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Pilot Study: 2J3K Atlantic Halibut Longline Survey and Tagging Program

Background:

Over the past few years, harvesters have reported increasing catches of Atlantic halibut (*Hippoglossus hippoglossus*) from both inshore and offshore areas of NAFO Divisions 2J, 3K and 3L, from southern Labrador and the northeast tip of the Northern Peninsula, near the Hawke Box and on the Grand Bank. Given the increasing biomass in recent years in both the Gulf of St. Lawrence (4RST) and in the southern Grand Banks and Scotian Shelf (3NOPs4VWX5Yc) stock areas, and given potential northern shifts in populations of halibut, research is needed to identify the level of mixing and movement among stock areas. Additionally, initial data is needed on relative abundance (i.e., catch rate data from standardized longline surveys) for the development of longline survey and tagging programs and to assess the development of potential emerging fisheries.

For both the Gulf and southern stocks, longline surveys and tagging programs were implemented to provide an estimate of fishable biomass. In part, this is because commercial-sized halibut are typically not caught in the DFO research vessel (RV) surveys. FFAW was instrumental in launching the Gulf-wide survey of Atlantic halibut in the Gulf along with DFO and fish harvesters' organizations from other provinces. FFAW led the development of industry-based longline surveys in the Gulf by launching two years of pilot longline and tagging programs. Data from these programs were used to develop the Gulf-wide longline survey and tagging program.

Halibut distribution and behaviour data, which was collected from a satellite tagging program led by Marine Institute researchers, was used to delimit the survey area in the development of the Gulf longline survey (e.g., Le Bris et al. 2018). Additionally, satellite data has proved instrumental in understanding movement and mixing within stocks and in the identification of discrete spawning areas and periods (e.g., Gatti et al. 2020).

This 2J3K halibut longline survey and tagging program will focus on:

(1) using standardized longline survey methods to estimate catch rates of Atlantic halibut and other species,
(2) collect bottom temperature data from halibut longlines to determine, what if any, associations between halibut and bottom temperature exist in this region,
(3) double-tag and release all sizes of halibut using standard floy/spaghetti tags,
(4) collect genetic samples for DFO and university collaborators that will contribute to understanding linkages to the Gulf and southern Grand Banks stocks, and
(5) use the longline survey vessels as platforms for satellite tagging of 15 Atlantic halibut by researchers at the Marine Institute of Memorial University.

Standardized catch rates from the longline survey, as well as bycatch data, will provide needed information for the development of emerging fisheries and in the costing and developing of a longline survey program. An all-sizes tagging program floy-tagging program would provide additional information on mixing and movement among stock areas as well as information that would be useful in the development of a longline survey and tagging program. All halibut will be double tagged and released as part of this project, following protocols consistent with tagging programs in adjacent stock areas.

Data from these efforts will be crucial for understanding linkages, if any, among the different Atlantic halibut management areas in the western North Atlantic. Fin clip samples will be collected that could be used to differentiate among halibut populations (e.g., Kess et al. 2021) and estimate halibut population size. Satellite tagging data from Atlantic halibut in the Gulf of St. Lawrence has been used to identify spawning periods and locations (e.g., Gatti et al. 2020), and to differentiate between spawning components (Shackell et al. 2021).

This initial survey will provide much needed data to help develop a stratified-random survey throughout 2J3KL, but in this first year the survey will be limited to one nearshore and one midshore/offshore charter per NAFO Division (2J and 3K). Longline stations will be a minimum of 5 nm between stratified random stations. Onboard fisheries technicians/observers will record the length frequencies of all Atlantic halibut captured as well as the catch composition on the 500 hooks (see example at-sea data sheet from used in the 4RST Atlantic halibut longline survey).

While earlier versions of this proposal included stratified-random stations in 3L as well as 2J and 3K, allocations will not be made available to offset some of the costs of the survey. As such, this proposal has been revised to focus in 2J and3K in the initial year because (1) satellite tagging in the Hawke Box would contribute to ongoing research priorities of CFER researchers and (2) because the survey areas in 2J and 3K are adjacent, making survey deployments less challenging. We recognize that this work needs to include 3L areas in future years.

The survey will also act as a research platform for related halibut research (e.g., satellite tagging and genetic sampling). We advised researchers at the Centre for Fisheries Ecosystems Research of Memorial University of the opportunity to use the longline survey as a platform for satellite tag deployments and we have committed to collecting genetic samples to contribute to ongoing genetic analysis of Atlantic Halibut. Both behavioural and genetic data are important for understanding movement and mixing of Atlantic halibut as there may be both genetic separation of major stocks (Kess et al. 2021) and behavioural subpopulations within

stocks (e.g., Gatti et al. 2020, Shackell et al. 2021). Researchers Dr. Arnault Le Bris and Dr. Jonathan Fisher plan to deploy 15 satellite tags on Atlantic halibut from these charters.

This initial survey will also collect satellite tagging and genetic data, which will contribute to understanding movement and mixing among stock areas. Taken together, these data will contribute to the design of a survey for Atlantic halibut along the northeast coast of Newfoundland and southern Labrador.

This work will contribute to research and management beyond 2J3K Atlantic Halibut along the northeast coast of Newfoundland and southern Labrador. The standardized longline survey can be used to collect information for longline-caught northern cod as well, a needed contribution to the FFAW-Fishery Improvement Program (FIP). Second, advertisements and fleet presentations for this and other halibut tagging programs may increase participation in tag return programs. Finally, inshore temperature data will be shared with the Oceanography section of DFO-Science.

Should we have opportunity to complete additional years of halibut longline surveys, our intention is to extend the work into 3L and to cover adjacent grounds in each of the NAFO divisions that we are unable to survey in this initial pilot program.

Proposal:

A pilot Atlantic halibut longline survey and tagging program would be realized during the 2022 fishing season with standardized sampling protocols, including 500 circular hooks per longline and soak times of 4 to 6 hours. Halibut tagging would follow the protocols developed for both the Gulf and southern stocks.

For the initial year, we are proposing 4 charters in the 2022 pilot program, with one inshore and one midshore/offshore charter areas in 2J, 3K, and 3L respectively. Example charter areas shown in relation to NAFO divisions, marine refuges, and land claim areas (Fig. 1), noting that the proposed survey area in 2J is outside and to the south of the Labrador Inuit Settlement Area.

Timelines:

Completion of the survey of 30 stations as per scientific protocol would be realized during September 1 – October 15, 2022. In preparation for this period, the opportunity would be advertised to eligible harvesters, with harvesters selected through a random draw process from all those that apply and meet the project criteria, as is standard practice with FFAW research programs. Project criteria will include access to line trawl gear sufficient for the project. A pre-season online workshop with selected harvesters would ensure all participants appraised of the project and protocols. Data would be provided to DFO Science (NL Region)

by February 2023. Information on the program will be discussed during winter 2022 fleet meetings. A summary of the research will be presented at the 2023 spring 2J3KL groundfish advisory.

Figure 1. Example charter areas in 2J & 3K

Methodology:

Sampling of stratified-random stations (Fig. 2 & Fig. 3) will be carried out using line trawl gear with a target soak time of 5 h. This soak time is calculated from the time the first hook enters the water until the first hook is retrieved from the water. Fishing is to be completed during daylight, with the first hook set no earlier than 5:00 am and the last hook hauled no later than 8:30 pm (Newfoundland Daylight Time). Multiple survey stations could be completed in a single day provided that the soak time limits (4-6 h) are met. As the gear is hauled, onboard fisheries technicians will record the status of each hook (baited or not) and will record the species caught.

For every halibut, cod and other flatfish caught, the onboard technician will record fish fork length. All Atlantic halibut will be double-tagged with standard-floy tags consistent with the methods used in the adjacent stock areas. Fin clips or other genetic material will be collected as per protocols provided by Dr. Bradbury.

No catch will be retained from these halibut charters. Instead, all species will be released in a manner to best ensure post-release survival.

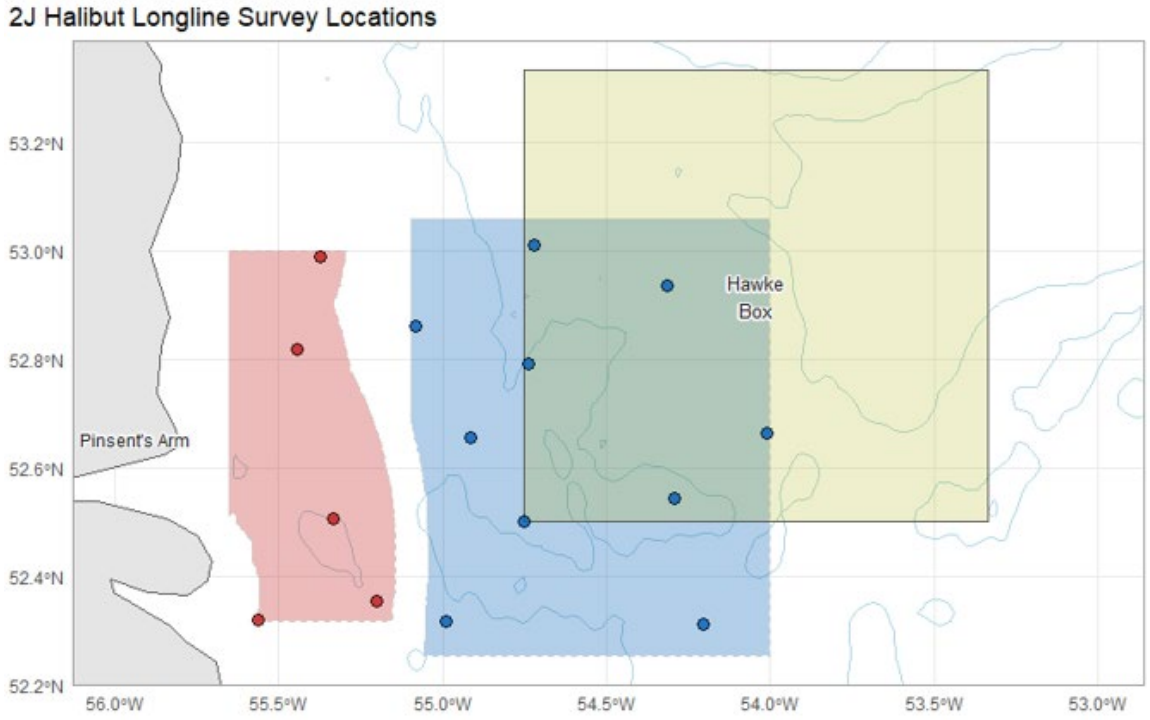

Figure 2. Stratified-random survey stations in 2J.

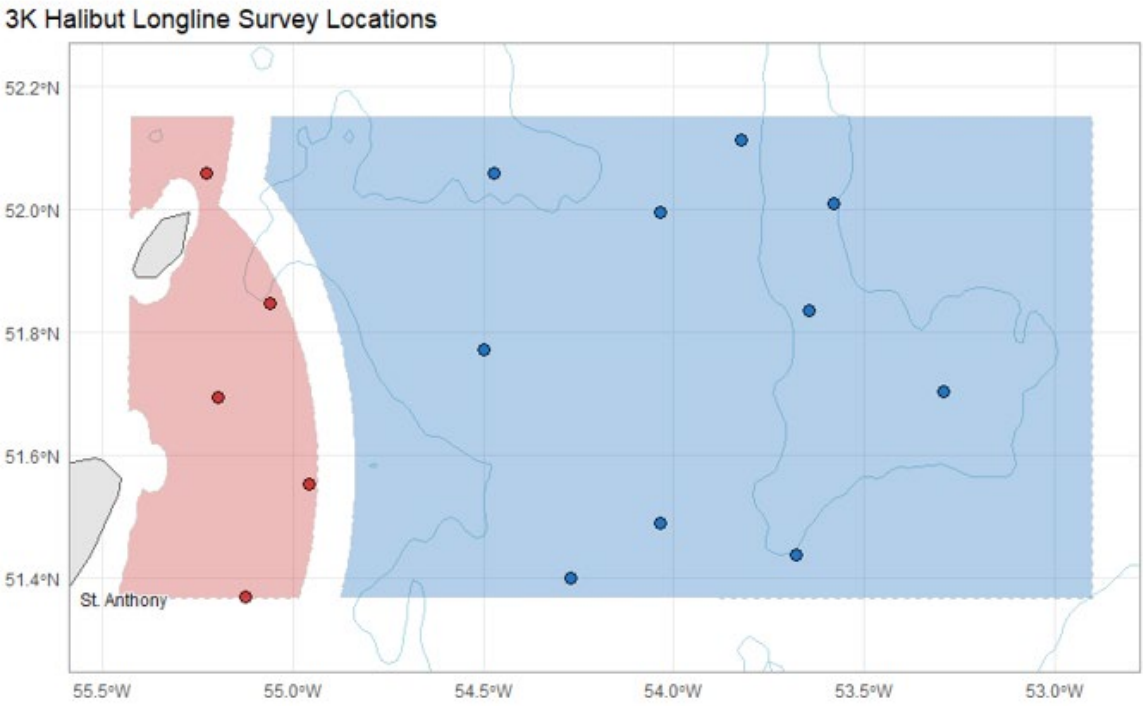

Figure 3. Stratified-random survey stations in 3K.

Deliverables:

Results from this project would include 1) halibut catch rate data from longline gear; 2) length frequencies of all halibut, cod and other flatfish caught; 3) detailed information of depredation levels (baited or unbaited hooks); and 4) catch composition. Tag release data will be provided to DFO Science. Additionally, this program will provide information on the bottom temperature as it relates to halibut catch.

Data from satellite tagged Atlantic halibut will be analysed by Dr. Arnault Le Bris and Dr. Jonathan Fisher. Genetic samples would be provided to Dr. Ian Bradbury (DFO Science).

All catch rate, tag release and return, effort and additional catch composition data will be shared with the Department of Fisheries, Forestry and Aquaculture of the province of Newfoundland and Labrador as well as DFO Science.

Responsibilities & Collaborations

Multiple partners are contributing to this proposal with researchers Dr. Jonathon Fisher and Dr. Arnault Le Bris from the Centre for Fisheries Ecosystems Research from the Marine Institute of Memorial University collaborating and contributing 15 satellite tags to the program, as well as deployment and analysis expertise.

Dr. Luiz Mello, DFO-Science, is a collaborator with DFO-Science and will be contributing to the program design and data analysis. Genetic sampling will be of no cost to the program and sampling kits will be provided by researcher Dr. Ian Bradbury.

The FFAW is contributing in-kind support through the work of the FFAW Fisheries Scientist, Dr. Erin Carruthers. Additional FFAW staff contributing to this proposal are at-sea Fisheries Technicians (who will be collecting data on catch rates, bycatch, length frequencies as well as catch and effort information), data entry and QA/QC work by support staff and coordination of draws, licensing and other logistics by the Project Coordinator.

References:

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