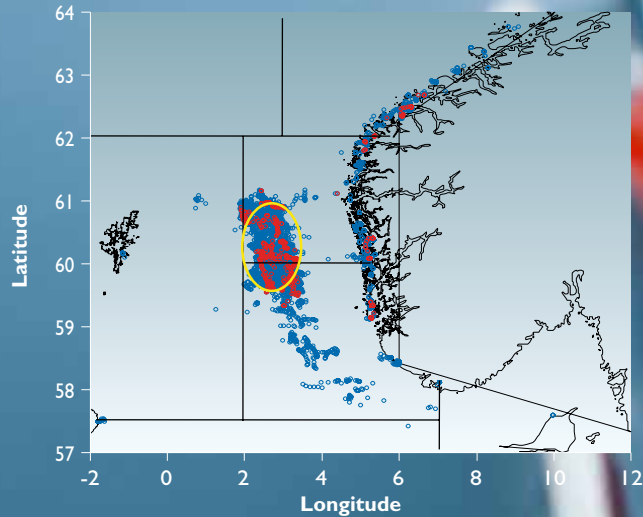
The agreement between IMR and the Reference Fleet includes an obligation for the vessels to record their catch logbooks electronically. The trawlers, Danish- and purse-seiners are required to make a complete record (including discards) of each catch, while longliners and gillnetters do so for one representative section per day and in addition for the whole day catch. The coastal fleet is required to make a complete record of the entire day catch.

Crew members are trained to conduct self-sampling following IMR's protocols. Biological samples include length, otoliths, genetic samples, stomachs, contaminants, tagging etc. The data are recorded electronically¹⁾ and transmitted to the IMR via a satellite link together with the electronic logbooks. This information is continuously added to the IMR's research database. There is also a direct e-mail connection between each vessel and the IMR. In addition, the IMR has access to data from the vessel monitoring system (satellite tracking) operated by the Norwegian Directorate of Fisheries. The Reference Fleet may also be requested to make specific observations and collect urgently needed data, and could also be used to collect environmental- and hydrographic data if it does not hamper the normal fishing activity. The Reference Fleet makes it thus possible for the IMR to be in the right place at the right time.

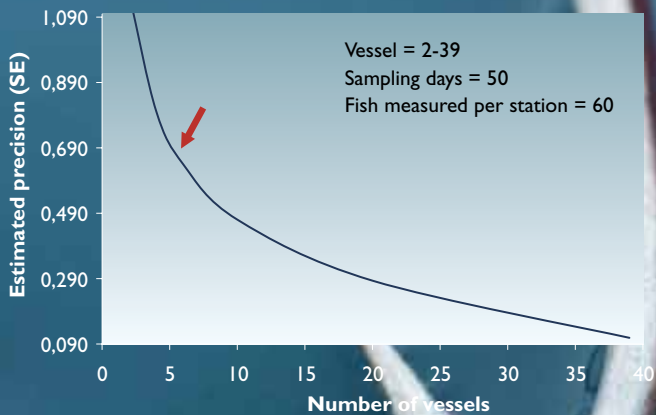
¹⁾ 1) On all high-seas vessels and selected coastal vessels.



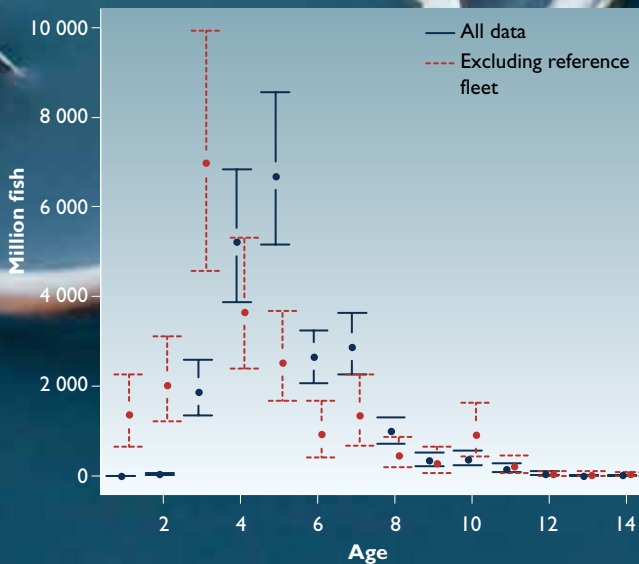
The figure compares the catch of tusk per hook north of 62°N (ICES Sub-area IIa) for the Reference fleet's 4 longline vessels (red curve) with the entire Norwegian longline fleet (34 vessels) in the same area (blue curve).



Quality control of temporal and spatial coverage using VMS data. The blue dots illustrate the Norwegian mackerel fishery in October with the red dots showing the Reference fleet. The yellow circle shows the area with highest catches.



Sampling from a sufficient number of fishing vessels matters most. The figure example shows the estimated precision of the mean length in the ling fishery. The arrows denote current sampling.



Catch-in-numbers-at-age of Northeast Arctic haddock incl. coefficient of variation, with and without data from the Reference Fleet, as input for stock assessment.

A USEFULL DATA COLLECTION PLATFORM FOR MANY PURPOSES

- The Reference Fleet is the only fisheries sampling program controlled by the IMR for collecting data on discards and bycatch.
- Results are mainly used for assessment purposes, e.g. for estimating total catch in tonnes by length and/or age groups in numbers, and hence improves stock assessments and fisheries management.
- Enables IMR to allocate commercial catch sampling resources in time and space in a sound statistical way, and may thus provide higher temporal and special coverage for increased precision.
- Provides observations of sea mammals, sea birds, crabs etc.
- Contributes to determining the effects of regulations, which again may lead to more practical and purposeful regulations.
- Provides continuous information and specimens from species that are rarely covered by research vessels (e.g., deep water species and near coast fish populations). This has led to new species being discovered in Norwegian waters.
- A platform for testing official catch data collecting systems and procedures (e.g. electronic logbooks, reporting- and grading systems, discards).
- Updates scientists on technological developments in the fisheries.
- Reduces controversies and fosters a joint “ownership” spirit for data and results.
- Allows for fishermen’s knowledge to become available for fishery research and management purposes.
- Assists in designing projects to meet specific needs and can be adaptive.

SOME CONCERNS

- Too few vessels to cover the complexity and size of the Norwegian fishing fleet.
- Vessels are recruited through a tender process which may compromise the representativeness of the sampling scheme.

Provides better insight and builds a common understanding





KEY FACTORS

REPRESENTATIVENESS

- Diagnostics based on catch composition compared with other sources of fisheries data indicate that the Reference Fleet data are representative.
- The Reference Fleet’s fishing behaviour in time and area is compared with the whole national fleet by using VMS data.
- Catch-per-unit-effort (CPUE) of the fleet is compared with other national vessels belonging to the same métier.

OPENNESS

- There exists an understanding with the Coastguard, IMR and the Directorate of Fisheries not to prosecute Reference Fleet vessels over data provided under the Reference Fleet program. This provides a good measure of protection for the vessels of the Reference Fleet and to date there have been no issues in this regard.

QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

- Institute personnel aim to make a visit on board the vessels at least once a year.
- Sampling protocols.
- Technicians as supervisor/mentor for 1-5 vessels each including responsibility of QA/QC.
- Regular testing of received data.
- Checking that sampling is conducted independent of catch size.
- Cross checking – comparison of sampling conducted with and without the presence of observers and inspectors.

TRAINING

- Annual meetings with vessel owners and crews at the institute including small workshops for species and sex identification, maturity staging, sampling protocols etc.
- Training on board vessels.
- Online communication by e-mail.
- Exchanging electronic photos by e-mail aides identification.

REGISTRATION OF DISCARDS

- A special code used on catches to indicate whether discards have been recorded/sampled or not.
- The crew is encouraged and paid to register all catch, including discards.
- A number of vessels in the pelagic fleet pump the catch directly into closed tanks, which makes sampling difficult at sea. In these instances sampling is done at the portside when the catch is landed.
- Discards may be estimated by comparing sampling at sea with sales notes and sampling at landing sites.

EXAMPLE OF THE VOLUME OF BIOLOGICAL SAMPLES:

In 2012, over 24 000 were collected from different catches and more than 150 species registered.

Species	Number of lengths measured	Number of length samples	Number of otoliths *	Number of otolith samples
Cod	72 109	3 037	10 527	644
Haddock	55 197	2 507	7 959	463
Saithe	35 867	1 810	4 523	335
Ling	18 719	1 296	1 400	146
Tusk	17 477	1 195	12	12
Golden Redfish	13 875	1 019	1 602	110
Greenland Halibut	9 262	645	762	57
Herring	9 553	295	280	66
Mackerel	5 962	289	1 581	33
Beaked Redfish	5 047	280	1 262	26

*Including scales which are collected and used for age determination of Norwegian spring-spawning herring.

INSTITUTE OF MARINE RESEARCH

Nordnesgaten 50 – Postboks 1870 Nordnes
NO-5817 Bergen – Norway
Tlf: 55 23 85 00 – Faks: 55 23 85 31
E-post: post@imr.no

www.imr.no

TROMSØ DEPARTMENT

Sykehusveien 23 – P.O. Box 6404
NO-9294 Tromsø – Norway
Tel.: +47 55 23 85 00

FLØDEVIGEN RESEARCH STATION

NO-4817 His – Norway
Tel.: +47 55 23 85 00

AUSTEVOLL RESEARCH STATION

NO-5392 Storebø – Norway
Tel.: +47 55 23 85 00

MATRE RESEARCH STATION

NO-5984 Matredal – Norway
Tel.: +47 55 23 85 00

COMMUNICATION AND

PUBLIC RELATION

Tel.: +47 55 23 85 38 – Fax: +47 55 23 85 55
E-mail: informasjonen@imr.no

CONTACT

Tom Williams
Mbl.: +47 924 00 116
E-mail: tom.williams@imr.no

Asbjørn Borge
Mbl.: +47 916 14 764
E-mail: asbjoern.borge@imr.no

Harald Senneset
Mbl.: +47 905 49 752
E-mail: harald.senneset@imr.no

