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Winter Flounder Traps:
Exploring The Potential For Environmentally-Friendly Access To Groundfish In Coastal Maine

Award #: NA04NMF4720302

Final report submitted to the Northeast Consortium

Period of Performance: January 1, 2005 – June 30, 2007

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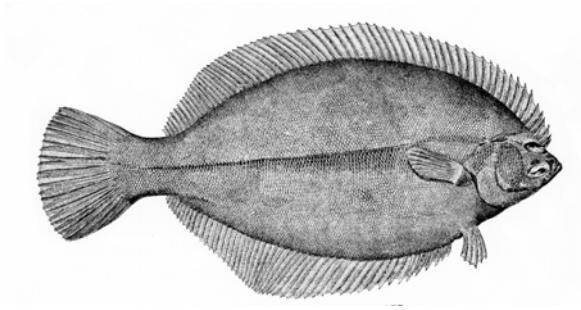

Winter Flounder *Pseudopleuronectes americanus*
image courtesy of NOAA Fisheries /NEFSC

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September 2007

ABSTRACT

The goal of this project was to explore the feasibility of a seasonal commercial winter flounder trap fishery in Maine's inshore waters. Experimental flounder traps with two different opening designs were tested. In one design, a standard crab hoop was used. In the other trap design, a smaller (restricted) opening was used in an attempt to exclude a higher proportion of bycatch, particularly legal sized lobsters. A total of 1160 traps were hauled over 33 trips during three different seasons: early summer, early winter, and late spring. The highest catch rates of winter flounder occurred in late spring although overall catch rates were low, an average of less than half of a pound of flounder per trap. The restricted opening design reduced the bycatch of legal sized lobsters compared to the traps with the standard opening during one field season, but results from the second field season were inconclusive. While catch rates in this experiment were not high enough to justify the development of a commercial fishery at this time, results were encouraging and should be used to direct further experimental testing. Future work should focus on setting the traps in areas of higher winter flounder abundance, exploring seasonal timing of a potential fishery, testing alternative bait types and refining trap opening design.

INTRODUCTION

Declining stocks and increased regulatory closures have effectively cut off access to groundfish in coastal Maine waters. As groundfishing has disappeared, the number of lobster traps has skyrocketed. Currently, the abundance of fixed gear in nearshore waters would render a mobile fishery difficult to execute should these waters be reopened.

In recent years, the Maine/New Hampshire Inshore Trawl Survey identified winter flounder as an abundant species, present in 92% of all tows (K. Stepanek, Scientist, Maine Dept. of Marine Resources, personal communication). Despite their abundance, the inshore area remains closed to mobile gear. Traps were once a traditional means of harvesting winter flounder, primarily for local consumption. Recent research in Newfoundland suggests that traps may provide an effective means of harvesting commercial quantities of winter flounder. Further, flounder traps could be hauled with the same gear used for lobster fishing, so participation in the fishery could begin with limited additional costs. A fixed gear fishery for winter flounder could offer Maine fishermen an opportunity to regain access to groundfish. It would also result in minimal seafloor impact, little to no bycatch and a superior quality of catch.

PROJECT OBJECTIVES AND SCIENTIFIC HYPOTHESIS

The objective of this project was to examine the feasibility of a winter flounder trap fishery in Maine's inshore and nearshore waters.

It was designed to test the hypothesis that specially designed traps can be used to harvest winter flounder in sufficient numbers to support a commercial fishery with minimal benthic interaction or bycatch.

METHODS

Gear Design and Construction

Trap design was based on a historical design, used previously in the Gulf of Maine to target winter flounder with slight refinements to the entry design reflecting more recent advances in trap design technology and understanding of flounder behavior. Kelo Pinkham built all traps used in the experiment with assistance from fellow Boothbay fisherman, Jim Lowe. In early 2005, thirty (30) traps were constructed from lobster crates fitted with a standard crab hoop acting as one long head (entrance). The crab hoop measures 8 inches across and 2 ½ inches in

height. It was hoped that this hoop would allow flatfish, crabs and some finfish to enter while excluding most lobsters.

Prior research suggests that entry design is the most important variable in flounder traps. With this in mind, Pinkham decided to fit the experimental traps with a standard crab hoop, which measures 8 inches across and 2 ½ inches in height. This hoop should allow entrance of flatfish, crabs and some finfish while excluding most lobsters. These traps were tested in the first of 3 field testing components during the summer of 2005. Following the first field testing component, Pinkham also constructed and tested traps with a more restricted opening size of 1 ¾ inches (8" x 1 ¾"). During the second and third field testing components traps with both types of opening designs were tested.

Study Area

The winter flounder traps were set in coastal areas of mid-coast Maine in Booth Bay, Linekin Bay and Sheepscot Bay as shown in Figures 1 – 3. Water depths ranged from 1 to 24 fathoms. Bottom type was varied and included mud, sand and rocky habitats.

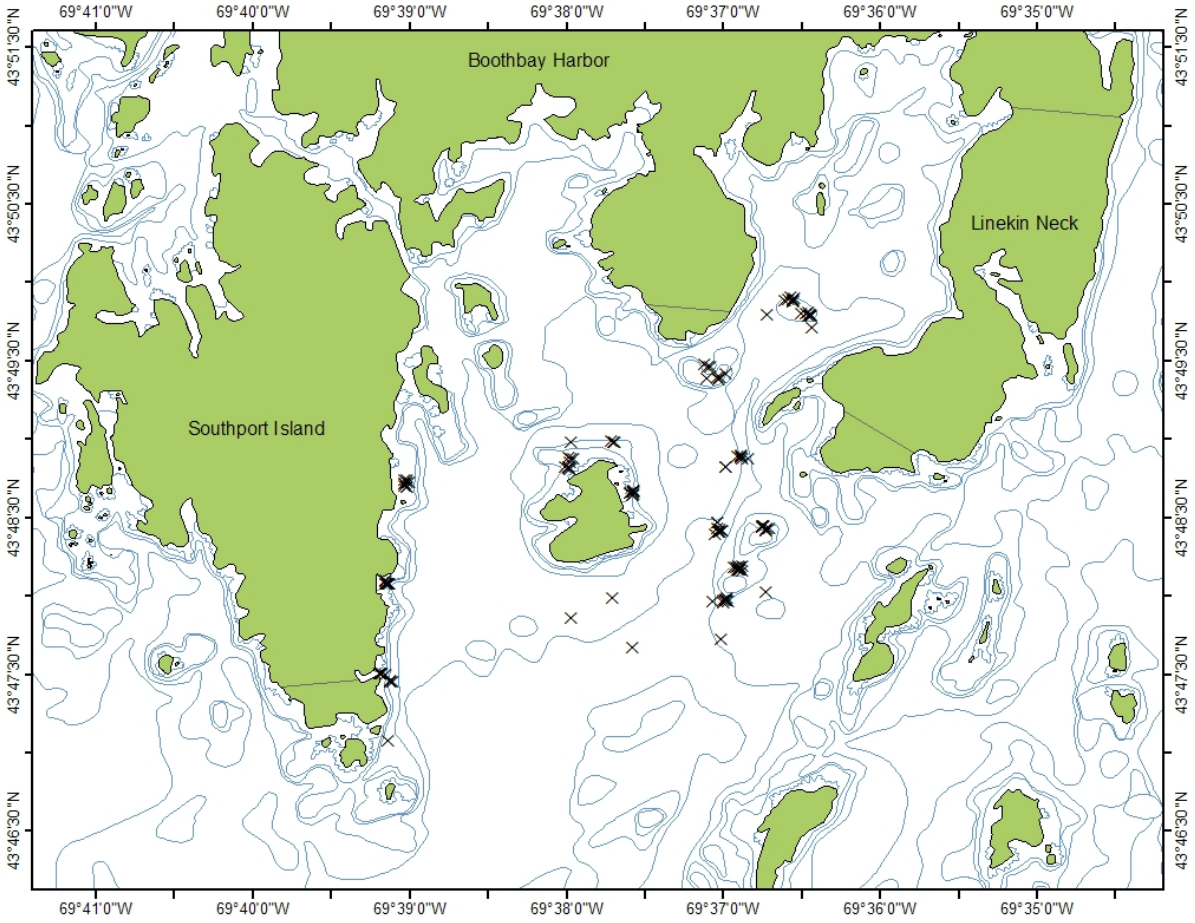

Figure 1. *Trap set locations (denoted by the x's) for the first field testing component (summer 2005).*

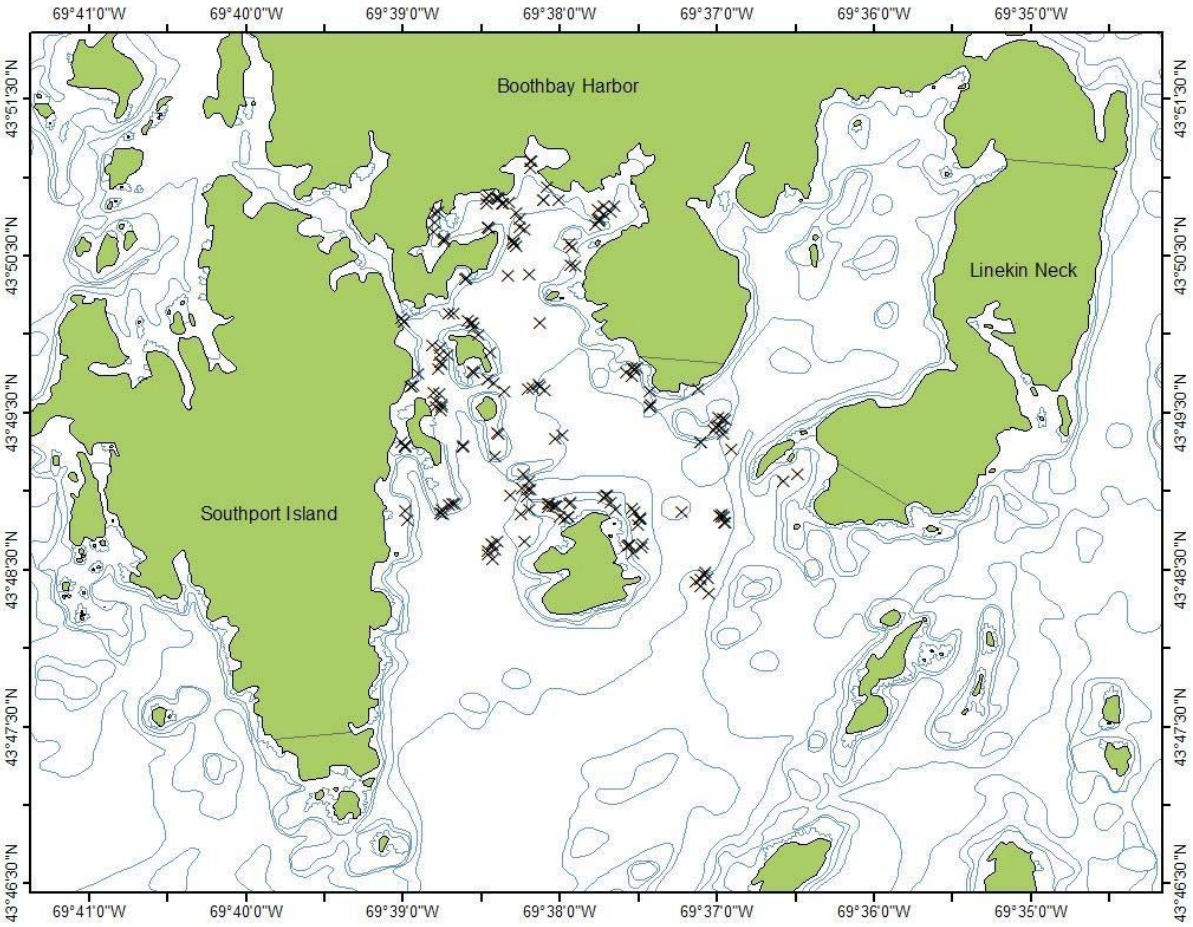

Figure 2. *Trap set locations (denoted by the x's) for the second field testing component (winter 2005).*

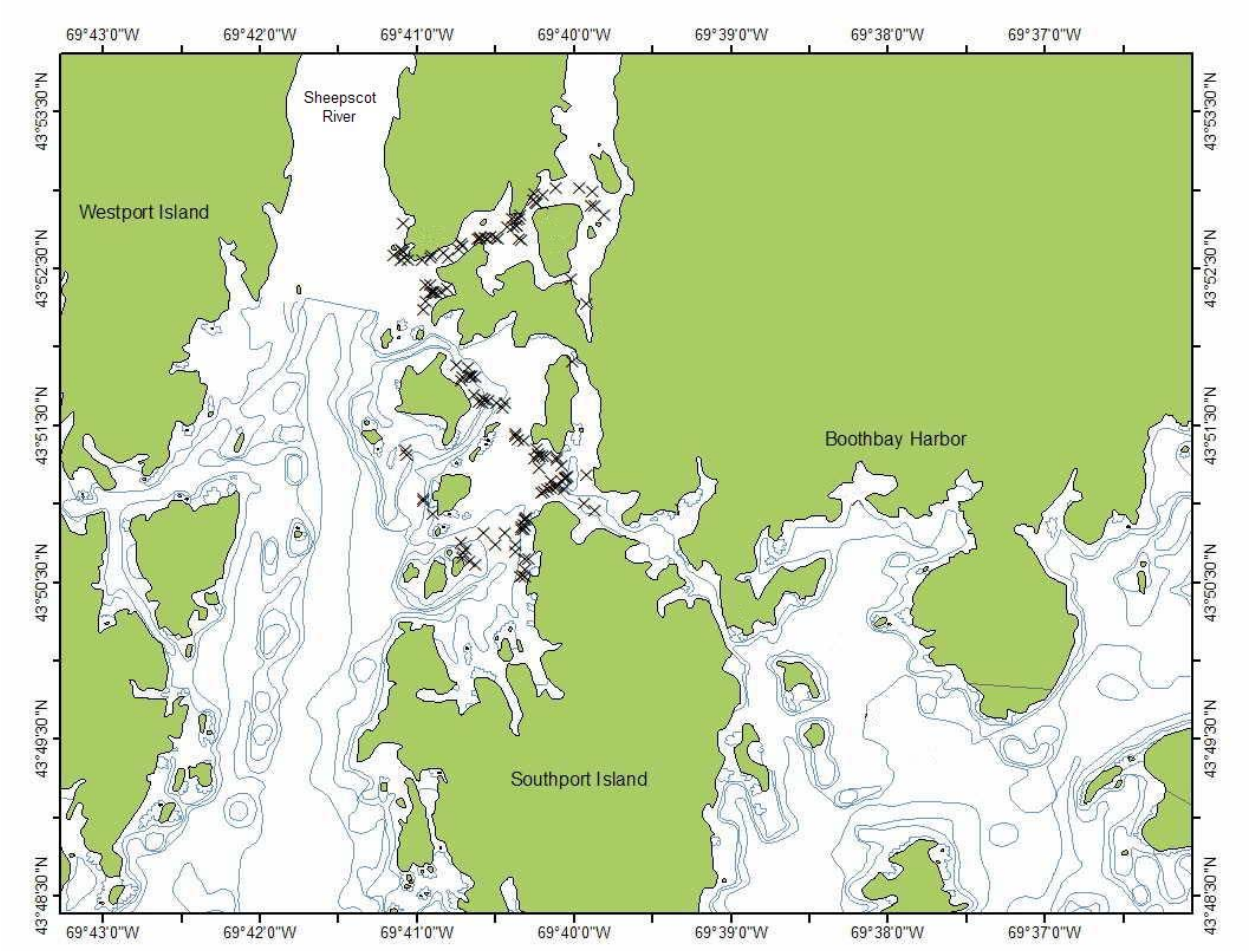

Figure 3. *Trap set locations (denoted by the x's) for the third field testing component (spring 2006).*

Field Trials

Field testing components occurred:

- Summer 2005: 02 June 2005 – 06 August 2005
- Winter 2005: 17 November 2005 – 31 December 2005
- Spring 2006: 03 May 2006 – 16 June 2006

Traps were baited with crushed mussels or a combination of mussels and herring in bait bags or jars and checked twice each week. For each trap hauled the date was recorded, soak time (days), location (latitude and longitude), and trap type (standard or restricted opening). Biological data collected included species identification, weight to the nearest hundredth of a kilogram and length to the nearest whole centimeter for each finfish species, and weight the nearest hundredth of a kilogram for crustaceans. In addition, environmental data was collected including water depth (fm), weather, wind speed (kt), and wave height (ft).

Additionally, during the first field testing component, the sex and maturity stage of all winter flounder captured was determined. This information was not collected for the second field component since no winter flounder were captured. During the third field component this

information was not collected since the traps were not fished by the project leader but by another fisherman who was not comfortable collecting this information.

During the first field testing component 30 traps were set. The traps were hauled during 10 trips between 02 June 2005 and 06 August 2005, with an average soak time of 8 days. All traps fished during this component were fitted with a standard crap hoop. Overall during this period, 253 hauls were made.

During the second field testing component 50 traps were set. The traps were hauled during 12 trips between 17 November 2005 and 31 December 2005, with an average soak duration of 4 days. Twenty-four (24) traps were fitted with the standard crab hoop opening, 25 traps had the restricted opening design. Overall during this period, 596 hauls were made. Traps with standard openings were hauled 297 times and traps with the restricted entry design were hauled 299 times.

During the third field testing component 30 traps were set. The traps were hauled during 11 trips between 03 May 2006 and 16 June 2006, with an average soak duration of 4 days. Seventeen (17) traps had the standard crab hoop opening, 13 traps had the restricted opening design. The project leader recruited Herbie Burnham, a fellow mid-coast lobster fisherman, to set and haul the traps and collect data for this field component. Overall during this period, 311 hauls were made. Traps with standard openings were hauled 164 times and traps with the restricted entry design were hauled 147 times.

Challenges

Two field testing components were originally scheduled for this project; the first to occur for 4 to 6 weeks in early winter 2004 and the second to occur for 4 to 6 weeks in late spring 2005. However, there was a delay in executing the contract due to a lengthy review process (NEPA review) at the National Marine Fisheries Service (NMFS). Because of this delay, the first field testing component did not occur until summer 2005. However, project participants were able to complete two more field testing components within the seasons originally scheduled, early winter (2005) and late spring (2006). Project participants were granted a contract extension through June 2007.

In addition, the first field component (summer 2005) was delayed by a red tide closure that prevented the fishermen from obtaining bait (mussels). As a result, the start of this field testing component was delayed from April until June.

DATA

Data collected during field trials is included with this report for inclusion in the Fisheries and Oceans Database. This includes data for 33 trips collected during 3 different seasons as detailed in Table 1.

FIELD COMPONENT	TRIP NUMBER	DATE	NUM TRAPS HAULED
Summer 2005	1	6/2/2005	30
	2	6/7/2005	30
	3	6/11/2005	30
	4	6/21/2005	28
	5	6/29/2005	26
	6	7/7/2005	23
	7	7/14/2005	23
	8	7/21/2005	23
	9	7/30/2005	21
	10	8/6/2005	19
Fall 2005	11	11/17/2005	50
	12	11/23/2005	50
	13	11/28/2005	50
	14	12/1/2005	50
	15	12/4/2005	50
	16	12/7/2005	50
	17	12/11/2005	50
	18	12/14/2005	50
	19	12/17/2005	47
	20	12/21/2005	50
	21	12/26/2005	50
	22	12/31/2005	49
Spring 2006	23	5/3/2006	30
	24	5/10/2006	25
	25	5/14/2006	28
	26	5/17/2006	29
	27	5/20/2006	29
	28	5/24/2006	28
	29	5/28/2006	28
	30	6/5/2006	28
	31	6/8/2006	28
	32	6/12/2006	28
	33	6/16/2006	30

Table 1. List of trips completed for this project.

RESULTS

Field Component 1: Summer 2005 (June –August)

During the first field testing component 30 traps were set a total of 10 times. The average number of traps hauled per trip was 25, due to some lost traps. All traps had the standard crab hoop entrance type. The catch by species and weight in the traps during the first field testing component is shown in Table 2. The species captured consisted primarily of American lobster and crabs from the genus *Cancer*. Less than 4 kg total of winter flounder were captured.

SPECIES COMMON NAME	WEIGHT (KG)
LOBSTER, AMERICAN	74.75
CRAB, JONAH	42.6
CRAB, ROCK	21.01
FLOUNDER, WINTER (BLACKBACK)	**3.95**
SCULPIN, LONGHORN	1.25
SCULPIN, SHORTHORN	0.2
CRAB, HERMIT, NK	0.05
TOTAL	**143.81**

Table 2. Catch weights by species for first field testing component (June - August 2005).

Table 3 presents more detailed information about the winter flounder captured during this field component. Nine (9) individual winter flounder were captured in the traps for a total catch weight of 3.95 kg. Two flounder were below the minimum legal landing size of 30.5 cm.

DATE	WEIGHT (KG)	LENGTH (CM)	SEX**	MATURITY STAGE
7/30/2005	0.05	16	U	UNKNOWN
7/7/2005	0.2	27	U	UNKNOWN
7/14/2005	0.55	31	F	IMMATURE
6/21/2005	0.25	33	U	UNKNOWN
7/7/2005	0.4	34	F	UNKNOWN
6/21/2005	0.35	36	F	RESTING
7/14/2005	0.75	37	F	UNKNOWN
7/14/2005	0.7	38	M	UNKNOWN
6/21/2005	0.7	42	M	RESTING

** SEX: M = Male, F = Female, U = Unknown

Table 3. Biological data collected for winter flounder captured during first field component.

Field Component 2: Winter 2005 (November – December)

During the second field testing component 50 traps were set a total of 12 times. An average of 50 traps were hauled each trip, as not many were lost during this field component. Twenty-five (25) traps were fitted with the standard crab hoop opening, 25 traps had the restricted opening design. The total catch by species and weight for this field testing component is shown in Table 4. The species captured consisted primarily of crabs from the genus *Cancer*. No winter flounder were captured.

SPECIES COMMON NAME	WEIGHT (KG)
CRAB, JONAH	146.17
CRAB, ROCK	68.96
LOBSTER, AMERICAN	22.4
CRAB, GREEN	21.07
SCULPIN, LONGHORN	0.5
COD, ATLANTIC	0.41
CRAB, SPIDER	0.1
SCULPIN, SHORTHORN	0.1
TOTAL	**259.71**

Table 4. Catch weights by species for second field testing component (November - December 2005).

Table 5 displays catch weights by species and trap type as well as the average weight per trap by species. As might be expected, separation of catch weight by trap type (standard crab hoop vs. restricted opening) shows that more of the catch occurred in the standard trap type (166 kg) versus the restricted opening design (94 kg). A comparison of average weight per trap by trap type presents a similar picture since the number hauls by trap type conducted were nearly equal (297 standard vs. 299 restricted opening). The difference in lobster catch between traps with the two different opening designs is especially worth noting (19.65 kg standard vs. 2.75 kg restricted). Since the traps with the restricted openings have smaller entrances, it is likely that smaller and fewer animals can and will find and use these openings.

TRAP TYPE:

STANDARD

SPECIES	WEIGHT (KG)	KGS/ TRAP
COD, ATLANTIC	0.41	0.00
CRAB, GREEN	10.67	0.04
CRAB, JONAH	87.52	0.29
CRAB, ROCK	47.63	0.16
LOBSTER, AMERICAN	19.65	0.07
SCULPIN, LONGHORN	0.3	0.00
TOTAL	**166.18**	**0.56**

RESTRICTED

SPECIES	WEIGHT (KG)	KGS/ TRAP
CRAB, GREEN	10.4	0.03
CRAB, JONAH	58.65	0.20
CRAB, ROCK	21.33	0.07
CRAB, SPIDER	0.1	0.00
LOBSTER, AMERICAN	2.75	0.01
SCULPIN, LONGHORN	0.2	0.00
SCULPIN, SHORTHORN	0.1	0.00
TOTAL	**93.53**	**0.31**

Table 5. Catch weights by species and trap type for second field testing component (November - December 2005).

Field Component 3: Spring 2006 (May – June)

During the third field testing component 30 traps were set a total of 11 times. The average number of traps hauled for this component was 28. Seventeen (17) traps were fitted with the standard crab hoop opening, 13 traps had the restricted opening design. The total catch weights

by species are shown in Table 6. The species captured consisted exclusively of crustaceans (crabs and lobster), except for 4.4 kg (estimated) of winter flounder.

SPECIES COMMON NAME	WEIGHT (KG)
CRAB, JONAH	85.09
CRAB, GREEN	25.66
LOBSTER, AMERICAN	4.46
FLOUNDER, WINTER (BLACKBACK)	4.4*
CRAB, SPIDER	0.1
TOTAL	**119.71**

* Estimated weight

Table 6. Catch weights by species for third field testing component (May - June 2006).

As in the second field testing component, separation of catch weight by trap type (standard crab hoop vs. restricted opening) again shows that more of the catch occurred in the standard trap type (71 kg) versus the restricted opening design (49 kg). However, this difference is less dramatic than that seen during the second field component. A comparison of the average weights by species per trap, which takes into consideration the uneven number of hauls per trap type (164 standard tap hauls vs. 147 restricted opening trap hauls), are very similar. The catch weights by species and trap type, and the average weight per trap by species are displayed in Table 7.

TRAP TYPE:

STANDARD

SPECIES	WEIGHT (KG)	KGS/ TRAP
CRAB, JONAH	53.40	0.33
CRAB, GREEN	11.89	0.07
LOBSTER, AMERICAN	3.07	0.02
FLOUNDER, WINTER	2.5*	0.02
CRAB, SPIDER	0.10	0.00
TOTAL	**70.96**	**0.43**

RESTRICTED

SPECIES	WEIGHT (KG)	KGS/ TRAP
CRAB, JONAH	31.70	0.22
CRAB, GREEN	13.78	0.09
FLOUNDER, WINTER	1.9*	0.01
LOBSTER, AMERICAN	1.39	0.01
TOTAL	**48.76**	**0.33**

***** Estimated weight

Table 7. Catch weights by species and trap type for the third field testing component (May - June 2006).

Table 8 presents more detailed information about the winter flounder captured during this field component. Seventeen (17) individual winter flounder were captured in the traps. For 5 of these flounders it was not possible to collect the weight. Weights for these fish were estimated using length-weight parameter estimates calculated from NMFS/NEFSC Bottom Trawl Surveys given in Wigley et al. (2003). The remaining 13 flounders had a total catch weight of 3.4 kg. The total estimated catch weight for all 17 winter flounders is 4.4 kg. Eleven (11) of 17 flounders were below the minimum legal landing size of 30.5 cm.

DATE	TRAP TYPE*	WEIGHT (KG)	LENGTH (CM)	SEX***	MATURITY STAGE
5/10/2006	R	0.04**	15	U	UNKNOWN
5/17/2006	C	0.1	16	U	UNKNOWN
5/3/2006	C	0.05**	16	U	UNKNOWN
5/17/2006	R	0.12	18	U	UNKNOWN
5/3/2006	C	0.1**	21	U	UNKNOWN
5/17/2006	C	0.18	23	U	UNKNOWN
5/10/2006	R	0.15**	23	U	UNKNOWN
5/14/2006	C	0.25	25	U	UNKNOWN
5/20/2006	R	0.19	26	U	UNKNOWN
5/14/2006	C	0.25	30	U	UNKNOWN
6/12/2006	C	0.4	30	U	UNKNOWN
5/24/2006	R	0.4	31	U	UNKNOWN
5/14/2006	C	0.4	33	U	UNKNOWN
5/10/2006	R	0.44**	33	U	UNKNOWN
5/14/2006	C	0.5	34	U	UNKNOWN
5/14/2006	R	0.56	35	U	UNKNOWN
5/20/2006	C	0.27	36	U	UNKNOWN

* Trap Type: C = standard opening, R = restricted opening
** Estimated weight
*** SEX: M = Male, F = Female, U = Unknown

Table 8. Biological data collected for winter flounder captured during the third field component.

Winter Flounder Catch per Unit of Effort (CPUE)

CPUE for fixed gear fisheries can be examined in a number of different ways. One method is to calculate the time it takes, in this case the number of trap hours, to capture one fish. Another method is to estimate the average amount of fish, given here by weight, captured per trap hauled. Table 9 gives both of these calculated CPUE measures for each field component. In Table 10, this same information is given according to trap type for the third field component.

FIELD COMPONENT NUMBER	SEASON	NUM WFL CAPTURED	SOAK TIME (HOURS)	**NUMBER OF TRAP HOURS PER FISH**	NUM TRAPS HAULED	KG WFL	LBS WFL	**LBS/TRAP**
1	SUMMER 2005	9	1856	**206**	253	3.95	8.69	**0.03**
2	WINTER 2005	0	2186	**N/A**	596	0	0	**0.00**
3	SPRING 2006	17	1603	**94**	311	4.4	9.68	**0.03**

Table 9. CPUE for winter flounder captured in the experimental traps.

TRAP TYPE*	SOAK TIME (HOURS)	NUMBER WFL	**NUMBER OF TRAP HOURS PER FISH**	NUM TRAPS	KGS WFL	LBS WFL	**LBS/TRAP**
C	849	10	**85**	164	2.5	5.50	**0.03**
R	754	7	**108**	147	1.9	4.18	**0.03**

* Trap Type: C = standard opening, R = restricted opening

Table 10. CPUE by trap type for winter flounder captured in spring 2006.

Fish Length Frequency Distributions

Fish species captured in the traps included winter flounder, longhorn sculpin, Atlantic cod and shorthorn sculpin. Total length measurements to the nearest whole centimeter were collected for winter flounder, longhorn sculpin, and shorthorn sculpin; fork length was collected for the cod. Twenty-six (26) winter flounder in total were captured over the duration of the project ranging in size from 15 to 42 cm. Exactly half of these winter flounder (13) were at or above the minimum legal landing size of 30.5 cm. The length frequency distribution of all winter flounder captured is shown in Appendix I. Eight (8) longhorn sculpin were captured over the duration of the project. A chart displaying their length frequency distribution is also given in Appendix I. Two Atlantic cod were also captured during the fall sampling period. These cod measured 27 and 30 cm. Two shorthorn sculpins were captured as well; one at 20 cm and one at 23 cm.

Lobster bycatch

The restricted entrance trap design appeared to capture fewer lobsters than the control trap design although average catch per trap was fairly low for both designs (Table 11). No legal sized lobsters were captured at all in the traps with the restricted opening design in 446 traps hauled.

		LOBSTER WEIGHT (KG)			
TRAP TYPE	**NUM HAULS**	**LEGAL SIZE**	**SUB LEGAL**	**TOTAL**	**AVG/HAUL**
RESTRICTED	446	0	4.14	4.14	0.01
CONTROL	714	9.1	88.37	97.47	0.14

Table 11. Bycatch of American lobster in winter flounder traps.

DISCUSSION

Overall, there were few winter flounder caught in the experimental traps during field trials. Results from the third field testing component were more encouraging than results from the pervious field components. Variability in the results between the three field seasons is likely due to a combination of factors including seasonal timing and habitat type.

Seasonal timing

This was probably the most important variable in determining the success of the experimental gear. Like any baited trap fishing method, the target species must be hungry and actively searching for food in order to be available to the gear. Previous studies suggest that winter flounder may feed infrequently or not at all during the winter (Pereira et al. 1999). In this experiment, no winter flounder were caught at all November – December 2005. Better catch rates were experienced in summer (June – August 2005). The best catch rates occurred in late spring (May – June 2006).

In addition, winter flounder are known to be visual predators that are more attracted to moving as opposed to stationary prey (Macdonald 1983). They are more likely to take advantage of baited traps only when there are few alternative food choices available to them. In the study area, off the coast of Maine, prey availability is likely lowest in winter and early spring. The results of this experiment also seem to correlate with these observations. The best catch rates in this experiment occurred in late spring (May – June 2006). Further, 16 of the 17 winter flounder caught during this field component were caught during the month of May.

Habitat

The best winter flounder catch rates for this study also occurred where there was more sandy bottom. During the first two field components, the traps were set in Booth and Linekin Bays where more mud and rocky, complex habitat is found. During the third field component, when the highest winter flounder catches were experienced, the traps were set slightly further west in Sheepscot Bay where there is a relatively higher proportion of sandy habitat. This finding also correlates with known life history characteristics for this species as winter flounder are known to prefer sandy bottom during spawning in the spring (Pereira et al. 1999).

Restricted Versus Control Entry Design

No significant differences were observed in winter flounder catch between the control opening and restricted entry design. However, the restricted opening does seem to reduce the amount of legal sized lobsters caught in the traps. This is important because regulations in Maine require the use of a trap tag in any trap capable of catching lobsters. For most fishermen who would consider using these traps to target winter flounder, it is important that they do not have to use a lobster trap tag. Lobster trap tags are too valuable to use in the winter flounder traps during the lobster fishing season and even using them out of season risks loss of the tags which cost time and money to be replaced. If traps meant to target winter flounder can be shown to have a low level of lobster bycatch, it is possible to gain an exemption from having to use lobster trap tags.

FUTURE RESEARCH

While the catch rates observed in this experiment were not high enough to make a commercial fishery economically viable, results were encouraging and further testing of the experimental flounder traps with the restricted entry opening design is encouraged. It is recommended that any future experiments take the following factors into consideration.

Seasonal timing

As discussed above, this is likely the most important factor in determining the success of this and future efforts to trap winter flounder on a commercial scale. The month of May saw the best winter flounder catch rate in this study. It is likely that catch rates may be even better earlier in the spring (March/April). If winter flounder feed infrequently during the winter, it is likely that they will be quite hungry in early spring, have a limited selection of prey available to them and more likely to enter a baited trap.

Location/habitat

The project director feels that field trials of these traps may be more successful further downeast the coast of Maine. There is a higher proportion of sandy bottom located further east. The ME/NH Inshore Trawl Survey has also documented higher catch rates of winter flounders above the minimum legal landing size in this area as compared to mid-coast Maine (K.

Stepanek, Scientist, Maine Dept. of Marine Resources, personal communication). Future field trails should focus on sandy habitat found in this area.

Bait selection

While winter flounder are known to be opportunistic feeders that consume a wide variety of prey, many studies have found that polychaetes (worms) and crustaceans make up the bulk of their diet (Pereira et al. 1999). Further field trials testing different types of bait in the traps, especially worms, may prove more successful than the mussels and herring used in this study.

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PARTNERSHIPS

Primary participants in this project include project director and fisherman Kelo Pinkham and project technical advisor Pingguo He. These parties have worked together successfully in the past on other research projects and collaboration during this project was excellent. Mr. Pinkham created the initial project idea, design and methods. Dr. He assisted Pinkham in refining the project design and methods.

Pinkham brought to the project a fishermen's knowledge of how the traps were designed and fished historically while He provided technical guidance on how to refine the trap design based on his experience conducting evaluations of fishing gear designs and his observations of winter flounder behavior. Pinkham constructed the traps and conducted the first two field trials in summer 2005 and winter 2005, hauling the traps and recording the necessary data.

Jim Lowe, a lobster fisherman from Boothbay, Maine assisted with trap design and construction. Pinkham was also able to involve another Boothbay lobster fisherman in project activities including tending the traps and collecting data during the last field testing component in spring 2006.

Catherine Salerno, Research Technician at the Gulf of Maine Research Institute, assisted with general project coordination and management as requested by the project leader. Salerno wrote project reports as well as entered, organized and managed the field data collected.

PRESENTATIONS

The Project Director displayed an experimental trap at the 2005 and 2006 Maine Fishermen's Forums. In addition, he discussed the project with interested individuals and answered questions.

STUDENT PARTICIPATION

There has been no student participation in this project to date.

PUBLISHED REPORTS AND PAPERS

There have been no published reports or papers relating to this project to date.

IMAGES

No new images are available for this project.

LITERATURE CITED

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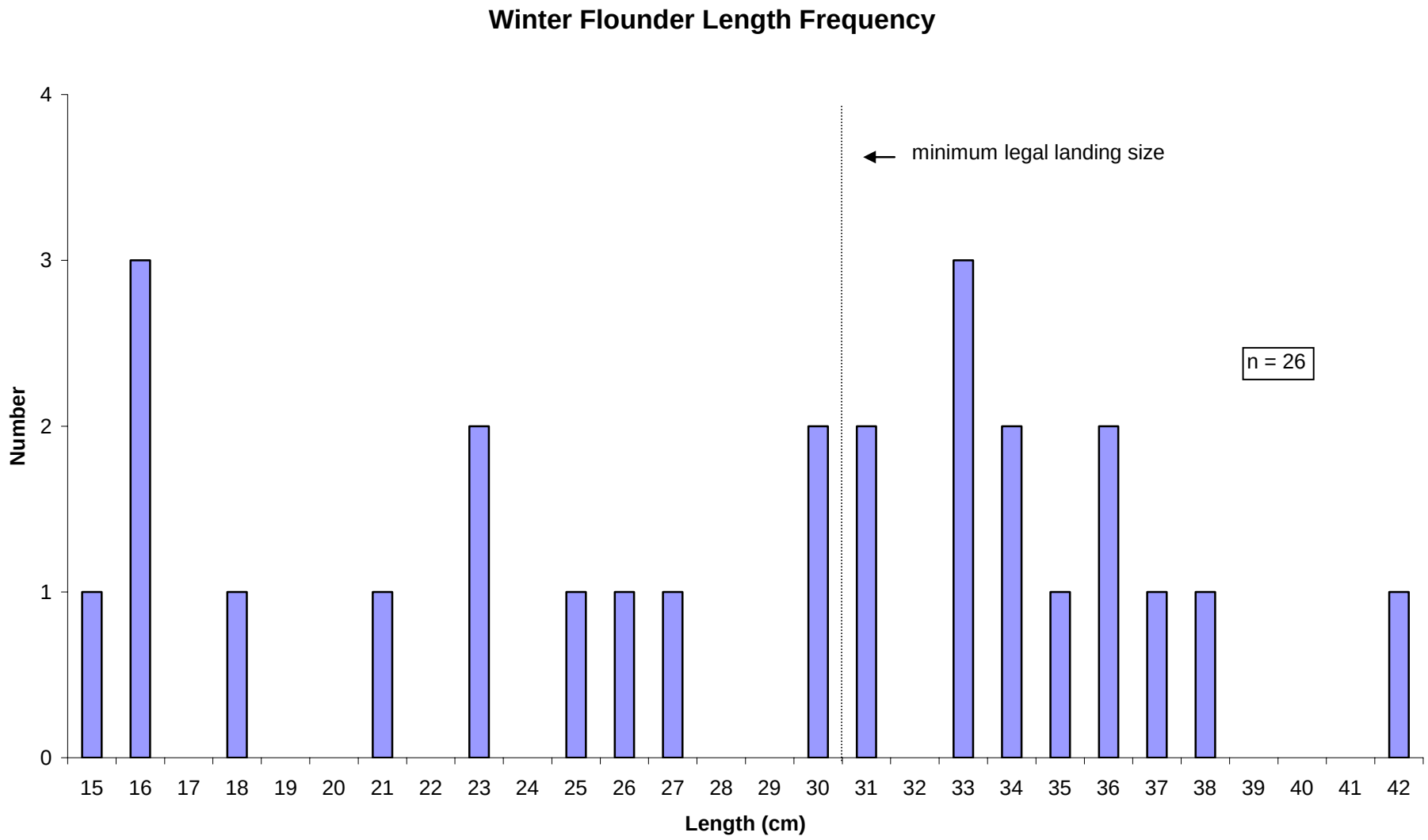
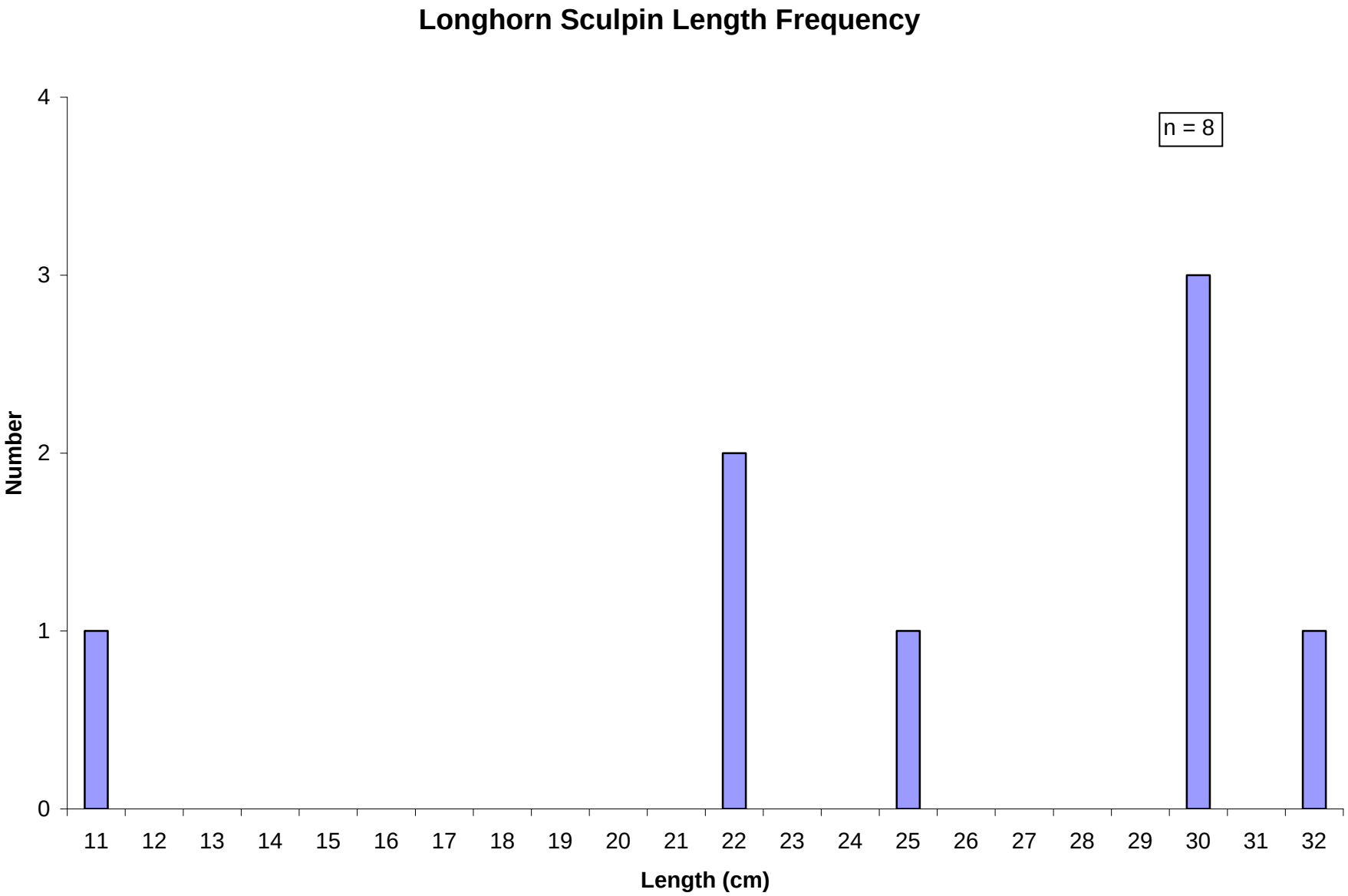
APPENDIX I - LENGTH FREQUENCY DATA


Winter Flounder Length Frequency
minimum legal landing size
n = 26
Number
Length (cm)
0
1
2
3
4
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42


Longhorn Sculpin Length Frequency
n = 8
Number
0
1
2
3
4
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
Length (cm)