Fisheries and Oceans Canada | Pêches et Océans Canada
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Canadian Science Advisory Secretariat (CSAS)

Proceedings Series 2022/023

Newfoundland and Labrador Region

Proceedings for the Regional Peer Review for the Assessment of Divisions 2J+3KL and Subdivision 3Ps Herring, and Divisions 2J+3KL Capelin

Meeting dates: March 18-21, 2019
Location: St. John's, NL

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April 2022

Canada

Foreword

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Published by:

Fisheries and Oceans Canada
Canadian Science Advisory Secretariat
200 Kent Street
Ottawa ON K1A 0E6

http://www.dfo-mpo.gc.ca/csas-sccs/
csas-sccs@dfo-mpo.gc.ca

ISSN 1701-1280
ISBN 978-0-660-43268-7 Cat. No. Fs70-4/2022-023E-PDF

Correct citation for this publication:

DFO. 2022. Proceedings for the Regional Peer Review for the Assessment of Divisions 2J+3KL and Subdivision 3Ps Herring, and Divisions 2J+3KL Capelin; March 18-21, 2019. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2022/023.

Aussi disponible en français :

MPO. 2022. Compte rendu de l'examen régional par les pairs pour l'évaluation du hareng des divisions 2J+3KL et de la sous-division 3Ps, et du capelan des divisions 2J3KL; du 18 au 21 mars 2019. Secr. can. des avis sci. du MPO. Compte rendu 2022/023.

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SUMMARY

Divisions 2J+3KL Capelin was last assessed in 2018 (DFO 2018). Divisions 2J+3KL and Subdivision 3Ps Herring was last assessed in 2017 (DFO 2017). The current assessments were requested by Fisheries Management to inform the development of management measures for the stocks for the upcoming fishing seasons.

The Regional Peer Review process to assess Herring in Northwest Atlantic Fisheries Organization (NAFO) Divisions 2J+3KL and Subdivision 3Ps, and Capelin in Divisions 2J+3KL was held March 18-21, 2019 in St. John's, Newfoundland and Labrador. This Proceedings Report includes abstracts and discussion summaries of all presentations at the meeting.

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INTRODUCTION

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HERRING: INTRODUCTION & ENVIRONMENTAL OVERVIEW

Presenter: C. Bourne

ABSTRACT

South and east coast Atlantic herring are managed via five stock complexes: White Bay-Notre Dame Bay (WB-NDB), Bonavista Bay-Trinity Bay (BB-TB), Conception Bay-Southern Shore (CB-SS), St. Mary's Bay-Placentia Bay (SMB-PB), and Fortune Bay (FB). There are also herring present in southern Labrador and the southwest coast of Newfoundland but the stock affinity of those populations is currently unknown. Historically all five stock complexes were comprised largely of spring spawners, but during a period of warming in the late-1990s and early-2000s there was a shift in spawning stock composition, with fall spawner recruitment increasing everywhere except Fortune Bay – as a result, in recent years most stocks have been comprised of over 50% fall spawners. Recruitment of Atlantic herring is highly variable and driven by environmental factors. The increase in fall spawner recruitment was correlated with warming temperatures, but recent work in the Gulf of St. Lawrence has shown that plankton community dynamics also play a key role in driving both spring and fall spawner recruitment dynamics.

DISCUSSION

A participant asked if year class data would be presented. It was clarified that information on year class strength would be presented at a later point in the agenda.

HERRING: FISHERY

Presenter: C. Bourne

ABSTRACT

The current combined Total Allowable Catch (TAC) for 2J3KLPs is 14,842 t, approximately 38% of which was landed in 2018. Purse seines account for most landings; the fishery is most active during spring on the south coast and the fall on the northeast coast. Landings increased/were relative high in 2018 in Labrador, White Bay-Notre Dame Bay (WB-NDB), St. Mary's Bay-Placentia Bay (SMB-PB) and Fortune Bay (FB); decreases occurred in Bonavista Bay-Trinity Bay (BB-TB) and Conception Bay-Southern Shore (CB-SS) due to high percentages of

undersized fish in those areas. The age distribution of commercial samples in 2017 showed potential strong spring year classes entering the fishery in WB-NDB; age 5 herring dominated the catch in BB-TB, CB-SS and SMB-PB; the FB fishery was dominated by a single strong year class (2012 – age 6). Purse seine, bar seine, and gillnet bait fishers were contacted via annual DFO Science telephone surveys. Purse seine fishers reported low discards in WB-NDB, CB-SS and SMB-PB. Discards were high in BB-TB due to high proportions of undersized fish. Bar seine fishers in FB also reported high discards due to the speed of the 2018 fishery. There were an estimated 363 active bait fishers in 2018, about 30% of license holders. The bait allocation was only exceeded in one area – CB-SS. Estimated bycatch in the bait fishery indicated that mackerel made up a large proportion in 2018. Bait logbooks were made mandatory for herring fishers in 2017 but return rates are still relatively low. Most fishers surveyed felt that herring abundance had increased in 2018, with the exception of gillnet fishers in SMB-PB and FB.

DISCUSSION

There was discussion about the methodology for collecting commercial herring samples. The point of contact in Labrador has changed annually in recent years, which has made it difficult to obtain commercial samples. At present, collecting samples is not a task asked of fishery observers though this may be explored in future years if obtaining commercial samples from Labrador continues to be problematic. The outlook for obtaining samples in 2019 appears promising.

A participant asked if there were any other sources of commercial samples collected other than processing plants and if there may be selection bias. With the exception of a small number of harvesters who provide samples from the dock, all other samples are sent from processing plants. It was acknowledged that there is potential for bias but it is fairly easy to detect and there is a low overall occurrence of biased samples (one to two samples each year).

There were a number of observations of undersized herring in commercial catches and discards. A participant commented that the number of discards in the data included sets on undersized fish that were subsequently released. It was explained that discards of undersized fish are partially accounted for in the assessment by including a question in the annual phone survey on perceived survival rates of the discards. Survival is influenced by how tightly the seine is pursed and how much it is drawn up but overall estimates of survival are low (75-85% mortality across all stocks). Mortality may not be immediate, occurring several weeks after being caught.

A participant commented that discards are treated differently by gear in other regions such as full retention of the catch (including undersized fish). Harvesters are not paid for undersized fish but the proceeds are put to other use (e.g. research projects, restoration), accounted for in the quota, and the survival of discards is known (0%). In other pelagic fisheries, once Fisheries Management is made aware of high discard incidences the fishery is closed. This is often harvester driven, such as with capelin, when fishing stops due to the abundance of small fish (with fines for >20% undersized fish in the catch).

Several participants voiced concern that the large numbers of undersized herring are not reflected in the surveys or commercial samples. One individual noted that in 2018 several sets could not be landed because small and large herring formed mixed schools. It was observed that there was a high abundance of 2-4” and 7-8” sized herring in schools so sets were not landed and these data were, therefore, not included in the stock assessment. It was clarified that data from the research gillnets are weighted more heavily than the commercial samples in the stock assessment as they catch a wider range of sizes including undersized fish. It was also clarified that commercial samples are collected to determine catch composition of landed fish

and are not expected to provide data on undersized fish. It was also noted that the presence of any age two and age three herring in the commercial samples reflects the high abundance of these age classes in the population as these young age classes are not a target for the commercial fishery.

When the L50 (length when 50% of the population is mature) was calculated in 2017, fish of all sizes were necessary and there was a concerted effort to collect undersized fish from harvesters including sending kits for sample collection. Now that the L50 is due to be updated, it may be time to distribute these sample kits again. Purse seiners would be the ideal gear type to collect samples because there is no size selectivity (gillnets target age 4+ herring). Harvesters were encouraged to collect a sample from sets that would otherwise be released due to a high abundance of undersized fish.

White Bay-Notre Dame Bay (WB-NDB) and Bonavista Bay-Trinity Bay (BB-TB)

A participant inquired about the high number of age 2's and 3's in White Bay-Notre Dame Bay (WB-NDB). It was explained that size is usually more similar between years within areas but there were more small fish in 2017 in WB-NDB. A participant questioned if more of these small fish were discarded in BB-TB than in WB-NDB. Large number of age 11+ fish may have made up the bulk of the catch but the rest could have been the small, young fish. It is unlikely that landings could occur with greater than 20% undersized fish, so the difference in landings between the two stock complexes may have been a reflection of the distribution of fish in the bays in 2017 and where/when fishing occurred.

Conception Bay-Southern Shore (CB-SS)

It was clarified that a fall fishery was not conducted in 2018 due to the mixing of legal and undersized fish. Poor weather was also a factor in November that prevented fishing. It was reiterated that in 2017 the purse seine TAC was landed because the large and small herring separated into schools.

St. Mary's Bay-Placentia Bay (SMB-PB)

A participant asked why there was a large drop in older age classes (>age 8) and if this could be due to the commercial fishery. Age composition changes annually, possibly due to migration patterns with herring moving south from Conception Bay. Age 7 fish were not detected in 2017 but there was a small sample size (n=2) and both samples were collected in the fall. A participant also asked for clarification of which gear types collected commercial samples. Commercial samples are collected from each gear type in each bay for each month that fish are landed. The goal is to obtain proportional representation of landings by gear type.

Year to year differences in abundance seem to be greater in SMB-PB than other regions, likely driven by migration. During the spring multi species surveys, it was observed that more herring than usual were found offshore in 3Ps in 2005-07. In recent years the offshore abundance has decreased overall and shifted towards the Burin Peninsula. It was noted that timing of the survey relation to this migration may be an issue.

Fortune Bay (FB)

A participant asked whether there was evidence of another large incoming year class given the large number of discards thought to be composed primarily of undersized fish. There is no indication of another large year class in the research gillnet program (RGN) program (data only available through 2017). There is concern that fish may be smaller at age. During the last assessment it appeared that size at age had decreased but it was not statistically significant. If

more data was available this may produce different results. A participant asked what the likelihood of survival was for fish discarded in FB. Estimates from harvesters from the phone surveys range between 10-100% survival but these estimates are subjective. There were observations of large numbers of dead herring where bar seining occurs and there are ongoing discussions of the perception of survival between the gillnet fishers and bar seiners. It was noted that there were high trap landings in 2017 in PB, which is not a size selective gear, but most harvesters are now transitioning to bar seines.

Bait fishery

Logbooks in the bait fishery were discussed including both return rates and data reporting. Returns increased in 2018 compared to 2017, when logbook returns became mandatory. An observation was made that a very low or zero-catch may not be reported in the logbooks due to the perception that this information is not meaningful. It was stated that all effort, regardless of catch, needs to be reported. It was noted that in the Maritimes Region, harvesters are not able to access their licence if they do not return their logbooks. While this would likely improve return rates, this policy is not used in the Newfoundland Region. Electronic logs are not yet an option but will likely be coming in future years, which may increase compliance. Electronic logbooks are currently being tested in other regions for the mackerel and herring fisheries on a per trip reporting basis.

A participant asked if the 1,500 bait licences includes all harvesters and what percentage of license holders are active. Approximately 40-45% of licence holders are active, estimated from the phone survey responses. It was suggested that the timing of logbook delivery (with the licence vs. mailed) may have an impact on whether logbooks are used. A participant commented that early delivery may result in the logbook being set aside until the fishery opened, at which point it may be forgotten or misplaced. Majority of harvesters using bait are inshore lobster harvesters so the primary focus of the bait logbook return is centered on these individuals.

By-catch in the bait fishery is self-reported via phone surveys; reported 2018 by-catch was similar to 2017. A question was asked if the size of the mackerel caught as by-catch are reported. It was confirmed that only the total weight caught was reported and no further information was collected. It was suggested that the high number of mackerel caught in Notre Dame Bay (NDB) in 2018 may have been from the 2015 year class.

HERRING: BIOLOGICAL INFORMATION

Presenter: C. Bourne

ABSTRACT

The length at age of spring spawners peaked in the late 1970s, declined through the 1990s, stabilized in the early 2000s and increased slightly in the 2010s (when pooled for all stock areas). There is not enough data to preform a similar analysis for fall spawners as their numbers were low up to the mid 2000s. There was no significant difference in size at age between spring and fall spawners through the 2000s.

DISCUSSION

The size at age metric was discussed including how it was calculated, hypotheses for the decline in recent decades and differences in trends between the stocks in eastern Newfoundland and across the Northwest (NW) Atlantic. It was clarified that the data presented

were the length at age for all south and east coast Newfoundland stocks combined, although weight at age followed the same trend. This metric was evaluated in the 2017 assessment, and it was determined there was no significant differences among stocks.

Declines in length at age in eastern Newfoundland stocks may be associated with abundance, which also declined in the 1990s, and changes in the environment. Declines in length at age were observed across the full range of sizes and were similar between the spring and fall spawners. At this time, potential causes have not been closely examined in Newfoundland. A participant asked if condition of herring was recently examined. Condition was last evaluated several years ago but significant declines were not observed. It was suggested that this be revisited in future research efforts.

In the Gulf of St. Lawrence, length and weight at age has steadily declined in both the spring and fall spawners although the rate of decline was different. It was noted that spring spawners in the Gulf region are generally smaller than fall spawners. Unlike in Newfoundland where length at age stabilized in the 2010s, it continued to decline in other regions of the NW Atlantic. It was suggested that the recent stabilization of length at age may be due to the large percentage of spring spawners in Newfoundland.

A participant noted that if there was no increase in abundance then the decrease in length at age must be a genetic change, not enough resources to grow, or both. It was also suggested that fishery-induced selection, removing the larger individuals from the population, may be causing the decline in length at age. It was also noted that fishing pressure is higher in other parts of the NW Atlantic.

An observation was shared that the smallest herring caught of legal size, 9.75”, were full of spawn. The legal size, 9.75”, was determined by the length when 50% of the population is mature (L50) which was set at the 2017 assessment. Herring of this size are estimated to likely be age 4’s with most herring maturing between ages 3 and 4. Although the L50 was not updated this year, the age at maturity has also declined in recent decades so fish are spawning at smaller sizes compared to the 1980s.

HERRING: RESEARCH GILLNET PROGRAMS

Presenter: C. Bourne

ABSTRACT

The spring research gillnet program has been running in BB-TB and FB since the early-1980s. During the program fishers set a fleet of standardized gillnets for six weeks, collecting catch rate and biological data that is used to evaluate stock status. A similar program was also run in PB in 2018 via the Coastal Baseline Program, the results of which could be used to extend a historical time series and evaluate stock status. In BB-TB the stock status index declined in 2016 and again slightly in 2017, however potential strong recruitment of spring spawners indicate positive future prospects. Given these contrasting trends, the stock status evaluation is uncertain. In PB catch rates were just above the reference period mean but the age distribution was largely dominated by age 5 and 11+ herring with no indications of strong recruitment; given these trends the stock status is uncertain. In FB catch rates have been well below the reference period mean throughout the 2010s and the catch is dominated by a single strong year class (2012) with no indications of further strong recruitment. The FB stock status index did increase slightly in 2017 due to the entry of a strong year class into the fishery, however given the lack of further recruitment, the stock status in negative.

DISCUSSION

A participant asked how the nets are fished and effort is calculated. Nets are checked once a day for a 45-day period with two samples of 55 fish collected each week. Detailed catch logs are maintained including catch rate calculations based on days fished, set duration, etc. It was also asked why a 3” net was used, suggesting that this may result in high salmon bycatch. When the program was launched in the 1980s five mesh sizes were used, ranging from 2-3” in 0.25” increments, to collect all commercial sizes of herring. The 2” minimum mesh size was selected because it targets the minimum commercial size herring. All bycatch in the RGN program is recorded though there is little overall bycatch.

A question was raised about how herring were designated as either spring or fall spawners. Spawner designation is determined both by the otoliths and stage of gonads (stage 1-8). The otolith centers of the spring and fall spawners look different so the otoliths are aged and the gonads examined to confirm the designation. This was evaluated during the last assessment, recognizing that other regions use different metrics such as GSI (gonadosomadic index). Even considering the possibility of summer spawning, this method consistently made the correct designation of spawning component.

A discussion followed regarding if the RGN program effectively sampled both spawning components and if spring and fall spawners could be considered two different stocks. The RGN program was designed when spring spawners were dominant and was meant to intercept spring spawners when they returned to the bays. There was a question of whether catch rates dropped because the timing of the RGN program no longer matched when the majority of fish were in the bays due to the increase in fall spawners. Ideally, the RGN program would be conducted in both the spring and fall but, logistically, this is difficult due to harvester availability. For a short time, the RGN program was conducted in the fall but it is not known if catch rates tracked between the two spawning components. There were also issues with consistency in the fall RGN program due to difficulties finding/retaining harvesters that were both active in the fall and willing to participate. It may become increasingly more difficult to maintain the program going forward due to low harvester recruitment and participants aging out of the fishery.

Whether the spawners comprise different stocks is hard to determine because the spring and fall spawners never completely separate, a characteristic that is unique to the NL region. In other areas, like the Gulf and Maritime regions, the spring spawners move into spawning areas separately from the fall spawners so fisheries occur on different spawning components.

Bonavista Bay-Trinity Bay (BB-TB) and Placentia Bay (PB)

An observation was made that in the 1970s, herring were abundant in TB and virtually absent in PB (though lobster fishing was good) while presently it seems this is reversed. It was reiterated that migration patterns strongly influence the PB stocks.

Fortune Bay (FB)

It was asked why the spring/fall spawner index could not be applied to FB. The landings in FB are still up to 90% spring spawners. This method was attempted for the region but, because so few fall spawners are present in the catch, year classes could not be tracked consistently. The RGN does track the spring spawner year classes in FB but there is no evidence of a strong recruitment following the 2012 year class. A participant asked if the FB data has been compared to the Gulf. The age distribution of Division 4R actually tracks better with the fluctuations observed in the Gulf, and its likely that FB reflects characteristics of both the Gulf and other stocks of eastern Newfoundland.

In the 1980s, both the spring and fall spawning components were fairly equal in terms of abundance but prior to and since then there have been few fall spawners in FB. It was clarified that the spring spawners remaining aren't necessarily stronger than the fall spawners, just that there is an absence of strong recruitment of fall spawning herring. It was proposed that the main theory explaining this observation would likely be temperature. It was asked if FB remained colder than the other bays. It was confirmed that the Labrador Current likely affects the northern stocks more heavily than the south but that inshore temperatures were not available for comparison. It was suggested that in the future temperature loggers could be added to the RGN program to try to compare inshore microclimates.

STOCK STATUS

There was a request for further clarification of the three metrics used to generate the stock status index. The way each metric was scored was determined by the percent of the time series mean (i.e. a decline is scored as a 0, a 10% increase would be given a 1 and an increase of 200% would be given a 10). All three metrics were assigned a score between 0-10 which was then averaged to determine a final value. It was asked if the index values shown in the current stock evaluations (ranging from 0-1.2) were out of a possible score of 10. It was clarified that this value has never been treated as an absolute value. While these could be considered low, without a spawning stock biomass (SSB) estimate, these values are relative. In order to get a value of 10, this would mean catching twice the amount that was caught the year before and all year classes were above average for a number of years.

Concern was raised that the three metrics were not independent. It was confirmed that metrics one and two were not entirely independent (metric one being the catch rates as a percentage of the mean from a reference period for ages 4-10 while metric two is the same calculation for ages 7-10).

Bonavista Bay-Trinity Bay (BB-TB)

A participant questioned how conflicting signals were interpreted (e.g. a strong recruiting year class but a negative trend). The decline in the index value is attributed to declining catch rates from 2015 to 2016 but there are signs of good spring spawner recruitment so the status remains uncertain.

It was noted that while catch rates are available through 2018, otolith ages from the RGN program are available to 2017. If the age breakdown of the catch is known, it is possible the signals (catch vs. year class) would no longer be in conflict. It was noted that because catch rates were known for 2018, it is likely there will not be a large variation in the status of the stock next year (2019). This could be added as a qualitative observation in future assessments.

Fishing pressure in eastern Newfoundland is lower than in other regions (e.g. Gulf and Maritimes) so the large year classes in Newfoundland maintain a strong presence for successive years whereas in the Gulf region there can be indications of good recruitment but the commercial size fish do not show up in the surveys.

It should be noted that uncertain stock status means only the absence of a negative or positive designation. The timing of spawning is also a source of uncertainty. There was consensus to accept an uncertain designation for BB-TB.

St. Mary's Bay-Placentia Bay (SMB-PB)

A question was asked about the likelihood of the survival of the small fish observed in the bays. The general theory is that once herring mature past the larval stage, the survival bottleneck has

passed. If small fish did not 'show up' in the RGN/fishery, it would have to do with a natural mortality event that occurred between that time and when herring reach about age 4 (recruitment age). In recent years, when the small fish appear in the bays they generally appear in the fishery. It was also suggested that the timing of any potential herring acoustic survey be in March to better match harvester observations of peak abundance.

There was concern raised about the uncertain designation for the PB stock status index given harvester observations of high abundance. It was acknowledged that this observation is consistent with the above average catch rates in PB (TAC taken in 10 days) but that recruitment was below average. The uncertain stock status designation is not based on the number of fish but the age distribution and recruitment from the RGN program. At present, a positive designation is not possible because there is only a single strong year class and no signs of strong recruitment but this may change after more data becomes available. The RGN program in PB will likely continue to run for the next four years so increased recruitment may be observed in future years. This will be up for discussion at the advisory meeting but stock status is not negative or cause for concern at this time.

A question was also raised how PB and St. Mary's Bay (SMB) could be combined into a single stock evaluation when PB has high abundance while SMB has low abundance. As recruitment in PB is low, stock status is uncertain for SMB-PB. It is likely that zooplankton availability and the environment are important factors in driving herring population dynamics and, if predators are present, it is possible predation may impact populations.

It was asked if herring have antifreeze proteins like cod. Herring do not have this protein but, generally, die-offs are not related to temperature. Herring larvae are more susceptible to temperature fluctuations than adults which may explain why spring numbers are low.

The uncertain designation of the SMB-PB stock complex was accepted, acknowledging that this designation may change as more data becomes available in the coming years.

Fortune Bay (FB)

A question was raised about how long a trend must be maintained in order to change the designation. Historically a pattern must persist for four to five years to detect a change in the trend to avoid being skewed by a single, particularly strong year class.

The negative designation of the stock status for FB was accepted.

HERRING: REVIEWER REPORTS

Presenters: F. Turcotte and A. Smith

It was acknowledged that limited sample sizes for the RGN program and a lack of spawning stock biomass data makes it difficult to assess the herring stock complexes. The biological parameters and environmental measures currently in place are good.

There were concerns that the stock complexes were defined by historical tagging studies in the 1980s, based largely on the then-dominant spring spawners. There may be a latitudinal gradient with distinct genetics unique to spring and fall spawners. Stock delineation is a significant source of uncertainty and should be re-evaluated as it may have changed over time and/or with the shift in dominant spawning component. There was discussion about possible methods to determine stock complexes. Tagging studies are not ideal due to poor recapture rates and genetic work of this scale is expensive, but acoustic tags have been used in other areas with some success.

It was asked if the *Teleost* records acoustics during the multi-species survey and if this data could be processed for herring abundance. Acoustics are regularly recorded during these surveys but the data has not been analyzed. Ideally the herring acoustic survey would resume but it would likely be only a single instance rather than a return to annual surveys due to funding limitations. A participant also asked if any modelling had been done in the past. Historically, VPA (virtual population analysis) based on acoustic surveys and the RGN program were completed every other year in each region to estimate SSB. Flicka and ADAPT models were also attempted in the past.

Suggestions from the reviewers included finding other measures of effort to determine catch per unit of effort (CPUE) in the commercial fishery (similar to the phone surveys and logbooks in the bait fishery), restoring the RGN program to the other bays and exploring the use of larval indices for herring. It was noted that the Gulf Region has used larval indices with some success to estimate recruitment. Reviewers encouraged further examination of the fishery in FB to determine why discards were nearly three times higher than landings.

Reviewers also expressed support for opportunistic sampling of undersized herring by purse seiner harvesters to try gain more information about the upcoming year classes.

HERRING: RESEARCH RECOMMENDATIONS

- Model recruitment of spring and fall spawners using Atlantic Zone Monitoring Program (AZMP) data similar to Brosset et al. (2019).
- Collect samples of small fish from seiners to update L50.
- Investigate the possibility of having observers assist with collecting samples during the commercial fishery.
- Analyze changes in size at age in more detail, as well as condition (e.g. by stock, by season).
- Analyze existing inshore temperature time series data series and/or add temperature loggers to nets in the Research Gillnet Program to investigate differences between bays.
- Age the most recent Research Gillnet Program samples in advance of the next assessment.
- Restore Research Gillnet Program to WB-NDB and CB-SS; potentially begin a similar program in Labrador.
- Reinstate regular acoustic surveys.
- Investigate stock delineation further to 1970s/1980s tagging studies through other methods (e.g. genetics, acoustic tagging) as there have been significant changes in stock composition and previous study results may no longer be valid.
- Analyze effort in the commercial fishery through logbooks, telephone surveys, etc.
- Develop a pre-recruit index (age 1 to 3).
- Analyze the use of acoustic data collected during multispecies surveys to identify herring.

CAPELIN: ENVIRONMENTAL OVERVIEW

Presenter: G. Maillet

ABSTRACT

In 2018, the biomass of chlorophyll a in the first 100 m of the water column was above normal across NAFO Divisions 2J3KLNOPs for the first time in nine years. Positive chlorophyll-a anomalies observed in the past two years were associated with a return to above normal levels of nitrate in the deeper layers (50-150 m) of the ocean in 2016-17. However, the low deep nitrate inventories observed across the shelf in 2018 may negatively affect chlorophyll biomass in the water column in 2019. Spring bloom indices derived from satellite data indicate that surface phytoplankton production was below the 1998-2015 climatology across the region for a fourth consecutive year, with blooms occurring slightly later than normal. Zooplankton biomass increased approximately 50% compared to the lowest levels of the 20-year time series observed during 2015-17 but remained below the long-term average in all NAFO Divisions except in 2J, where biomass reached above normal levels for the first time in seven years. Total zooplankton abundance continued significantly above normal across the Grand Bank and southern Labrador Shelf for a fourth consecutive year with high abundances of small copepods (*Pseudocalanus* spp. and *Oithona* spp.) and amphipods, while the abundance of large calanoid copepods (*Calanus finmarchicus*) and euphausiids was mostly below normal. Observations indicate a change in the size-structure of the zooplankton community driven by a overall decrease in the abundance of large, energy-rich, copepods (*Calanus finmarchicus*) concurrent with an important increase in the abundance of small copepod taxa such as *Pseudocalanus* spp. and *Oithona* spp.

DISCUSSION

Data trends and the suitability of temperature as an environmental indicator for capelin was discussed. Historically there was a focus to define temperature trends across sampling sections of the Atlantic Zone Monitoring Program (AZMP), with slope water embedded, and results partially integrated. Approximately 90% of the stations were located on the shelf with minimal deep-water coverage. Trends were relatively similar across sections but may be variable outside of the slope water region. A participant asked if any of the indicators shown may potentially impact capelin. Beach spawning for capelin ends at 12°C. Warmer, inshore waters early in the summer may lead to increased demersal spawning, which has lower egg survival rates than beach spawned eggs. Since 1990-91, capelin observed in the spring acoustic survey have remained below the cold intermediate layer (CIL) so the depth of this layer may affect their distribution.

It was noted that more thermograph data will be available for inshore areas (five to seven stations) which provides more holistic coverage (deployed late spring through early fall) and will fill in gaps in oceanographic data inshore. Conductivity temperature depth (CTD) profiles have been completed in the inshore areas in the past but thermographs provide continuous data. A participant questioned how well the Station 27 mooring represents conditions on the coasts of Newfoundland. The physical oceanographic conditions are similar but the biology is much more variable. At present there are no resources available for additional fixed sampling stations. Ideally multiple stations would be available with broader spatial coverage.

Prior to 1999, there was no information available on the biogeochemistry of the region. Some studies on northern cod in 1992-95 looked at chlorophyll-a (chl-a) nutrient distributions but these data are not presented because it wasn't part of the standard monitoring program. Recently there have been unusual environmental conditions including heavy sea ice. Biological indices

reflect these physical anomalies with extremely high ice algae (chl-a) levels. There was a shift in phenology of copepods in 2006 with an increase in small-bodied copepods and decrease in large copepods, such as *Calanus finmarchicus*, in the Gulf of St Lawrence, Scotian Shelf, and across the NW Atlantic. These trends are relatively consistent over large scales.

CAPELIN: FFAW INDUSTRY SURVEY RESULTS

Presenter: E. Carruthers

ABSTRACT

The 2018 2J3KL capelin fishery was expected to be very poor based on data and analyses presented at the 2018 assessment and based on the 2017 season. However, the 2018 fishery was better than anticipated, with reports of spawning capelin much more broadly distributed than in recent years. Fish harvesters' knowledge includes information not only on catches and distribution of target species during a fishery but also observations and insights from their cumulative time on the water.

The objectives of this study are two-fold:

1. Document harvesters' observations and interpretations from the 2018 fishery, including observations of capelin size, distribution and abundance; and
2. Identify collaborative opportunities to contribute improved capelin assessments.

Twenty-seven capelin harvesters were interviewed in January and February of 2019. Harvesters were interviewed from Conception, Trinity, Bonavista, Notre Dame, and White Bays. Nineteen harvesters were interviewed from the fixed gear fleet and the remainder were from the mobile gear fleet. On average, harvesters had over 30 years of experience fishing capelin. In 2018, an abundance of capelin was seen one to three months before the capelin fishery when travelling to offshore fishing grounds, and in Conception, Trinity, Bonavista, and Notre Dame Bays. Harvesters reported large aggregations of capelin, which were described in terms of the depth (e.g., 14-50 fathoms) of capelin on sounders or sonars. Harvesters reported catching larger capelin in 2018. When compared to 2017, seven of 10 of harvesters had lower counts - meaning larger capelin - in 2018. During the 2018 fishery, the number of sets needed to land the daily limit or quota was lower and search time was reduced. Most interviewed harvesters expressed interest in collecting additional information and contributing to collaborative research. Data collection such as using a fish harvesters log to record the location, abundance and extent of capelin before during and after the fishery, could potentially help reconcile differences in capelin abundance and stock status.

DISCUSSION

Concerns were raised regarding how harvester interviews compared with capelin count data obtained from processors, particularly over the past five years. Harvester impressions were based on observations of fish size, number of sets, and the size/number of aggregations in the bay. The source of processor count data wasn't clear. The results of the industry survey were different in 2018 compared to the previous five years with larger than usual catches in Conception Bay and favorable catches across most regions in 2018. Relative to the last three to four years, 2017 was an anomaly.

A participant asked how echosounder data was collected from harvester vessels and if it could be extracted in raw form for independent analysis. Echosounder images were taken either as screenshots or on phones so it is not possible at this time to pull any data. A suggestion was

made to explore ways for DFO Science to collaborate with harvesters in order to obtain data that is already being collected by the commercial fishery (e.g. uploading acoustic data directly online for science access).

It was noted than in other regions there are collaborative efforts between DFO Science and industry to collect acoustic data on pelagic fisheries. In the Gulf Region, a harvester is hired to conduct an acoustic survey on herring spawning grounds both before and after spawning, using a systematic design with transects and calibrated scientific echo-sounders. It was acknowledged that opportunistic data collection is difficult to integrate into an assessment but may be useful to explore in lieu of a formal survey moving forward. Unlike the Herring Science Council in the Maritimes, which has a dedicated technician, funding and staff availability to process acoustic data is limited in the NL Region. Timing of data availability may also be an issue (summer observations not useful/available for spring assessment).

A participant asked how catch and effort are estimated, particularly when more than one set is completed in a day and if the catch of each set is used to calculate CPUE. It was clarified that harvesters are required to record the catch of sets in the logbook and, with experience, they are usually able to estimate catch fairly well. Logbooks record catches but actual values likely vary (i.e. logbook records based on harvester estimates rather than actual catch weighed at wharf).

It was asked if groundtruthing occurs to confirm acoustic signatures on industry surveys. In the Gulf Region, acoustic surveys occur on weekends while herring samples are collected during the week from both experimental and commercial fisheries. A recommendation was made that if a similar program were to be undertaken in NL sampling would need to occur at the time of surveys to ensure that species mixing was not occurring.

CAPELIN: ASSESSMENT INTRODUCTION & MULTISPECIES AND SPRING ACOUSTIC SURVEYS

Presenter: C. Bourne and A. Adamack

ABSTRACT

Capelin are caught during fall and spring multispecies surveys, but as bottom trawl surveys are not well suited for pelagic species, information collected is used to determine distribution, condition and diet – not biomass or abundance. A center of gravity analysis showed a general shift in capelin distribution along a north-south axis during the fall, generally centered further north during years of higher abundance. In 2017 and 2018, the center of gravity was orientated towards the inshore, further south (in NAFO Division 3K). During spring multispecies surveys concentrations of capelin were seen in NAFO Division 3Ps. Stomach content analysis indicated that spring and fall feeding was good in 2017 and 2018. The annual spring capelin acoustic survey takes place in NAFO Div. 3L and is used to derive an index of abundance of age 2's. In 2018, capelin were concentrated inshore and nearshore in the northeast portion of 3L. Fewer capelin were observed in offshore areas as in previous years. The age distribution during the survey had a high proportion of age 2's, with very few age 1's or age 4's. Size at age was up slightly in 2018 but still below what was observed in the 2000s. The abundance index derived from the survey increased from 2017 and was as comparable to 2007-09 values, about 25% of the recent time series high observed in 2014.

DISCUSSION

The methodology of the capelin acoustic survey was discussed. The spatial distribution of the survey starts in the north and moves southward. Acoustic backscatter is groundtruthed with a

Campelen trawl. A participant suggested 24-hour sampling may introduce bias because artificial light at night can influence fish abundance/distribution estimates down to 200 m. Over the last 10 years, the core transects for the survey have remained unchanged. Years of partial or inconsistent coverage was not included in the analysis.

It was clarified that the condition metric used in the fall was Le Cren's and Fulton's K condition is used in the spring. It was noted that Le Cren's condition metric is a better measure because it relies on assumptions of isometric, rather than allometric, growth. It was clarified that spring condition is evaluated by length class to avoid potential bias but acknowledged that a single condition metric could be used for both the spring and fall surveys to more easily compare these results.

The results of capelin diet analysis were also discussed. A participant asked for clarification of the taxonomy of copepods in the diet. *Psuedocalanus* spp. was predominantly found in the stomachs of larvae. *Calanus finmarchicus* was most common in adult diets as well as the smaller copepod *Metridia* spp., which has been become increasingly more common in recent years. A participant noted that mysids aggregate inshore and asked if they were reflected in capelin diets. At present, mysids are not present in the diet data but comparisons of inshore vs. offshore diets have not been analyzed. Mysids are hard to classify on the echosounder.

The results of the acoustic work show spatial differences between 2017 and 2018 with large aggregations inshore in in 2018 compared to 2017. There was good coverage in 2018 but it was noted this hasn't always been the case. A participant asked if estimates from the current year were adjusted to account for areas missed in previous years. The same core transects are surveyed each year.

The age composition and maturity status of capelin surveyed in the spring acoustic survey were discussed. Since 1991 there has been an increase in the proportion of mature age 2's and fewer older fish present in the acoustic survey. In the 1980s, most of the mature fish were ages 3 to 5, with very few mature age 2's. There has always been a nontrivial proportion of mature fish present in the acoustic samples but there are also some areas not covered by the survey. A participant asked if the proportion of spawners and age composition of fish outside the survey area was assumed to be the same as those surveyed. The current hypothesis is that mature, older fish tend to aggregate farther north outside of the survey range which targets immature age 2's.

It was noted that while the acoustic index targets immature age 2's, there is actually a high proportion of mature age 2 and older fish surveyed. It was suggested that an estimate of the proportion of immature fish can be used to estimate the abundance of fish spawning the following year. The majority of immature age 2's present in the current survey will spawn the following year as age 3's; however, since 1991, there has been inter-annual variability in the percentage of age 2's that will spawn in the current year. For the past few years, approximately 30% of age 2's spawned. It was clarified that approximately 60-70% of age 3's are mature but that an ogive curve would be necessary to confirm this estimate.

CAPELIN: FISHERY

Presenter: C. Bourne

ABSTRACT

The entire TAC was landed in 2018, with fixed gear accounting for the largest proportion of landings. Approximately 55% of the TAC was landed in 3L, with the remaining 45% landed in 3K. Commercial samples were collected throughout the fishery from various bays and all gear

types. Very few age 4 capelin were present in 2017 or 2018 samples. There was a time series high proportion of age 2's in the 2017 catch, accounting for the time series low size of fish that year. There was a higher proportion of age 3's in 2018 which improved the mean lengths and weights of capelin in the fishery, however they were still below those observed previously in the 2010s. There were relatively low removals of capelin as by-catch in the shrimp fishery in 2018.

DISCUSSION

No discussion.

CAPELIN: SPAWNING AND LARVAL INDEX

Presenter: H. Murphy

ABSTRACT

The timing of capelin spawning has been persistently late since the early-1990s, occurring in early to mid-July in most years. Peak spawning on the northeast coast of Newfoundland was marginally earlier in 2018 than 2016-17, however there was very low productivity at Bellevue and Mussel Shells beaches. The larval index and emergence patterns from the Bellevue Beach study site suggest a small year class was produced in 2018 – this is the fifth consecutive year of low larval abundance, similar to what was seen in the early-2000s.

DISCUSSION

The results of capelin spawning and rearing temperature experiments in 2018 by a meeting participant were discussed. It was observed that when capelin were held for more than several days (4+ days) before eggs were stripped, the eggs had extremely poor survival. It was observed that in 2018 capelin aggregations were present at Bellevue Beach around July 18th but that spawning did not occur until July 24th. This was the first year in the past 13 years that this egg rearing experiment faced difficulty. The conclusion of the experiment was that the window of optimal egg fertilization was missed due to delayed spawning which resulted in low egg quality and poor hatch rates. Another participant questioned if temperature could be a factor in the poor hatch success but it was suspected that temperature was not an issue.

The egg fertilization findings were consistent with observations of low capelin larval emergence (i.e. productivity) at both demersal and beach sites at Bellevue Beach in 2018. Eggs on demersal sites were monitored daily after fertilization but only developed to a certain point before development was arrested. Development of the fertilized embryos at the two demersal sites appeared to have stalled in 2018, likely due to cold temperatures (1°C). It was noted that demersal sites can become anoxic which results in 100% mortality. This may have occurred in 2018 and is suspected to have occurred at a second larval sampling site in Notre Dame Bay in 2018. The larval index was also low at another beach in Div. 3K (Mussel Shell, Notre Dame Bay) and it was questioned if Bellevue could still be considered representative of other bays. Given the low larval productivity at these two sampling sites, it was suggested that this may be problematic for the 2018 year class and may reflect in low values of the immature index in 2020.

Eggs are not evaluated for condition but they are staged to estimate larval emergence. After spawning occurs, embryos are collected at various tide levels on the beach as well as at demersal sites and eggs are preserved to assess development stage and determine when larval emergence may occur. A participant asked if the condition of spawning females in 2018 was different from previous years. At present, spawning condition is not assessed. It seems that there was a delay in embryo development relative to other years so it could be an issue of

slower embryo development rather than a decline in egg production. It was suggested that spawning condition and fecundity may be something to explore in future research efforts.

Spawning time, as defined by observer's perception of peak spawning, is highly variable both in terms of timing and duration. It was clarified that onshore winds events were positively correlated with larval emergence but after 1991 there is no association. Wind events still produce periods of high emergence but these occurrences are much less frequent and there is more time between the onshore wind events.

CAPELIN: PROPOSED FORECAST MODEL

Presenter: K. Lewis

ABSTRACT

Forage fish play a central role in marine ecosystems, acting as a trophic link between plankton and larger marine species. They also contribute to global economies by directly and indirectly supporting commercial and recreational fisheries. Managing forage fish is problematic due to their high spatial-temporal variation in biomass and strong responses to environmental variability. A variety of mechanisms have been proposed to explain variation in capelin *Mallotus villosus* biomass, a keystone forage fish in the Northwest Atlantic, including factors influencing cohort strength such as larval abundance and larval food (i.e. *Pseudocalanus* spp.) availability. Alternately, pre-spawning mortality of capelin may be regulated by the timing of the retreat of sea ice (tice) via its effects on the spring bloom and the availability of food (e.g. *Calanus* spp.) for adult capelin, or by the condition of adult capelin the previous fall. Here, we used a Bayesian approach in a multimodel inference framework to assess support for a series of hypotheses explaining the population dynamics of capelin. The most parsimonious model included larval abundance, tice, and capelin condition in the fall, and explained 69% of the variance in capelin biomass. These results are consistent with much of the literature that suggests capelin in the Northwest Atlantic are driven by bottom-up forces. This model allows us to produce forecasts of capelin biomass one to two management cycles in advance. The current model suggests 2019 will have a higher biomass than 2018 but that biomass in 2020 will be a very low.

DISCUSSION

Inputs for the model were discussed including condition factor and spawning mortality estimates. It was clarified that the Le Cren relative condition factor was used and support was expressed for this decision, noting that relative condition had been successfully used for capelin in the Gulf with less data. Fall condition was integrated into the model but used only for males, calculated for both age 1 and age 2. It was suggested to add a female somatic index if possible (few studies on male gonad size in recent years). A comment was also made that the model assumes most adult mortality occurs between December and May but that there is also considerable mortality during/after the spawning period. This model focuses on adult mortality in a narrow window and does not account for either higher post-spawning mortality of males or repeat spawners. It was suggested that histology work is conducted to determine the effect/frequency of repeat spawners on the population (e.g., Magnaye et al. 2019). It was further clarified that the model was run with and without informative/uninformative priors and there was no difference.

General support was expressed for the cohesive nature of the model, integrating multiple factors but clarification was requested for what exactly the model was predicting. The model output estimates the capelin biomass (not SSB) from the spring acoustic surveys. The spring acoustic survey targets the immature portion of the stock, so therefore, this model cannot

forecast SSB. It is meant to inform the overall population trends. The age composition and proportion of mature fish varies between years. The model predicts out through 2020, integrating all available data for 2018 and can be used as a tool to estimate the capelin biomass in the 2019 spring survey. Given that a high proportion of capelin caught in last year's survey are still alive as they were surveyed as immature age 2 fish, it is likely 2019 estimates will be fairly similar to 2018.

It was noted that in the future that top-down controls on capelin may be investigated as inputs into the model, such as looking at harp seal and cod predation and abundance. Landings may be another factor to consider. At present bottom-up control is the stronger forcing in the NL ecosystem.

Suggestions for future directions included adding age composition which would make the model less dependent on data from indices. It was also asked if the proportion of age 2's maturing could be predicted in future years. Researchers will consider moving towards an age structured model and explore splitting the acoustic index into mature and immature components.

It was asked how quickly the results from the spring survey will be available for comparison with the model predictions, given that the fishery follows shortly after the survey. Historically, abundance estimates were generated at sea on the acoustic survey. In theory this could be done again in the future but the abundance estimate would not be peer reviewed. At present, to produce a capelin biomass estimate, which the model forecasts, the capelin must be aged, which takes time. There is a possibility of streamlining the biomass estimate by weighing each capelin sampled at sea rather than waiting for ageing data so a biomass estimate can be produced earlier in the management cycle to test the model forecast.

It was asked how the confidence intervals were calculated for the acoustic estimate. A Monte Carlo approach is used.

A participant suggested developing a Limit Reference Point (LRP) for capelin. It was suggested that a short-term goal may be to explore using a heuristic approach to a rule-based model to provide advice to the fishery, with long term goals working towards a LRP model.

At the conclusion of the section discussion, it was voiced that the general impressions were that the group was comfortable moving forward with a summary bullet on the model, acknowledging that the suggestions presented would be considered for revisions to the model for the next assessment in 2020.

CAPELIN: REVIEWER REPORTS

Presenter: F. Turcotte and A. Smith

The reviewers expressed general concern for capelin with decreased productivity in the ecosystem, limited number of year classes in the population, and the absence of older, high fecundity individuals. With increased size and weight of age 2's they likely contribute considerably to the population. The possibility of compensatory growth mechanisms and trade offs of growth for fecundity were suggested. Poor productivity in the environment likely explains why there has not been a return of the older year classes.

Recommendations included looking at extending surveys (ichthyoplankton and/or hydroacoustic) farther north and ensuring that a consistent measure of fish condition is used throughout all analyses. It was also suggested to consider incorporating genetic work into the stock evaluation

It was noted that the fishery now relies primarily on age 2 and age 3 fish, not the age 4 fish observed historically, and that in some years fish extend into the bays during the acoustic survey. It was recommended that the main indices should try to cover as much of the bays as possible each year.

The reviewers suggested using a predictive model to determine abundance trends by incorporating acoustic survey data covering the major aggregations. Although the acoustic index value is average, it is low relative to the values of the 1980s. No reference points are available for the stock but it likely that they would indicate the status of the stock is a cause for concern or in the critical zone and a cautious approach to managing the stock is recommended given the uncertainty surrounding the stock.

CAPELIN: RESEARCH RECOMMENDATIONS

- Investigate post-spawning mortality rates, particularly age 3+.
- Explore possible collaboration with harvesters to collect industry-based calibrated acoustic data to further investigate capelin distribution and abundance in areas and/or times outside of the DFO spring acoustic survey.
- Consider using a fixed average/reference period for the condition indices and use a consistent method to calculate condition for both spring and fall (recommended to use Le Cren's condition index vs. using Fulton's in the spring).
- Use data collected at Station 27 multi-frequency echo sounder to extract seasonal information about pelagic fish and zooplankton dynamics.
- Create two indices from the acoustic survey: one for the percent of mature capelin that will be spawning that year and the other for immature capelin that will spawn the next year; this may require creating a maturity ogive.
- Investigate low percentage of capelin roe in 2017 and 2018 acoustic surveys and potential implications on fecundity, egg size and/or spawning time.
- Calculate condition for spawning capelin.
- Adapt existing forecast model to integrate age composition and maturity data, splitting mature/immature components of the acoustic survey (high mortality of mature individuals) to better estimate biomass.
- Validate the forecast model estimates with results of the acoustics survey. Serves as a test for whether this needs to be peer-reviewed/undergo more extensive revision prior to use in the stock assessment.
- Incorporate fishery and predator mortality into the capelin forecast model. Use the model to explore the effect of mortality of large gravid females on capelin stock.
- Hold a Framework meeting in advance of the next capelin assessment to review acoustic survey data analysis methodology.
- Develop a Limit Reference Point or similar measure using available data and modeling tools for data limited stocks that can be used as a recommendation tool to provide advice for management.
- Explore seasonal and spatial patterns in capelin diet.

- Expand inshore drone work to include other northeastern bays of Newfoundland and, potentially, Labrador. Expand the geographic scope of targeted capelin research north (into 2J), through the expansion of existing programs (index beaches, egg and larval sampling, capelin diaries), and further analysis of existing data (e.g. spatial analysis of multispecies survey data).
- Reimplementation of fall capelin acoustic surveys to capture entire stock area which will provide valuable data on absolute stock size for developing a limit reference point.
- Continue to evaluate current knowledge of capelin genetics across the NL distribution and new genomics methodologies to determine if multiple stocks or species are present.
- Further research on demersal spawning versus beach spawning is warranted to estimate larval survival from both spawning modes.

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APPENDIX I – TERMS OF REFERENCE: HERRING

Assessment of Divisions 2J+3KL Capelin

Regional Peer Review - Newfoundland and Labrador Region

March 19-21, 2019
St. John's NL

Co-Chairs: Joanne Morgan and Laura Wheeland, DFO Science

Context

Divisions 2J+3KL Capelin was last assessed in 2018 (DFO 2018).

The current assessment is requested by Fisheries Management to inform the development of management measures for the stock for the upcoming fishing season.

Objectives

- Report on physical, chemical, and biological oceanographic conditions.
- Review information on historical catches up to and including the 2018 fishery.
- Analyze trends in abundance from the spring acoustic survey and larval recruitment indices.
- Review behavioural information on occurrence, distribution, and spawning times.
- Analyze biological information on sizes, ages, maturities, condition and feeding.
- Conduct a preliminary evaluation of proposed capelin forecast model.

Expected Publications

- Science Advisory Report
- Proceedings[1]
- Research Document

Participation

- Fisheries and Oceans Canada (DFO) Science and Fisheries Management
- Newfoundland and Labrador Department of Fisheries and Land Resources
- Indigenous groups
- Fishing Industry
- Academia
- Non-governmental organizations

References

DFO. 2018. Assessment of Capelin in SA2 and Divs. 3KL in 2017. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2018/030.

[1] Joint Proceedings with the March 18, 2019 2J+3KL and Subdivision 3Ps Herring Stock Assessment.

APPENDIX II – TERMS OF REFERENCE: CAPELIN

Assessment of Divisions 2J+3KL and Subdivision 3Ps Herring

Regional Peer Review - Newfoundland and Labrador Region

March 18, 2019
St. John's NL

Co-Chairs: Joanne Morgan and Laura Wheeland, DFO Science

Context

Divisions 2J+3KL and Subdivision 3Ps Herring was last assessed in 2017 (DFO 2017).

The current assessment is requested by Fisheries Management to inform the development of management measures for the stocks for the upcoming fishing seasons. The assessment will review new information on status of East and South coast Newfoundland Herring in the following stock areas: White Bay – Notre Dame Bay, Bonavista Bay – Trinity Bay, Conception Bay-Southern Shore, St. Mary's Bay – Placentia Bay, and Fortune Bay.

Objectives

- Review information on catches up to and including the 2018 fishery.
- Analyze biological data on sizes, ages, maturities and spawning components.
- Report on industry input from logbooks and telephone surveys.
- Report on environmental conditions and recruitment.
- Update stock status for the Bonavista Bay-Trinity Bay, St. Mary's Bay-Placentia Bay and Fortune Bay Herring stocks.
- Update biological data on White Bay-Notre Dame Bay and Conception Bay-Southern Shore Herring stocks.

Expected Publications

- Science Advisory Report
- Proceedings[2]
- Research Document

Participation

- Fisheries and Oceans Canada (DFO) Science and Fisheries Management
- Newfoundland and Labrador Department of Fisheries and Land Resources
- Indigenous groups
- Fishing Industry
- Academia
- Non-governmental organizations

[2] Joint Proceedings with the March 19-22, 2019 2J+3KL Capelin Stock Assessment.

References

DFO. 2017. Assessment of Newfoundland east and south coast herring to the spring of 2016. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2017/028.

APPENDIX III – AGENDA

Assessment of Divisions 3KL and Subdivision 3Ps Herring, and 2J+3KL Capelin

Chairpersons: Joanne Morgan and Laura Wheeland, DFO Science

March 18-21*, 2019

Memorial Room - Northwest Atlantic Fisheries Centre
80 East White Hills Road, St. John's

HERRING

Monday, March 18

Time	Topic	Presenter
09:00	Opening remarks, Terms of Reference and agenda	*Chairpersons*
-	Introduction and Environmental Overview	*C. Bourne/F. Cyr and D. Belanger*
-	Fishery • Landings, catch at age, industry input	*C. Bourne*
-	Biological Information • Length/weight at age, L50	*C. Bourne*
-	Research Gillnet Programs • Catch at age, catch rates, recruitment, stock status	*C. Bourne*
12:00	*LUNCH*	-
-	Reviewer Reports	*F. Turcotte & A. Smith*
-	Summary and Conclusions	*C. Bourne*
-	SAR Summary Bullets	*ALL*
-	Research Recommendations	*ALL*
-	Upgrading of working paper to Research Document	*ALL*
-	Adjourn	

CAPELIN

Tuesday, March 19

Time	Topic	Presenter
09:00	Opening remarks, Terms of Reference and agenda	*Chairpersons*
-	Environmental Overview	*G. Maillet*
-	FFAW Industry Survey Results	*E. Carruthers*
12:00	*LUNCH*	-
-	Assessment Introduction • Data inputs, overview Multispecies and Spring Acoustic Surveys • Distribution • Abundance • Size and Age Structure • Maturation • Condition • Diet	*C. Bourne &* *A. Adamack*
-	Fishery • Landings • Biological data (catch)	*C. Bourne*
-	Spawning and larval index	*H. Murphy*

Wednesday, March 20

Time	Topic	Presenter
09:00	Presentation of proposed capelin forecast model	*K. Lewis*
-	Reviewer Reports	*F. Turcotte &* *A. Smith*
-	Summary and Conclusions	*ALL*
-	*LUNCH*	-
-	Drafting of SAR Summary Bullets	*ALL*
-	Research Recommendations	*ALL*
-	Upgrading of working paper to Research Document	*ALL*
-	*ADJOURN*	

***Thursday, March 21**

March 21 has been added in the event of winter weather related delays, NAFC building closure due to a storm, and/or extra time is required for discussion.

Notes:

- Health breaks will occur at 10:30 a.m. and 2:30 p.m. Coffee and tea can be purchased from the cafeteria.
- Lunch (not provided) will normally occur 12:00-1:00 p.m.
- Agenda remains fluid – breaks to be determined as meeting progresses.
- This agenda may change.

APPENDIX IV – LIST OF PARTICIPANTS

NAME	AFFILIATION
Aaron Adamack	DFO Science, NL Region
Andrew Smith	DFO Science, Quebec Region
Bill Montevecchi	MUN
Bob Rogers	DFO Science, NL Region
Brad Squires	DFO Science, NL Region
Brandi O'Keefe	DFO Science, NL Region
Brandon Ward	Fisheries Land Resources Govt NL
Chelsea Boaler	Marine Institute
Christina Bourne	DFO Science, NL Region
Connie Korchoski	CSA NL Region
Craig Purchase	MUN
Dennis Chalk	Harvester
Divya Varkey	DFO Science, NL Region
Dwight Drover	DFO Science, NL Region
Emilie Novaczek	DFO Science, NL Region
Erika Parrill	CSA NL Region
Erin Carruthers	FFAW
Erin Dunne	DFO Resource Management
Francois Turcotte	DFO Science, Gulf Region
Gary Maillet	DFO Science, NL Region
Hannah Murphy	DFO Science, NL Region
Heather Penney	DFO Science, NL Region
Ivan Batten	Harvester
Jennifer Duff	DFO Communications, NL Region
Jessica Randall	Rapporteur
Joanne Morgan	DFO Science, NL Region
Katie Schleit	Oceans North
Keith Lewis	DFO Science, NL Region
Kristin Loughlin	DFO Science, NL Region
Laura Wheeland	DFO Science, NL Region
Maxime Geoffroy	Marine Institute
Megan Boucher	DFO Science, NL Region
Meredith Terry	DFO Science, NL Region
Nancy Pond	Fisheries Land Resources Govt NL
Natalya Dawe	FFAW
Neil Stuckless	Harvester
Paul Regular	DFO Science, NL Region
Paula Lundrigan	DFO Science, NL Region
Rob Coombs	NunatuKavut Community Council
Sigrid Kuehnemund	WWF
Trevor Jones	Harvester
Wilbur Crann	Harvester
William Hickey	Harvester