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Canadian Science Advisory Secretariat
Maritimes Region **Science Response 2018/049**

STOCK STATUS UPDATE OF AMERICAN LOBSTER (*HOMARUS AMERICANUS*) IN LOBSTER FISHING AREAS 35-38

Context

Advice on the stock status of American Lobster in Lobster Fishing Areas (LFAs) 35-38 is requested annually by Fisheries and Aquaculture Management (FAM). The last Assessment of this stock occurred in February 2013 (DFO 2013, Tremblay et al. 2013). Annual stock status updates have been completed since the assessment, with the most recent update occurring in 2017 (DFO 2017). The 2013 assessment identified three primary indicators that describe changes in lobster abundance and biomass, as well as proposed reference points for each indicator. The next framework review of this stock is scheduled for 2019. This Science Response updates these indicators to the end of the 2016-17 fishing season.

This Science Response Report results from the Science Response Process of September 24, 2018, on the Stock Status Update of American Lobster in Lobster Fishing Areas (LFAs) 35-38.

Background

Description of the Fishery

Commercial lobster fishing in LFAs 35-38 occurs in the Bay of Fundy (Figure 1) and borders the 2 biggest lobster fisheries in the Northwest Atlantic: LFA 34, which has the highest landings of approximately 25,000 tonnes (t) (mean of last 5 years) and the most participants of any LFA in Canada, and Downeast Maine (Hancock and Washington counties), with annual landings averaging approximately 29,000 t over the last five years (Historical Maine Department of Marine Resources Fisheries Landings Data (DMR 2017)). Landings in LFAs 35-38 began a long-term increase in the mid-1990s, and current landings are near record highs. This increase in landings occurred in most of the Gulf of Maine regions as well as for many other lobster stocks in Atlantic Canada.

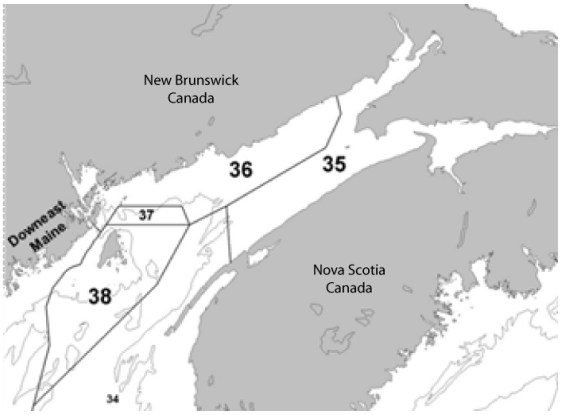

Figure 1. Lobster Fishing Areas (LFAs) 35-38 in the Bay of Fundy. Lobster Fishing Area 37 is a shared fishing area between LFAs 36 and 38.

The fishery is managed by input controls including a minimum legal size (MLS, 82.5 mm Carapace Length (CL)), prohibition on landing of both egg-bearing and V-notched (with no setal hairs) females, limited entry, fishing seasons and trap limits. Fishing seasons and traps limits differ among LFAs (Table 1). Other management measures include the requirement of vents to allow sublegal sized lobster to escape and biodegradable trap mechanisms to mitigate ghost fishing by lost traps.

Table 1. Number of total licences, trap limits and fishing seasons for each LFA within the Bay of Fundy. Note that LFA 37 is a shared fishing area where fishers from LFAs 36 and 38 are authorized by licence condition to fish.

LFA	Licences*	Traps Limits	Fishing Year
35	95	300	*Fall: Oct. 14th – Dec. 31st* *Spring: Last day Feb. – July 31st*
36	177	300	*Fall: Second Tuesday in November – December 31st* *Spring: March 31st – June 29th*
38	136	375	*Second Tuesday in November – June 29th*

* as of December 31, 2017 (see Tremblay et al. 2013 for the different categories)

Analysis and Response

The LFA 35-38 assessment (Tremblay et al. 2013) provided a full analysis of stock health by describing fishery performance and providing indicators for abundance and biomass, fishing pressure and reproduction. Spatial variation of these indicators was evaluated. Three primary indicators were identified and reference points were tabled. The rationale for these indicators was documented at a Maritimes Region Science Advisory Meeting in 2012 (DFO 2012). The first biomass indicator was based on landings. Landings-based reference points are part of the current Inshore Lobster Integrated Fishery Management Plan for LFAs 27-38. It was recognized that using landings as the sole indicator of lobster stock status has risks, and one of the goals of the 2013 assessment (Tremblay et al. 2013) was to provide potential alternatives. Two additional stock indicators and associated Upper Stock Reference (USR) points that relate to abundance or biomass were proposed and have subsequently been adopted but without Limit Reference Points (LRP) set. The commercial catch rate indicator is calculated as total landings/total trap hauls in LFAs 35-38 from complete logbook records, and is related to the abundance of the legal portion of the stock. The other indicator related to population abundance and was based on the stratified mean of number of lobsters per tow in a fishery-independent trawl survey (DFO Summer Research Vessel [RV] Survey). For each indicator, a 3-year running mean of the index was used to compare to the USR. The status of these indicators against the USR is provided below.

Landings and Catch Rate

An upward trend in landings was recorded for the past 2 decades (1994-1995 to 2015-2016) in all 3 LFAs, and 2015-2016 landings are the highest on record for the Bay of Fundy at 12,873 t (Figure 2).

Landings in LFA 36 and LFA 38 reached their highest levels in 2015-2016 at 3,681 t and 5,711 t, respectively. Landings from LFA 37 are allocated to the licence holder's LFA, either

LFA 36 or LFA 38. In comparison, landings in LFA 35 were highest in 2013-2014 at 3,941 t. Total landings in LFA 35-38 decreased in 2016-2017 to 11,369 t and were lower in all individual LFAs compared to the previous year. The USR and LRP for the biomass of legal lobsters based on landings is defined as 80% and 40% of the median for the period 1984-1985 to 2008-2009, which corresponds to 1,575 t and 788 t, respectively. For the 2016-2017 fishing season, the 3-year running mean was 12,178 t, which is 7 times the USR. By this measure, the LFAs 35-38 Lobster stock is considered to be in the Healthy Zone.

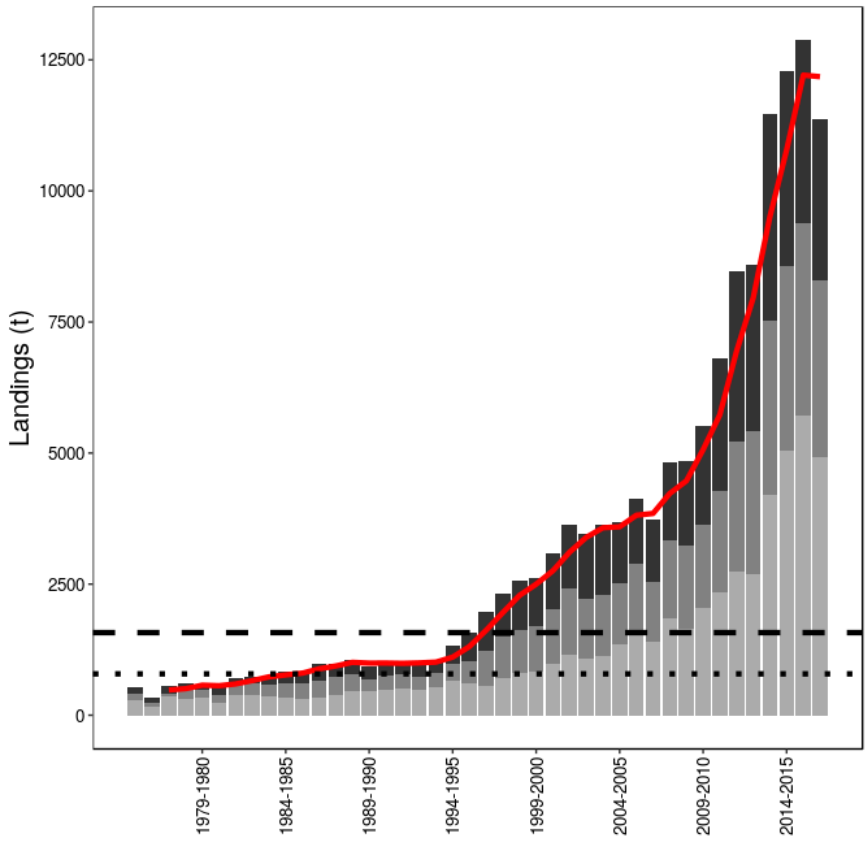

Figure 2. Lobster landings by fishing season from the commercial fishery in LFAs 35-38 from 1975 to 2017. Fishing season encompasses the fall through the early summer of the following year. Stacked bars represent landings within LFAs where LFA 35 is represented by black bars, LFA 36 is represented by dark grey bars, and LFA 38 is represented by light grey bars. The horizontal dashed and dotted lines represent the Upper Stock Reference (1,575 t) and Limit Reference (788 t) point, respectively. The solid red line is the 3-year running mean for LFAs 35-38 landings.

The commercial Catch-Per-Unit-Effort (CPUE, in kg/trap haul) increased substantially between 2004-2005 and 2014-2015 (Figure 3). The CPUE has decreased in each of the past two fishing seasons, and the CPUE of 2.02 kg/trap haul for the 2016-2017 fishing season is the fourth highest on record. The USR for the biomass of legal size lobsters based on the CPUE (0.58 kg/trap haul) is defined as 50% of the median for the reference period 2005-06 to 2008-09. The most recent 3-year running mean is 2.20 kg/trap haul, more than 3 times the USR (Figure 3).

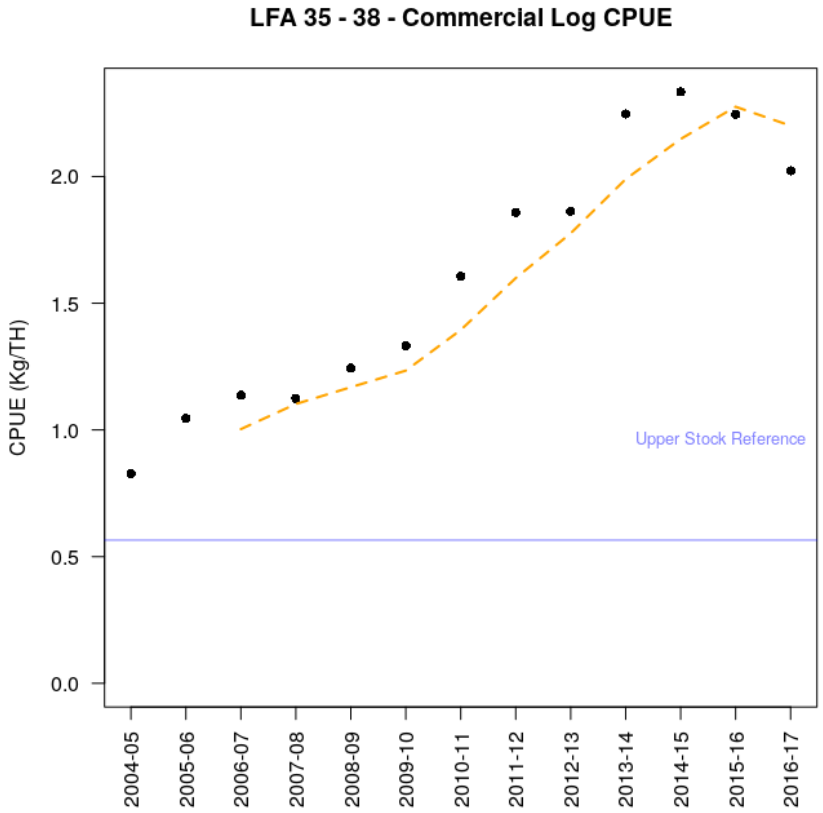

Figure 3. Trend in commercial Catch-Per-Unit-Effort (CPUE; total weight landed/total trap hauls) per fishing season calculated from complete entries of logbooks. The horizontal solid blue line is the Upper Stock Reference (0.58 kg/trap). The orange dashed line is the 3-year running mean.

Fishery-independent Survey

The fishery-independent indicator adopted following the last assessment (DFO 2013) was based on stratified mean of lobster catch rate (number of lobsters/tow) from the DFO Summer RV Survey in strata 490-495 (Figure 4). The USR for lobster abundance based on this survey was 80% of the median catch rate for the period 1985-2009, which correspond to 1.9 lobsters per tow. In 2017, the estimated 3-year running mean was 67.8 lobsters/tow; more than 30 times greater than the USR (Figure 5). This survey does not sample in depths shallower than 50 metres in the Bay of Fundy, which are highly productive lobster areas. The observed annual variability in average catch rates is likely related to low sampling intensity.

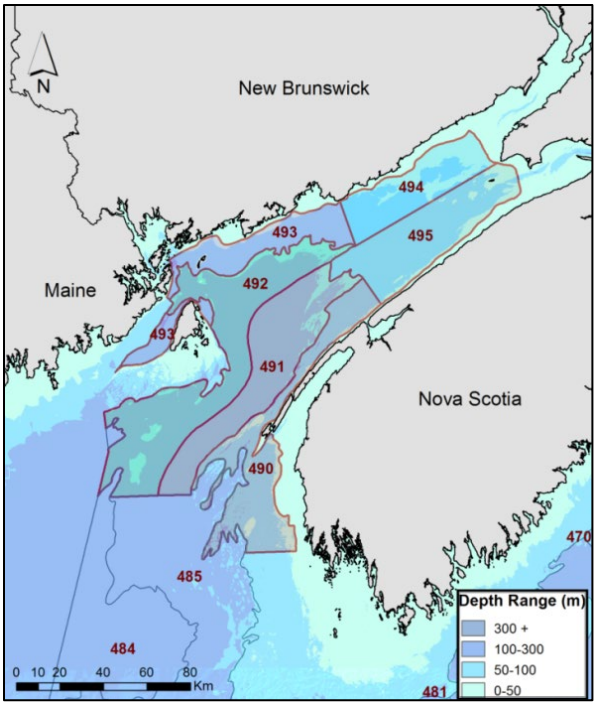

Figure 4. The DFO Summer Research Vessel survey strata in NAFO Division 4X. Data compiled to assess lobster stock status in LFAs 35-38 are from strata 490 to 495 inclusively (n=6).

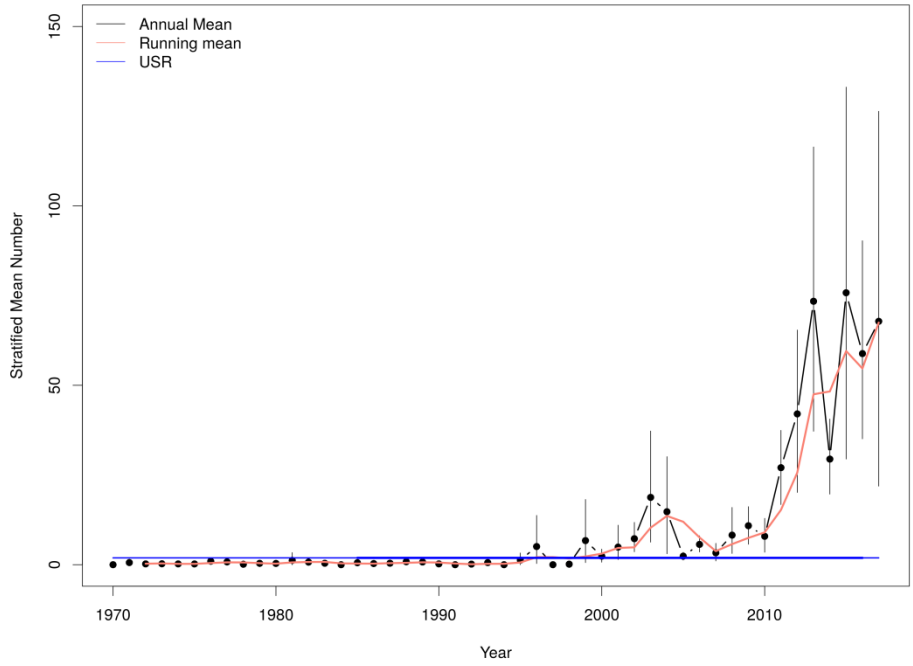

Figure 5. Stratified mean number of lobsters per tow (95% bootstrapped Confidence Interval (CI)) in LFAs 35-38 from DFO Summer Research Vessel Survey (Strata 490-495) calculated as the stratified mean catch rates of the 6 strata within the Bay of Fundy. The solid red line is the 3-year running mean. The horizontal blue line represents the Upper Stock Reference (USR) of 1.9 lobsters per tow.

Conclusions

Based on three stock indicators (landings, commercial catch rate and DFO Summer RV Survey catch rate), the lobster stock in LFAs 35-38 was considered to be in the Healthy Zone at the end of the 2016-2017 fishing season. The 3-year running averages of these indicators were above the USRs.

Each of the stock indicators has strengths and weaknesses that were outlined in the previous assessment (DFO 2013). Given that all three are providing similar signals, there is confidence that overall abundance and biomass remain high relative to the 1994-2009 period. The minimum legal size in the fishery of 82.5 mm is less than the size-at-50%-onset-maturity in the Bay of Fundy (> 90 mm CL). This indicates that a large proportion of the total landings in the Bay of Fundy fishery are immature lobsters. Therefore, abundance trends presented here may not reflect the broodstock status and are likely influenced by recruitment pulses.

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Sources of Information

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