Masteroppgåver ved Havforskingsinstituttet 2019–2020
Possible master theses at the Institute of Marine Research 2019–2020

FG Bunnfisk – Demersal fish
Kontaktperson: Erik Olsen *(*erik.olsen@hi.no)
Vi arbeider p.t. med tilrettelegging av flere masteroppgaver. Sted: Bergen.

FG Fangst – Fish capture
Contact person: Svein Løkkeborg (svein.loekkeborg@hi.no)

Behaviour and welfare of herring and mackerel caught in purse seines. *The objective of this MSc project will be to describe and quantify the behaviour of pelagic fish (herring and mackerel) during their capture in purse seines and relate this to potential capture related stressors (e.g. hypoxia, crowding and net contact), to assess the potential impact upon the welfare of the catch. The candidate will use archived data and video from previous research cruises and will also have the opportunity to join a research cruise on a commercial purse seine vessel and collect further data.* **IMR-supervisors**: *Michael Breen, michael.breen@hi.no / Maria Tenningen, maria.tenningen@hi.no.*

Behaviour and welfare of herring (*Clupea harengus*) caught in trawl. *The main aim of this project is to describe and quantify the behaviour of herring inside a trawl (swimming speed, orientation, density, contact with the net walls etc.) and relate the behaviour to capture stressors and fish welfare (exhaustion and skin injuries). The student will use archived video footage collected in a previous research cruise to describe and quantify behaviour. In addition, they will use image analysis to quantify scale loss and skin injuries of trawl and purse seine caught fish. There will also be an opportunity to join a research cruise in 2019 for further data collection.* **IMR-supervisors**: *Maria Tenningen, maria.tenningen@hi.no, and Michael Breen, michael.breen@hi.no.*

FG Fiskeernæring – Research program Fish Nutrition
Contact person: Rune Waagbø (Rune.Waagbo@hi.no)

In principle, all our running research projects in the research program can be available for master student studies.

Investigating the requirements for micronutrients in Lump sucker (*Cyclopterus lumpus*). *IMR-supervisor: Øystein Sæle (oystein.saele@hi.no)*

Investigating the requirements for micronutrients in Ballan wrasse (*Labrus berggylta*). IMR-*supervisor: Øystein Sæle (oystein.saele@hi.no)*

Applying a gut sac model (from salmon) to investigate the impact of undesirables in feed, such as pesticides, on intestinal integrity. *IMR-supervisor: Øystein Sæle (oystein.saele@hi.no)*

Effects of n-3/n-6 profile on AGD development (OptiHealth project). *Altantic salmon smolts fed one of 4 combinations of n-3/n-6 ration diets are challenged with Neoparamoeba perurans and examined for progression of AGD, blood clinical markers and gill inflammatory marker expression (qPCR).* **IMR-supervisors***: Prof. Mark Powell (*mark.powell@hi.no*) and Nini Sissener (*nini.sissener@hi.no*).*

Effects of fatty acid/amino acid profile on Atlantic salmon responses to SAV infection (OptiNutr project). Atlantic salmon fed on different fatty acid/amino acid diets are bath challenged with SAV, and the progressive development of PD in fish fed different diet regimes are followed in samples of heart, pyloric caecae (pancreas) and other tissues by histology and qPCR. **IMR-supervisors***: Prof. Mark Powell and Nini Sissener (*nini.sissener@hi.no*).*

Kan fiskemelke eller fiskemelke-komponenter modulere immunresponsen hos atlantisk laks (*Salmo salar*)? En cellestudie. *Fiskemelke er en betydelig ressurs som kan ha stor innvirkning på fiskens helse og velferd som en funksjonell fôringrediens ved stressende hendelser som håndtering, vaksinering, når den er smittet med virus og bakterier, når fisken blir utsatt for miljøgifter eller en kombinasjon av disse stressfaktorene.*
HI-veiledere*: Elisabeth Holen (*elisabeth.holen@hi.no*) og Marit Espe (*marit.espe@hi.no*).*

FG Fiskeridynamikk – Fishery dynamics
Contact person: Jon Helge Vølstad [(jon.helge.voelstad@hi.no)](mailto:jon.helge.voelstad@hi.no)

Robustness-analysis of fishery dependent estimates. *The IMR run several sampling programs to collect data from commercial fisheries. An in-depth analysis on how robust estimates are to variations in sampling intensity from different gears, at different times and in different places, will provide important validation of estimates and has great potential to assist efforts in developing future sampling programs.*
IMR-supervisor*: Edvin Fuglebakk (*edvin.fuglebakk@hi.no*).*

Cath per unit effort indices. *Data sources contain information on total catch and fishing effort from commercial vessels, as well as meta-information about time, location and fishing-gear. The candidate will apply existing theory to analyse Norwegian fisheries-data.*
IMR-supervisor*: Edvin Fuglebakk (*edvin.fuglebakk@hi.no*).*

Time series analysis of survey estimates. *The survey estimates are traditionally used as input to assessment models, but there could be simpler models serving as alternatives to the assessment models, which are worth pursuing.*
Suggested contact*: Jon Helge Vølstad (*jon.helge.voelstad@hi.no*)*

FG Marin økosystemakustikk – Ecosystem acoustics
Contact person: Rolf Korneliussen (rolf.korneliussen@hi.no)

Bootstrapping of acoustic-trawl surveys. *Variance estimation of acoustic-trawl and swept-area survey estimates has received increasing attention with the on-going REDUS project (Reduced Uncertainty in Stock Assessment) at the IMR. Using the StoX software, the variance of the survey estimates can be estimated by bootstrapping echosounder and trawl data. This routine has however not been intensively tested with regards to number of bootstrap replicates, number of data points available and the stochastic nature of the data. Evaluating these bootstrap routines and suggesting alternatives would be a valuable contribution to the assessment of fish stocks.* **Suggested contact**: *Espen Johnsen* (espen.johnsen@hi.no).

Image analysis of echosounder and sonar data. *Machine learning initiatives have been initiated at the IMR for categorizing images of fish, seals and other organisms, and similar approaches are intended for acoustic data. Alternatively, traditional image analysis can be applied.* **Suggested contact**: *Nils Olav Handegard* (nilsolav@hi.no).

FG Oseanografi og klima – Oceanography and climate
Contact person: Jan Erik Stiansen (jan.erik.stiansen@hi.no)

Optimal plassering av oppdrettsanlegg basert på kunnskap om strøm og smittespredning. *Kandidaten vil fortrinnsvis benytte numeriske simuleringsmodeller for strøm og partikkelspredning til å gjennomføre scenarie-testing av ulik plassering av oppdrettsanlegg. Det vil også være muligheter for å delta på tokt og gjennomføre innsamling av hydrografi og strømdata fra felt.* **HI-veileder**: *Lars Asplin (lars.asplin@hi.no).*

Fornying av bassengvann i terskelfjorder i dag og i et framtidig klima. *Kandidaten vil gjennom å analysere resultater fra numeriske strømmodeller identifisere bassengvann-utskiftning og hvilke prosesser som fører til dette. Med strømmodellsystemet vil kandidaten manipulere ferskvannsavrenningen og teste i hvilken grad økt nedbør og ferskvanns-avrenning til fjordene vil påvirke utskiftningen av bassengvann.* **HI-veileder**: *Lars Asplin (lars.asplin@hi.no).*

Masteroppgave om strøm over terskel i Hardangerfjorden. *Havforskningsinstituttet har observasjoner som viser vertikal profil av strøm, temperatur og salt.* **Kontaktperson**: *Jan Erik Stiansen (jan.erik.stiansen@hi.no)*

FG Pelagisk fisk – Pelagic fish
Contact person: Aril Slotte (aril.slotte@hi.no)

Capelin stock-dynamics. *This can be explained by over-harvesting and predator-relation-ships, but some indicators also suggest effects related to intraspecific effects, that is effects on growth and spawning caused by the competition for food within the capelin stock. The candidate will develop mathematical models to explore hypothesis of how different con-straints on growth and spawning dictate stock dynamics.* **IMR-supervisors**: *Edvin Fuglebakk (edvin.fuglebakk@hi.no), Sam Subbey (sam.subbey@hi.no), Georg Skaret (georg.skaret@hi.no).*

FG Sjøpattedyr – Marine mammals

Contact person: Tore Haug (tore.haug@hi.no)

Analyser av allerede innsamlede data av hvalarter. *Kontaktperson: Nils Øien (nils.oien@hi.no).*

FG Økosystemprosesser – Ecosystem processes

Contact person: Mette Mauritzen (mette.mauritzen@hi.no).

Diettanalyser 0-gruppe torsk gjennom kritisk fase Skagerrak. *Innsamlet materiale, men studenten kan bli med på tokt. To oppgaver.* **HI-veileder:** *Tore Johannessen (tore.johannessen@hi.no).*

Endringer i bentos-biomasse i tid og rom; transekter – koble til miljøvariabel. *Innsamlet materiale, men studenten kan bli med på tokt.* **HI-veileder:** *Lis Lindal Jørgensen (lislin@hi.no).*

Hvordan varierer bredden i fiskediett – mellom individer/innen individer, lokalt og regionalt? *Innsamlet materiale, men studenten kan bli med på tokt.* **HI-veileder**: *Per Arneberg (per.arneberg@hi.no).*

Eksperimentelt oppsett for å teste konkurranse mellom stillehavøsters fucus-arter ift. kolonisering av hardbunn. *HI-veileder: Anders Jelmert (anders.jelmert@hi.no).*

Økosystembasert høsting av rekefjorder i Finnmark inkl. modelleringsverktøyet ECOPATH. *I dette prosjektet kan det bli aktuelt med masterstudenter i flere arbeidspakker.* **HI-veiledere**: *Guldborg Søvik, guldborg.soevik@hi.no, Kjell Nedreaas, kjelln@hi.no og Lis Lindal Jørgensen (lislin@hi.no).*

FG Reproduksjon og utviklingsbiologi – Reproduction and developmental biology

Kontaktperson: FG-leder Anna Troedsson Wargelius (annaw@hi.no).

I satsningsområdet **Bærekraftig oppdrett av marin fisk** kan vi tilby oppgaver innen reproduksjon og tidlige livsstadier på kveite og andre marine fiskearter som kan være aktuelle som kandidater for oppdrett. *Within the focus area «Sustainable aquaculture of marine fish», we have MSc thesis projects on reproductive physiology and early development of Atlantic halibut and other species that may be candidates for aquaculture.* **HI-veileder**: *Birgitta Norberg (birgittan@hi.no).*

FG Plankton

Kontaktperson: FG-leder Kjell Gundersen (kjell.gundersen@hi.no)

Two Master's projects will study **the feeding ecology of myctophids in the Northeast Atlantic Ocean.** *Samples have been collected during the "Mesopelagisk Irmingerhavet" cruise 2018 by the IMR. These projects will investigate and compare the diet change along the*

*longitudinal gradient and fish size. Resource partitioning, diet overlap and prey selectiveness will also be investigated. One project will study the stomach contents of smaller myctophid species (Benthosema glaciale, Myctophum punctatum and Protomyctophum arcticum) and a second project will study the stomach contents of larger myctophid species (Lampadena speculigera, Lampanyctus sp. and Notoscopelus kroeyeri). Laboratory work is a component for both projects. We are searching two motivated students that can work together on similar topics. Participation in a cruise to learn how sampling mesopelagic fish is optional. Both projects will require collaborating with the IMR. The projects are open to Master students in Marine biology, Biodiversity, Evolution and ecology, and Fisheries biology and management. **IMR-supervisor**: Eva García Seoane (eva.garcia.seoane@hi.no).*