Harvest Rate Strategy and Harvest Control Rules: Inshore Lobster, LFAs 34-38

Introduction

The harvest rate strategy and harvest control rules (HCRs) presented in this document have been developed according to Fisheries and Oceans Canada's *A Fishery Decision-Making Framework Incorporating the Precautionary Approach* (PA Policy). A copy of the policy is available on DFO's website at https://www.dfo-mpo.gc.ca/reports-rapports/regs/sff-cpd/precaution-eng.htm.

This document, developed in consultation with industry partners and stakeholders, applies to the commercial lobster fisheries in Lobster Fishing Areas (LFAs) 34 to 38. It is in effect as of April 2020 and will be incorporated into the *Integrated Fisheries Management Plan for Lobster Fishing Areas 27-38* (IFMP) when it is next updated.

This document does not apply to food, social, and ceremonial fisheries for lobster. It is acknowledged that Indigenous rights to fish for food, social, and ceremonial purposes will take priority, after conservation, over commercial uses of the lobster resource.

Management Objectives

In Maritimes Region, one of the overarching objectives of fisheries management is to not cause unacceptable reductions in productivity so that components of the marine environment can play their role in the functioning of the ecosystem. In LFAs 34-38, this will be achieved through managing commercial exploitation and promoting egg production in a manner consistent with the Department's PA Policy and according to the following sub-objectives:

1. to maintain a healthy lobster stock;
2. to manage the risk of the fishery causing or precipitating a decline in stock status, such that -
   a) where the stock is high in the healthy zone, the risk is low to moderate;
   b) where the stock is not high in the healthy zone, the risk is low; and
3. to promote recovery of the stock should it fall into the cautious or critical zone.

Harvest Control Tool Box

Currently, the lobster stocks in all LFAs are high in the healthy zone. The HCRs presented herein are pre-agreed decision rules that state what actions will be taken should there be a decline in stock status or should exploitation exceed the removal reference. The HCRs leave the choice of controls for achieving reductions in exploitation open so that the economic and biological factors in play at the time that the reductions are needed can be considered. This means that no decisions have been made at this time on the specific controls – increase of X mm in the minimum legal size, introduction of a window measure, shortening of the season by X days, etc. – that may be implemented in the future.

Nevertheless, it has been agreed that controls will be chosen from among those that form part of the current management framework for the inshore lobster fisheries in the Region. A list of these controls – the "harvest control tool box" – is presented in Table 1.

Table 1: Harvest Control Tool Box

Input Controls	Escapement / Biological Controls
Limited entry Trap limits Fixed seasons	Release of berried females Release of v-notched females Minimum legal size Maximum legal size (females) Window measure (females) Area closure (i.e. LFA 40) Maximum hoop size Escape vent size

Different controls will have different effects on exploitation, and these effects may vary across LFAs. In October 2019, DFO Science provided advice on simulating the effects of changes to minimum and maximum sizes, season lengths, and window measures on egg production and landings (research document forthcoming). For LFA 34, the simulations used two different assumptions of exploitation on the stock: relative fishing mortality estimated by the industry lobster trawl survey (survey relF) and the exploitation rate generated from the recruitment trap project (CCIR). For LFAs 35-38 where an index of exploitation is not available, these simulations were completed using two differing assumptions of exploitation on the stock, both high and low. The results of these simulations are presented in Appendix 1 to this document for each LFA.

Harvest Strategy and Harvest Control Rules

Summary

The harvest strategy is to maintain exploitation at or below the removal reference within LFA 34 (Table A11 of Appendix 2). The HCRs, which have been developed for each stock status zone, are summarized in Table 2 and elaborated upon further below.

Table 2: Summary of proposed HCRs for the commercial fisheries in LFAs 34-38

Stock Status		HCR
Healthy Zone	Above the upper stock reference (USR)	- For LFA 34, maintain the exploitation rate at or below the removal reference (see Appendix 2) - For LFAs 35-38, maintain stability in input and biological controls (no increase in exploitation). Monitor stock status indicators for signs of overexploitation
	Declining and approaching the USR	- Request science advice. For LFA 34, two (2) or more survey biomasses falling below their respective upper stock indicators (USIs) will trigger an assessment - Initiate consultations - Consider reducing the exploitation rate
Cautious Zone	Below the USR	- For LFA 34, reduce the exploitation rate (see Appendix 2) - For LFAs 35-38, aggressively reduce the exploitation rate - Progressively reduce the exploitation rate as stock status declines
	Midway between the USR and limit reference point (LRP) and declining	- Request science advice - Initiate consultations on a rebuilding plan
	Approaching the LRP	- Prepare to implement rebuilding plan
Critical Zone	Below the LRP	- Reduce the exploitation rate to the lowest possible level - Implement the rebuilding plan

Having an ability to estimate exploitation will be important for monitoring the effectiveness of the HCRs if there is a need to implement them.

For LFA 34, the indicator for exploitation will be calculated by Science annually based on a three year running median and will be reported on in stock status updates or stock assessments. This will allow for monitoring by the advisory committee of whether the exploitation rate is being maintained at or below the removal reference for each stock status zone, and it will allow for

evaluating the success of management actions in effecting changes to exploitation rates when these are implemented. In LFA 34, regulated measures for reducing exploitation will not be necessary in any stock status zone if the exploitation rate is shown to be below the removal reference.

In LFAs 35-38, where removal references and exploitation rates have not been developed, regulated measures for reducing exploitation will be necessary if the stock falls below the upper stock reference (USR). The combination of input and biological controls is intended to keep the level of exploitation fairly constant and should be results-driven to effect a change in stock status in a reasonable timeframe. The effectiveness of the controls will need to be evaluated based on the results, i.e. changes to stock status relative to the USRs and limit reference points (LRPs).

The HCRs will generally be implemented on an LFA-by-LFA basis. This means that a decline in stock status in one LFA will not automatically necessitate a reduction in exploitation in other LFAs. Where there is a need to reduce exploitation across more than one LFA, variation in the choice of harvest control(s) will be considered only where the variation will not jeopardize recovery.

The harvest strategy is based on an assumption that changes in stock status can result from changes in the management of the fishery. This is true to some extent. However, environmental factors appear to have a significant effect on the productivity of lobsters. It is therefore possible that the status of the lobster stock will vary as a result of changes in the environment as opposed to changes in fishing pressure. Should it appear that there have been significant changes in lobster productivity to the point that a shift in productivity regimes appears to have occurred, a review will be requested by Science of the reference points in the fishery.

Healthy Zone

When the stock is in the healthy zone, the LFA 34 Advisory Committee will monitor the exploitation rate in relation to the removal reference. If the exploitation rate exceeds the removal reference, the committee will discuss and recommend management actions to reduce fishing pressure during the next fishing season. At any time, the advisory committee may also propose a target removal reference and recommend actions for managing the fishery within a lower level of exploitation.

For LFAs 35-38, where exploitation rates and a removal reference have not been developed, management actions will respond to the status of the stock relative to the USR and LRP and data from secondary and contextual indicators.

If stock status declines and approaches the USR, advice from Science will be requested and consultations will be initiated with partners and stakeholders through the advisory committee process. For LFA 34, an assessment will be triggered when two or more survey biomasses fall below their upper stock indicators (USIs). Consultations will focus on the specific changes to harvest controls that will be implemented if stock status falls below the USR. The advisory committee may also recommend changes to harvest controls before stock status reaches the USR in an effort to arrest the decline. In developing recommendations on management actions, the advisory committee will consider the impact of possible actions on egg production and landings, as advised by Science (Appendix 1).

Cautious Zone

In the cautious zone, the exploitation rate will be reduced progressively if stock status continues to decline. Conversely, the exploitation rate will be increased progressively if stock status improves. Consideration will need to be given to the time needed for previous reductions in exploitation to have a positive effect.

As stated in the PA Policy, adjustments to the exploitation rate in the cautious zone need not be linear, but linear adjustments will serve as a general guide during consultations. For example, in LFA 34, if the stock is halfway between the USR and LRP the removal reference will be approximately half of the removal reference for the healthy zone; if the stock is in the bottom quarter of the cautious zone, the removal reference will be approximately a quarter of the removal reference for the healthy zone. In LFAs 35-38, where an assessment of exploitation rate against a removal reference is not available, management actions should mitigate declines and, when possible, promote positive change in biomass. The management response will vary depending on location of the stock within the cautious zone, whether the stock is increasing or decreasing, and indications of incoming recruitment, for example.

If stock status declines to midway between the USR and the LRP, advice from Science will be requested, and consultations with the advisory committee will be initiated to support the development of a rebuilding plan. If stock status approaches the LRP, preparations will be made to implement the rebuilding plan.

<u>Critical Zone</u>

In the critical zone, removals will be kept to the lowest possible level, which may mean closure of the commercial fishery. Closure would be effected through varying the season to zero days.

The rebuilding plan will be implemented. The rebuilding plan will promote stock growth, and it will have a high probability of allowing the stock to rebuild within a reasonable timeframe.

Appendix 1: Effect of changes in harvest controls on egg production and landings

These tables are based on the simulations presented at a framework assessment for LFAs 34-38 held in September 2019.

Table A1: Percent change in egg production, numbers and weight of lobsters landed with various harvest controls for LFA 34 using the CCIR exploitation rate.

Harvest Control		Eggs produced	Numbers landed	Weight landed
Increase minimum legal size	90 mm	115	-9	20
	87.5 mm	58	-5	12
	85 mm	33	-4	8
Shorter season	50%	47	-1	2
	60%	22	0	1
	70%	10	0	0
	80%	4	0	0
	90%	1	0	0
Window size	105 – 125 mm	461	-2	8
	115 – 125 mm	88	0	2
Females only	105 – 125 mm	461	-1	1
	115 – 125 mm	88	0	0
Maximum legal size	135 mm	37	-1	-2
	130 mm	79	-1	-3
	125 mm	160	-2	-5
Females only	135 mm	37	0	0
	130 mm	79	0	-1
	125 mm	160	0	-1

Table A2. Percent change in egg production, numbers and weight of lobsters landed with various harvest controls for LFA 34 with exploitation from Survey relF

Harvest Control		Eggs produced	Numbers landed	Weight landed
Increase minimum legal size	90 mm	62	-6	17
	87.5 mm	35	-3	10
	85 mm	19	-2	6
Shorter season	50%	374	-10	25
	60%	233	-7	18
	70%	139	-4	12
	80%	74	-2	7
	90%	130	-1	3
Window size	105 – 125 mm	246	-4	12
	115 – 125 mm	67	-1	4
Females only	105 – 125 mm	246	-3	2
	115 – 125 mm	67	-1	0
Maximum legal size	135 mm	51	-3	-9
	130 mm	90	-4	-12
	125 mm	152	-5	-15
Females only	135 mm	51	-1	-1
	130 mm	90	-1	-2
	125 mm	152	-2	-4

Table A3. Percent change in egg production, numbers and weight of lobsters landed with various harvest controls for LFA 35 under high exploitation (0.82)

Harvest Control		Eggs produced	Numbers landed	Weight landed
Increase minimum legal size	90 mm	98	-5	20
	87.5 mm	51	-3	12
	85 mm	27	-2	7
Shorter season	50%	23	0	3
	60%	11	0	1
	70%	6	0	1
	80%	42	0	0
	90%	2	0	0
Window size	105 – 125 mm	457	-2	9
	115 – 125 mm	99	0	2
Females only	105 – 125 mm	457	-1	2
	115 – 125 mm	99	0	0
Maximum legal size	135 mm	66	-1	-3
	130 mm	135	-1	-5
	125 mm	258	-2	-7
Females only	135 mm	66	0	0
	130 mm	135	0	-1
	125 mm	258	-1	-1

Table A4. Percent change in egg production, numbers and weight of lobsters landed with various harvest controls for LFA 35 under lower exploitation (0.68)

Harvest Control		Eggs produced	Numbers landed	Weight landed
Increase minimum legal size	90 mm	57	-5	17
	87.5 mm	33	-3	10
	85 mm	17	-2	6
Shorter season	50%	11	0	2
	60%	5	0	1
	70%	3	0	1
	80%	2	0	0
	90%	1	0	0
Window size	105 – 125 mm	259	-4	13
	115 – 125 mm	75	-1	4
Females only	105 – 125 mm	259	-3	2
	115 – 125 mm	75	-1	0
Maximum legal size	135 mm	84	-3	-10
	130 mm	141	-4	-13
	125 mm	232	-6	-17
Females only	135 mm	84	-1	-2
	130 mm	141	-1	-3
	125 mm	232	-2	-4

Table A5. Percent change in egg production, numbers and weight of lobsters landed with various harvest controls for LFA 36 under high exploitation (0.82)

Harvest Control		Eggs produced	Numbers landed	Weight landed
Increase minimum legal size	90 mm	102	-5	19
	87.5 mm	54	-3	12
	85 mm	29	-2	8
Shorter season	50%	463	-6	22
	60%	283	-4	16
	70%	157	-3	10
	80%	84	-2	6
	90%	32	-1	3
Window size	105 – 125 mm	392	-2	9
	115 – 125 mm	86	-1	2
Females only	105 – 125 mm	392	-1	2
	115 – 125 mm	86	0	0
Maximum legal size	135 mm	56	-1	-3
	130 mm	113	-1	-5
	125 mm	217	-2	-6
Females only	135 mm	56	0	0
	130 mm	113	0	-1
	125 mm	217	-1	-1

Table A6. Percent change in egg production, numbers and weight of lobsters landed with various harvest controls for LFA 36 under lower exploitation (0.68)

Harvest Control		Eggs produced	Numbers landed	Weight landed
Increase minimum legal size	90 mm	61	-5	17
	87.5 mm	34	-3	10
	85 mm	18	-2	6
Shorter season	50%	356	-9	26
	60%	230	-7	19
	70%	134	-4	12
	80%	74	-3	7
	90%	29	-1	2
Window size	105 – 125 mm	251	-4	13
	115 – 125 mm	74	-1	4
Females only	105 – 125 mm	251	-3	2
	115 – 125 mm	74	-1	0
Maximum legal size	135 mm	76	-3	-10
	130 mm	130	-4	-13
	125 mm	215	-6	-16
Females only	135 mm	76	-1	-2
	130 mm	130	-1	-3
	125 mm	215	-2	-4

Table A7. Percent change in egg production, numbers and weight of lobsters landed with various harvest controls for LFA 38 under high exploitation (0.82)

Harvest Control		Eggs produced	Numbers landed	Weight landed
Increase minimum legal size	90 mm	106	-5	19
	87.5 mm	55	-3	12
	85 mm	30	-2	7
Shorter season	50%	16	0	2
	60%	18	0	2
	70%	9	0	1
	80%	4	0	1
	90%	1	0	0
Window size	105 – 125 mm	386	-2	9
	115 – 125 mm	81	0	2
Females only	105 – 125 mm	386	-1	2
	115 – 125 mm	81	0	0
Maximum legal size	135 mm	42	-1	-3
	130 mm	86	-1	-4
	125 mm	169	-2	-6
Females only	135 mm	42	0	0
	130 mm	86	0	-1
	125 mm	169	0	-1

Table A8. Percent change in egg production, numbers and weight of lobsters landed with various harvest controls for LFA 38 under lower exploitation (0.68)

Harvest Control		Eggs produced	Numbers landed	Weight landed
Increase minimum legal size	90 mm	62	-5	17
	87.5 mm	35	-3	10
	85 mm	18	-2	6
Shorter season	50%	9	0	2
	60%	10	0	2
	70%	5	0	1
	80%	2	0	0
	90%	1	0	0
Window size	105 – 125 mm	241	-4	12
	115 – 125 mm	67	-1	4
Females only	105 – 125 mm	241	-3	2
	115 – 125 mm	67	-1	0
Maximum legal size	135 mm	57	-3	-9
	130 mm	100	-4	-12
	125 mm	166	-5	-15
Females only	135 mm	57	-1	-1
	130 mm	100	-1	-2
	125 mm	166	-2	-4

Appendix 2: Reference Points

Table A9. Upper stock reference (USR) and limit reference point (LRP) for LFA 34

Zone	Reference Points	
Healthy	USR	2 or more survey biomasses are above their respective USIs
Cautious	-	3 or more survey biomasses are below their respective USI and above their respective LRI; OR
		2 survey biomasses are above their respective USIs and 2 survey biomass are below their respective LRIs; OR
		1 survey biomass above its respective USI, 1 survey biomass below its respective LRI, and 2 survey biomasses between their respective USIs and LRIs
Critical	LRP	2 or more survey biomasses are below their respective LRIs

Table A10. Upper stock references (USRs) and limit reference points (LRPs) by LFA for LFAs 35-38, and equivalent weight of landings in pounds and kilograms per day

	USR			LRP		
	Value (kg/trap haul)	Lbs per day	Kg per day	Value (kg/trap haul)	Lbs per day	Kg per day
LFA 35	1.62	1,069	486	0.81	535	243
LFA 36	1.36	898	408	0.68	449	204
LFA 38	1.92	1,581	719	0.96	791	359

Table A11. Removal indicators (maximum rate of removals specific to each index) for each stock status zone for LFA 34

Index	Healthy Zone	Cautious Zone (Illustrative*)			Critical Zone
		Top Qtr	Mid	Bottom Qtr	
ILTS	0.849	0.637	0.424	0.212	Lowest possible level
DFO RV survey	0.979	0.734	0.490	0.245	
NEFSC Spring survey	0.9285	0.696	0.464	0.232	
NEFSC Fall survey	5.16	3.87	2.58	1.29	

Overfishing will be considered to have occurred when three (3) or more of the removal indicators have been exceeded for their respective stock status zone.

*Declines in the removal reference through the cautious zone may be faster or slower depending on conditions surrounding stock status.