RHODE ISLAND AND PROVIDENCE PLANTATIONS DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

DIVISION OF FISH AND WILDLIFE
MARINE FISHERIES

2015 Sector Management Plan for the Crustacean Fishery

Developed in association with commercial fishing licensing provisions set forth in the "Commercial and Recreational Saltwater Fishing Licensing Regulations"

October 23, 2014

Authority: R. I. Gen. Laws Chapter 42-17.1, Section 20-1-4, and Section 20-2.1-9, in accordance with Chapter 42-35 of the Rhode Island General Laws of 1956, as amended.

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PURPOSE

The purpose of these rules and regulations is to manage the marine resources of Rhode Island.

AUTHORITY

These rules and regulations are promulgated pursuant to Chapter 42-17.1, Section 20-1-4, and Section 20-2.1-9, in accordance with Chapter 42-35 of the Rhode Island General Laws of 1956, as amended..

APPLICATION

The terms and provisions of these rules and regulations shall be liberally construed to permit the Department to effectuate the purposes of state law, goals, and policies.

SEVERABILITY

If any provision of these Rules and Regulations, or the application thereof to any person or circumstances, is held invalid by a court of competent jurisdiction, the validity of the remainder of the Rules and Regulations shall not be affected thereby.

SUPERSEDED RULES AND REGULATIONS

On the effective date of these rules and regulations, all previous rules and regulations, and any policies regarding the administration and enforcement of this regulation shall be superseded. However, any enforcement action taken by, or application submitted to, the Department prior to the effective date of these Rules and Regulations shall be governed by the Rules and Regulations in effect at the time the enforcement action was taken, or application filed.

2015 Sector Management Plan for the Crustacean Fishery

INTRODUCTION

Rhode Island general law pertaining to commercial fishing licenses requires that the Director of the Department of Environmental Management (DEM) develop conservation and management plans in support of regulations that may restrict the issuance of licenses (RIGL 20-2.1-9(5)). Restrictions on commercial licenses were clearly contemplated by the Rhode Island General Assembly as a means to limit fishing effort and to rebuild depleted fishery resources (RIGL 20-2.1-2, 20-3.1-2 (4)). Such plans are to be developed with advice from the Rhode Island Marine Fisheries Council (RIMFC) (RIGL 20-2.1-10) and shall focus on fishery resources with the greatest value to the state. The current DEM commercial licensing program recognizes three fishery sectors; crustaceans, finfish, and shellfish. The following is the plan for the crustacean sector with recommendations for licensing in 2015. Two crustacean sector license endorsements, lobster and crustaceans other than lobster (crabs, shrimps) are offered by DEM and are considered here. This plan emphasizes American lobster in recognition of their great commercial and recreational value to Rhode Island citizens. The 2014 licensing plan recommended no new lobster licenses in view of the poor resource status and ongoing management activities designed to rebuild the lobster resource in the Rhode Island area.

AMERICAN LOBSTER

Stock Status: The lobster resource in Narragansett Bay and Rhode Island coastal waters (Lobster Conservation Management Area 2, Southern New England lobster stock unit) has been over exploited for many years (ASMFC 1996, 2000, 2006a, 2009, Gibson 2000). A stock decline in 2002 prompted the Atlantic States Marine Fisheries Commission (ASMFC) to initiate emergency remedial action in Lobster Conservation Management Area 2 (Area 2), which includes Rhode Island state waters. The two ASMFC lobster stock assessments conducted since 2002 have concluded that the southern New England lobster stock, including Area 2, is in poor condition based on the recommended biological reference points, is below the abundance threshold, is at or near the fishing mortality threshold, is depleted and at the overfishing threshold (ASMFC 2006a), and is below the effective exploitation threshold (ASMFC 2009) (Table 1).

Agency trawl surveys clearly document the abundance decline that triggered the 2002 ASMFC emergency action in Area 2. Rhode Island Division of Fish and Wildlife (DFW) surveys conducted in Narragansett Bay and Rhode Island coastal waters since 1979 show that local lobster abundance dropped from high levels in the mid-1990's to low levels in 2002-2003 (Figure 1). Although surveys conducted during 2005-2008 caught slightly more lobster, abundance has not recovered to former levels and remains below the time-series average. URI scientists have observed a similar pattern in lobster catches made by the Graduate School of Oceanography survey in state waters (Figure

2). Both Massachusetts and Connecticut have reported lobster declines to the east in Buzzards Bay and to the west in Long Island Sound. The decline in abundance of both sub-legal and legal lobster from 1997 to 2002 was preceded by a steep decline in the abundance of newly settled lobster from 1990 to 1996 (Figure 3). These abundance patterns are consistent with the generally accepted time lag of 6-7 years between first settlement and attainment of adult size. In addition to reduced settlement, shell disease, oil spills, and increasing predation by finfish have likely increased the natural mortality rate and reduced the number of lobster surviving from settlement to legal size. The combined effects of reduced settlement and declining post-settlement survivorship have impacted the fishery, reducing recruitment, landings and catch per unit effort (CPUE) to lower levels (Figure 4). Given the time lag from settler to adult, the increase in legal abundance observed in 2004-2006 was not unexpected. On a pessimistic note, settlement from 2007-2012 was poor, suggesting that a return to high stock levels is unlikely in the foreseeable future.

The ASMFC lobster technical committee last updated the coast-wide lobster stock assessment, including evaluation of new models that can consider increased natural mortality rate, in 2009. Revisions to their definitions of stock areas and recommendations for new biological reference points were made at that time as well. The ASMFC lobster management board, at their spring 2009 meeting, accepted the assessment results and peer review which have since been published for public information (ASMFC 2009). This last assessment showed that the southern New England (SNE) stock of lobster, spanning the region from Cape Cod to New Jersey, is at low abundance and considered depleted (Figure 5). The above cited assessment results and peer review comments pertain to a broader stock area than the Rhode Island marine waters under jurisdiction of the state. In response to the assessment and peer review, the ASMFC lobster management board authorized development of several addenda to the fishery management plan for lobster pending public comment and further board deliberations. An updated lobster stock assessment based on data through 2013 is currently under preparation and should be released in late 2014 or early 2015.

The ASMFC lobster technical committee recently examined data collected since the 2009 lobster stock assessment (i.e. 2008-2012 data). The SNE stock continues to be below the reference abundance threshold and below the effective exploitation threshold, meaning *the stock is depleted but overfishing is not occurring* (Table 1). Current abundance of the SNE stock is the lowest observed since the 1980s (Figure 5) even though exploitation rates have declined since 2000. More importantly, the 2009 assessment documented recruitment at very low levels throughout the SNE stock between 1998 and 2005. A number of empirical stock status indicators were examined to judge the stock's overall health independent of assessment model results. Abundance indicators for SNE are generally negative or neutral while fishing mortality indicators are mixed. In the offshore waters covered by the NMFS survey and deeper near shore waters covered by the RI survey, exploitation rates have been neutral or positive for the 2005–2007 time period. However, exploitation for Long Island Sound and the inshore waters of NJ are negative, with the exception of the NJ Fall Survey

which is neutral. Fishery performance indicators are generally negative, reflecting the fact that catches and abundance are cascading downward. In general, stock indicators and model results both reflect the same stock status: overall abundance, spawning stock biomass, and recruitment are all at low levels throughout SNE lobster stock; the stock has not rebuilt since the last assessment and is still in poor condition.

Management Program: Lobsters are managed within state waters by the DEM with advice from the RIMFC. Regional management of the lobster resource is the responsibility of the ASMFC. Amendment 3 to the fishery management plan (ASMFC 1997) and associated addenda govern the interstate management program and peer reviewed coast wide stock assessments (ASMFC 2000, 2006a, 2009) provide information on lobster biology and resource status. The ASMFC management program is organized by lobster management area with Rhode Island state waters being part of Area 2. DEM complies with the Area 2 plan through a set of management measures that includes minimum gauge and escape vent sizes, trap limits, protection of egg-bearing females, and v-notching. Both state (RI-MA) and federal waters are included in Area 2 making cooperative management essential. The plan for Area 2 initially required reductions in trap deployment in addition to a set of gauge and escape vent size increases in order to rebuild egg production to the minimum F10% level. The Addendum VII plan was structured to include transferability of lobster trap allocation, and includes a 10% conservation tax on trap allocation transfers which is expected to result in further reductions in the amount of traps deployed in Area 2 over time. The transferability provisions for Addendum VII have been developed by ASMFC Addenda XII, XVIII, XIX, and XXI. New interim biological reference points were adopted via ASMFC addendum VIII in 2006 and a rebuilding timeline with technical measures via ASMFC addendum XI were adopted in 2007. These actions were taken to remedy the over-fished condition identified in the 2006 stock assessment. ASMFC addendum XVI established new reference points for determination of lobster stock status and was adopted in November 2009.

Additionally, in response to the April 2010 ASMFC Lobster Technical Committee report on recruitment failure in the SNE lobster stock, the ASMFC Lobster Management Board called for development of an addendum (addendum XVII) to address a recommended 50-75% reduction in the exploitation rate on lobster in the SNE stock. The NMFS contracted the services of the Independent Center of Experts (ICE) to conduct a review of the 2009 stock assessment and technical committee report on recruitment failure in SNE. The ICE review produced a consensus that 1) natural mortality rate (M) had likely increased, 2) the stock was in poor shape, and 3) severe reductions in fishing mortality rate were needed immediately. The ASMFC Lobster Management Board approved Addendum XVII to the Interstate Fishery Management Plan for American Lobster in February 2012. This addendum presents a suite of management options to reduce fishing exploitation on the southern New England (including LCMA 2) lobster stock by 10% starting in July 2013. The proposed 10% reduction would come from changes in the minimum size limit, maximum size limit, and/or closed seasons. Proposals would be developed for each affected lobster conservation management area (LCMAs 2, 3, 4, 5, and 6) to meet the 10% reduction in exploitation. In lieu of a closed season, a

conservation equivalency program was approved for LCMA 2 to allow the states of Rhode Island and Massachusetts to implement a mandatory v-notch program for all legal sized egg bearing females beginning June 1, 2012. If the measures do not meet the conservation objectives, an annual four month closed season from January 1 to April 30 will be implemented. As part of the Southern New England area-specific measures, LCMA 3 will implement a minimum size of 3 17/32" effective January 1, 2013. In July 2014 staff biologists analyzed available fishery dependent data and determined that the 10% reduction in exploitation had not been met mostly because of further declines in lobster abundance.

In May 2012 the ASMFC American Lobster Management Board approved Draft Addendum XVIII for Public Hearing. The draft Addendum proposed a consolidation program for LCMA's 2 and 3 to address latent effort and reduce the overall number of traps allocated. The specific management tools being considered include trap allocations, trap banking and controlled growth for participants in the fishery. Addendum XVIII was approved in August 2012 with the goal of scaling the southern New England lobster fishery to the size of the resource, with an initial goal of reducing qualified trap allocation by 25% - 50% over a 5-10 year period of time. Addendum XIX was approved in February 2013 as essentially a revision to Addendum XVIII to change the LCMA 3 transfer tax from 20% down to 10%. Addendum XXI is a continuation and refinement of aspects of Addendum XVIII and addresses mechanisms for reductions in fishing capacity for LCMA's 2 and 3 and rules governing lobster trap allocation transferability. In May 2014 the DEM implemented a State only Lobster Trap Transferability program which allows State only license holders to transfer traps within the pool of State licenses along with a 10% transfer tax to further reduce traps.

Fishery Management Goals and Objectives:

Goal: The following goal is adapted from the coast wide goal of the Atlantic States Marine Fisheries Commission (ASMFC 1996).

Rhode Island will have a healthy American lobster resource and a fishery management regime, which provides for sustainable harvest, cooperative management by stakeholders, and appropriate opportunities for fishery participation.

Objectives:

1. Maintain fishing mortality rates and brood stock abundance at levels, which minimize the risk of stock depletion and recruitment failure.
2. Extend size-age composition of the resource and increase yield per recruit in the fishery while maintaining harvest at a sustainable level.
3. Maintain existing social and cultural characteristics of the fishery wherever possible
4. Promote economic efficiency in harvesting and use of the resource
5. Provide for adaptive management that is responsive to unanticipated short-term events or circumstances.

6. Increase understanding of American lobster biology and improve data collection, stock assessment models, and relationships between harvesters and scientists.

Licensing Options and Recommendations: Current Rhode Island lobstermen fishing in state waters must hold either a multipurpose license**,** lobster principal effort license**,** or commercial fishing license endorsed for lobster to fish for lobster, as allowed for by existing state and ASMFC regulations. The licensing statutes require that the Director of DEM specify by rule the status of the lobster resource each year and the availability of new lobster licenses. A limited number of individuals were issued limited access, basic commercial fishing licenses in 2003. These licenses allowed for a 100-pot deployment rather than the 800 pot, full access deployment. As a result of implementation of Addendum VII, all license holders are now limited to fishing a number of traps based on their individual lobster landings and trap deployment history during the years 2001-2003 (or 1999-2000 in cases of a proven medical or military service hardship during the years 2001-2003). No new lobster licenses were recommended or issued by DEM for 2014, and none are recommended by DEM for 2015. Table 2 shows Rhode Island commercial fishing license and lobster license/endorsement issuance data for 2003-2014.

RI Marine Fisheries Council Advice: The Industry Advisory Committee (IAC) of the RIMFC, required under RIGL 20-2.1-11, met to formulate advice for the Council on licensing and recommended status quo for the lobster fishery regarding licenses for 2014 (no new lobster licenses). The RIMFC agreed with the IAC and recommend status quo to the Director of DEM, no new lobster endorsements for 2014.

DFW Recommendations: It is clear from the above information that the regional lobster resource has undergone a decline in abundance and fishery performance. The decline has imposed substantial economic hardship on industry that has responded with attrition. Recently, the local stock has shown signs of increase but biomass remains below that needed for MSY. The regional rebuilding effort undertaken by the ASMFC has not yet been completed. Additional restrictions may be placed on existing fishers in 2013-2014 via addendums to the interstate fishery management plan including a prohibition on issuance of new Area 2 permits. This prohibition includes state lobster licenses and landing permits applicable to lobster. The finding of reduced resource status (biomass below threshold level) is inconsistent with Rhode Island fishery conservation standard A of RIGL 20-2.1-9. In view of ASMFC compliance requirements and state law, it is recommended that no new lobster licenses be issued for 2015. The state should continue to work with the RIMFC and ASMFC to further reduce fishing mortality and to rebuild the lobster resource throughout the region. Attrition is clearly occurring in the industry and contributing to reduced fishing effort. The state is preparing to neutralize latent effort through the trap reductions imbedded in Addendum XVIII so that it cannot activate if resource conditions improve. Participation in Area 2 is based on historical performance and the state has reviewed lobster licensing and made appropriate changes in preparation for limited access-historical performance. A lobster trap allocation transferability program, that was initiated with Addendum XII, is under development in consultation with ASMFC via Addenda XVIII, XIX, and XXI. This can be

used to bring new individuals into the fishery without increasing effort above that qualified in the initial trap allocation.

Other Management Considerations: Industry has worked closely with the ASMFC, NOAA Fisheries, and DFW to implement the effort control program approved by the ASMFC lobster management board. Continued agency/industry cooperation is needed as implementation of transferability and historic participation schemes proceeds throughout the region. These programs, although controversial in some quarters, provide the best long-term mechanism to reduce lobster fishing effort. Industry has also expressed support for a replacement for the North Cape v-notching program that ended in July of 2006. As noted above, this has come in the form of ASMFC Addenda VII, XII, XVIII, XIX, and XXI to the American Lobster FMP. The former program had reduced the fishing mortality rate on female lobsters locally and egg production by v-notched females was a substantial component of egg production during 2002-2006. However, this component of egg production has decreased drastically since the termination of the North Cape v-notching program. Re-institution of this program in the context of achieving ASMFC stock rebuilding targets is set to occur. DEM strengthened v-notch protection by implementing a more restrictive v-notch definition on September 12, 2006. The intent was to increase the longevity of v-notched lobsters and encourage industry to practice voluntary notching. Abundance of v-notched lobster declined during 2006-2009. This warrants close monitoring since industry based v-notching post North Cape is needed to keep mortality rates low on female lobster. The mandatory v-notch program for all legal sized egg bearing females as part of Addendum XVII to the Interstate Fishery Management Plan for American Lobster is currently still in effect. Finally, industry supports continuation of the un-vented trap survey begun in 2006 as the primary abundance-monitoring tool for lobster. Continued federal funding to Rhode Island is needed to continue this survey.

OTHER CRUSTACEANS

Stock Status: The commercial crab fisheries in state waters are relatively small with landings of green (*Carcinus maenas*), Jonah (*Cancer borealis*), rock (*Cancer irroratus*), and blue crabs (*Callinectes sapidus*) being made. Total Rhode Island landings of these species is currently (2012) about 3.9 million pounds and worth about 2.62 million dollars (Atlantic Coastal Cooperative Statistics Program 2012). However, only a small amount of this is taken from state waters. Landings of deep-sea red crabs (*Chaceon quinquedens*) are also made, but these come strictly from federal waters and participation is limited by federal permit. Fishing mortality rate on the two *Cancer* crab species (Jonah and Rock crabs, species combined) has recently exceeded the F_{msy} level (Figure 6) and should be monitored in the future. Biomass, however, was above the B_{msy} level so the Jonah and Rock crab resource is not considered over-fished at this time (Figure 7). Figure 8 shows the URIGSO trawl survey time-series for the two *Cancer* crab species (Jonah and Rock crabs, species combined). Recent (2006-2011) *Cancer* crab abundance is below the time-series mean. Figure 9 shows the URIGSO trawl survey time-series for blue crabs. There is not sufficient data to assess other crab

species in state waters at this time. The introduction of the Japanese shore crab (*Hemigrapsus sanguineus*) has been noted and may have as yet unknown consequences for other crab species.

The horseshoe crab (*Limulus polyphemus*), although not a true crab, is also harvested. Horseshoe crabs in Rhode Island were found to be over-fished and at low abundance in the first DFW assessment (Gibson and Olszewski 2001) and analysis of data through early 2013 show a continuing trend of low abundance. An updated Horseshoe Crab stock assessment is currently being conducted. A commercial quota system with additional seasonal harvest restrictions and possession limits is being proposed to better distribute the annual catch to multiple user groups and gear types. An updated stock assessment shows that fishing mortality rate has increased above the F_{msy} reference point while stock abundance has not yet recovered toward B_{msy} (Figures 10 and 11). If this trend continues, additional management measures should be considered.

Management Program: Horseshoe crabs and crustaceans other than lobster are managed in state waters by the DEM with advice from the RIMFC. DEM uses seasons, quotas, and possession limits to manage the state waters fishery. Compliance with an ASMFC management plan is required in the case of horseshoe crabs and is achieved with a commercial quota and permitting system.

Fishery Management and Licensing Recommendations: Crab abundance is stable or declining so that additional restrictions may be needed. The recent increase in crab landings should be monitored. The spawning period closures have greatly restricted the horseshoe crab fishery and reduced fishing mortality rates. Currently, the Rhode Island Horseshoe Crab assessment is being updated with the most recent data available. The current management approach has proven to be difficult for enforcement and does not allow multiple gear types and user groups an equal opportunity for harvest on a seasonal basis. Additional limits may be needed in the future. New commercial licenses for most of these species need not be limited and can likely sustain harvest levels equal to current licensees. In order for the DFW to react in a timely fashion to fishery landings, the reports should continue to be submitted in the current manner. However it should be noted that with somewhat un-restricted access to the horseshoe crab fishery, the likelihood of an early closure date due to an exhausted quota is high unless more restrictive daily possession limits are implemented. With a quota based management regime there is no biological reason for limiting access however as effort increases so do landings.

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TABLES AND FIGURES

Table 1 - Revised threshold reference points with stock status variables for the Southern New England lobster stock unit.

Variable	SNE
Effective Exploitation	
Effective Exploitation Threshold	0.44
Recent effective exploitation 2005-2007	0.32
Effective Exploitation Below Threshold?	YES
Reference Abundance (number of lobster)	
Abundance Threshold	25,372,700
Recent Abundance 2005-2007	14,676,700
Abundance Above Threshold?	NO

Table 2 - Rhode Island Commercial Fishing License and Lobster License/Endorsement Issuance Data, 2003-2014.

	YEAR											
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
License Type												
Total Multi-Purpose Licenses MPL	1191	1135	1075	1019	973	939	917	891	868	853	829	816
MPL w/ lobster endorsement*	1191	1135	1075	1019	973	939	917	891	868	853	829	816
MPL ordered trap tags (State only/Area2)**	265	243	228	207	154	172	148	156	141	108	113	88
MPL w/ lobster trap allocation (State only/Area2)*					210	219	215	210	209	209	210	200
MPL ordered trap tags (Federal/Area 2)**	130	130	119	108	95	91	87	89	81	78	83	64
MPL w/ lobster trap allocation (Federal/Area 2)*					112	111	112	110	110	104	107	108
Total Principal Effort Licenses PEL	1325	1148	997	930	862	810	776	737	717	690	655	615
PEL w/ lobster endorsement*	61	56	52	46	45	44	40	38	37	36	30	27
PEL ordered trap tags (State only/Area 2)**	25	21	19	18	20	17	17	17	13	10	10	5
PEL w/ lobster trap allocation (State only/Area 2)*					23	22	22	21	21	21	21	16
PEL ordered trap tags (Federal/Area 2)**	16	15	15	10	12	12	13	13	12	7	7	7
PEL w/ lobster trap allocation (Federal/Area 2)*					14	14	15	15	14	14	13	13
Total Commercial Fishing Licenses CFL	271	283	317	397	464	421	433	450	394	398	420	404
CFL w/ lobster endorsement***	50	48	41	38	32	27	22	19	17	16	15	14
CFL ordered trap tags (State only/Area 2)**	24	16	13	10	6	6	6	6	5	4	4	2
CFL w/ lobster trap allocation (State only/Area 2)***					9	8	8	8	8	8	8	6
CFL ordered trap tags (Federal/Area 2)**	0	2	2	2	2	2	1	1	1	1	1	1
CFL w/ lobster trap allocation (Federal/Area 2)***					2	2	2	1	1	1	1	1
Total Effective Lobster Licenses	1302	1239	1168	1103	1050	1010	979	948	922	905	874	857
Total Effective Lobster Licenses w/ trap allocation	0	0	0	0	370	376	374	365	363	357	360	344

* 800 trap limit during 2003-2006; individual history-based lobster trap allocation starting in 2007; all MPL licenses are endorsed to take lobster.

** 2003-2013 used trap tag orders as proxy for "effective" lobster licenses

*** 100 trap limit during 2003-2006; individual history-based lobster trap allocation starting in 2007

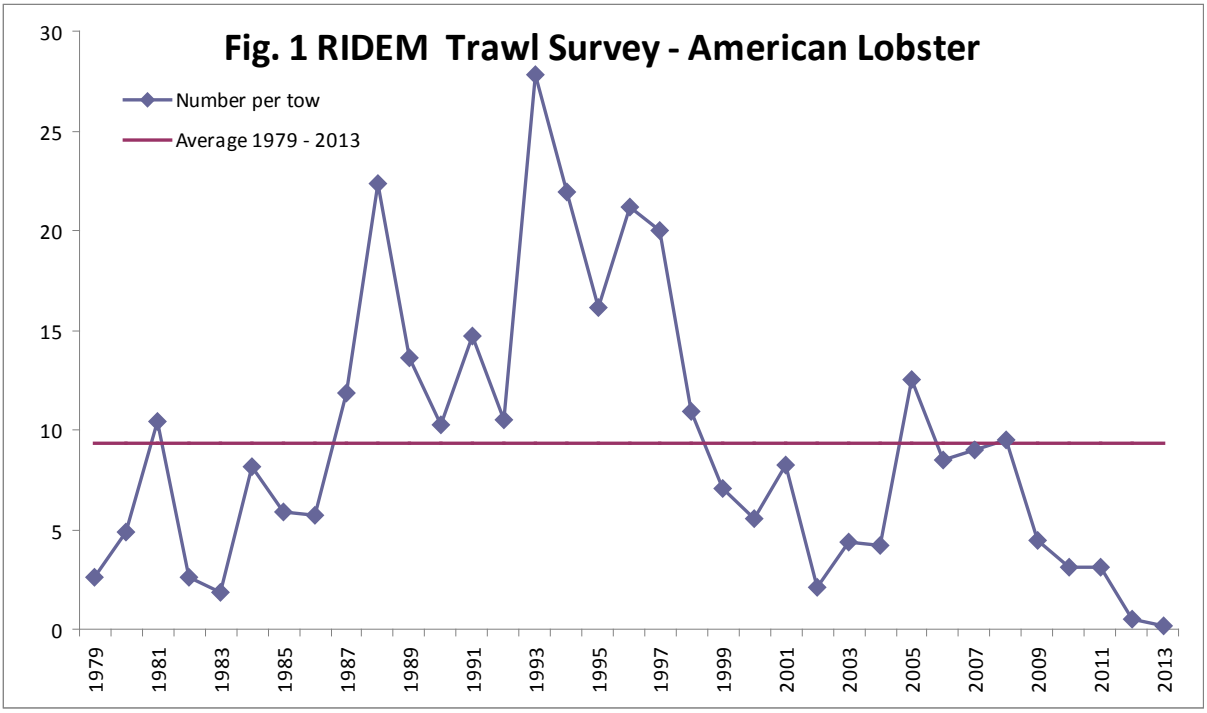
Fig. 1 RIDEM Trawl Survey - American Lobster
Number per tow
Average 1979 - 2013
30
25
20
15
10
5
0
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013

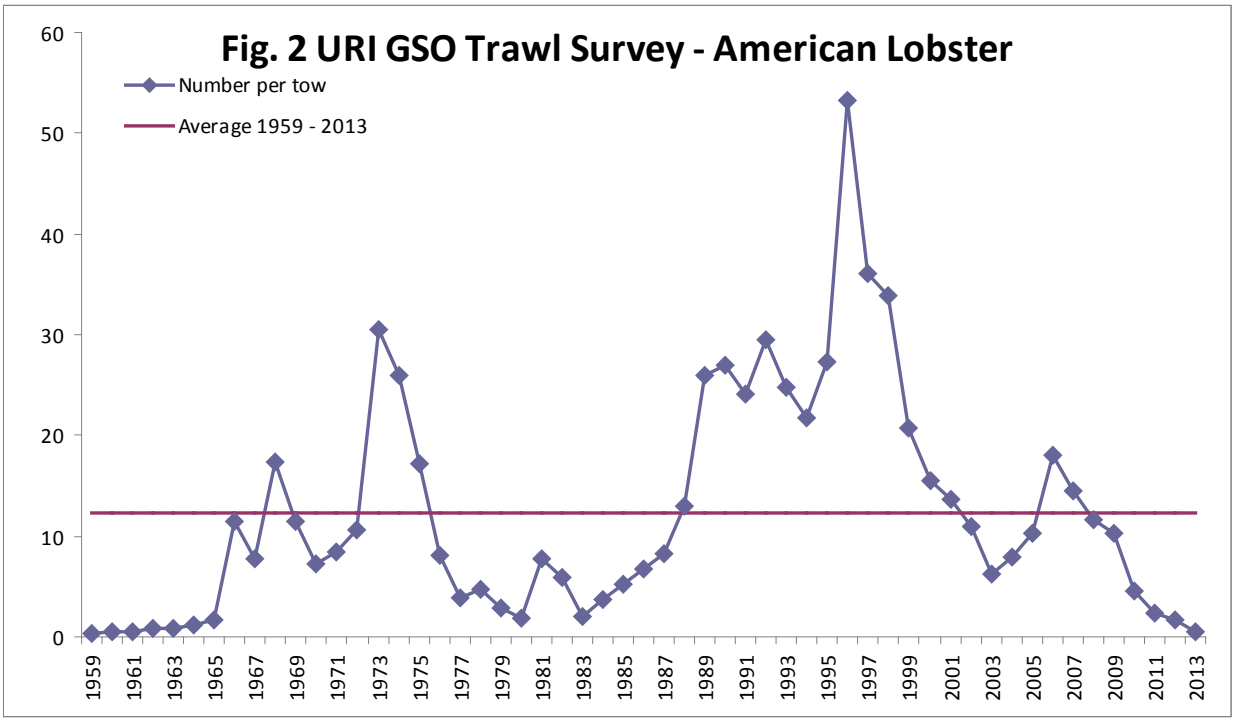
Fig. 2 URI GSO Trawl Survey - American Lobster
Number per tow
Average 1959 - 2013
60
50
40
30
20
10
0
1959
1961
1963
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
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2001
2003
2005
2007
2009
2011
2013

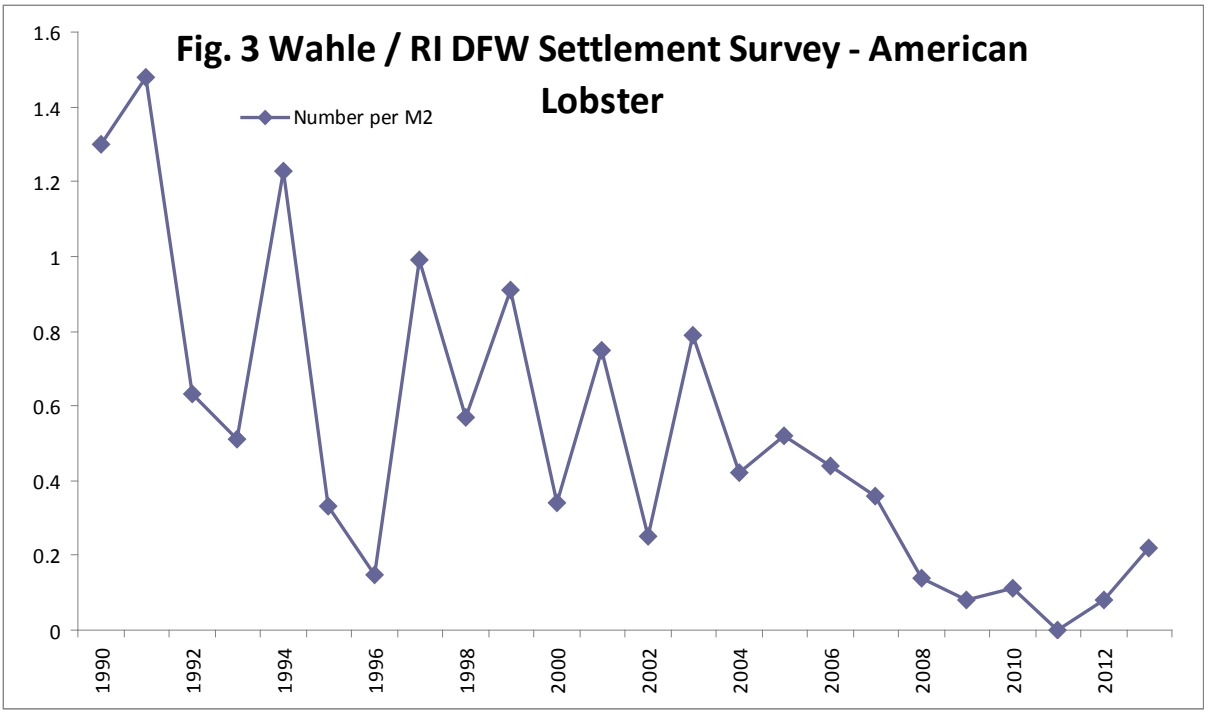
Fig. 3 Wahle / RI DFW Settlement Survey - American Lobster
Number per M2
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012

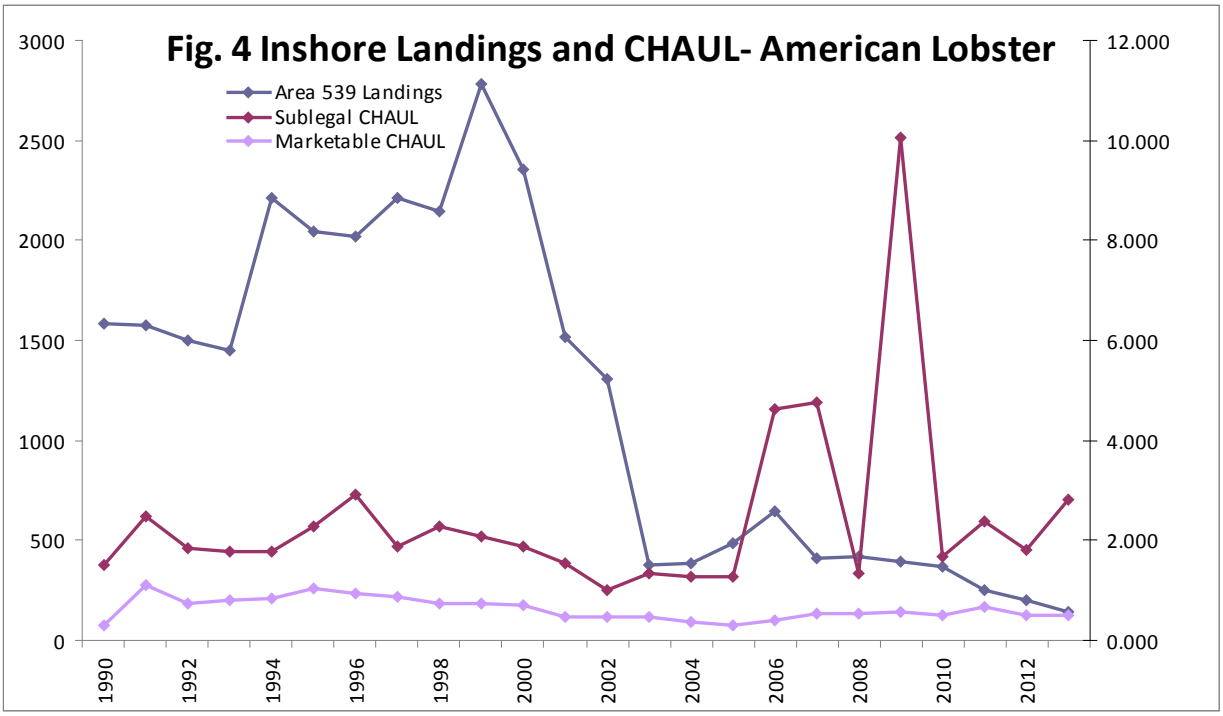
Fig. 4 Inshore Landings and CHAUL- American Lobster
Area 539 Landings
Sublegal CHAUL
Marketable CHAUL
3000
2500
2000
1500
1000
500
0
12.000
10.000
8.000
6.000
4.000
2.000
0.000
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012

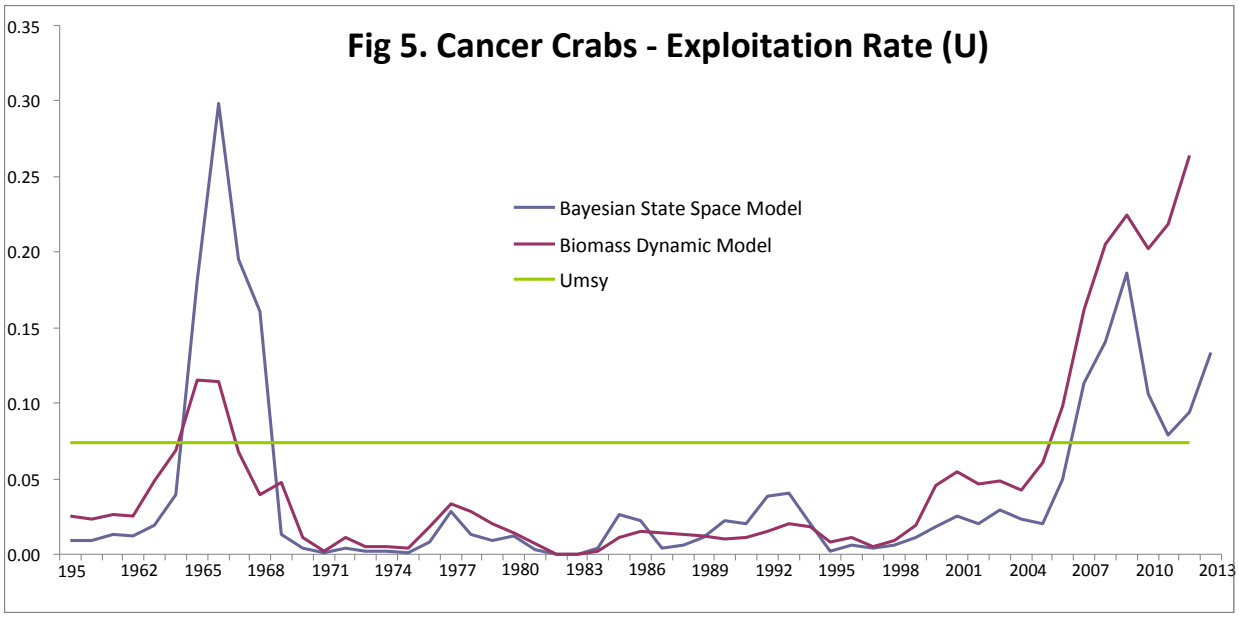
Fig 5. Cancer Crabs - Exploitation Rate (U)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
195
1962
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004
2007
2010
2013
Bayesian State Space Model
Biomass Dynamic Model
Umsy

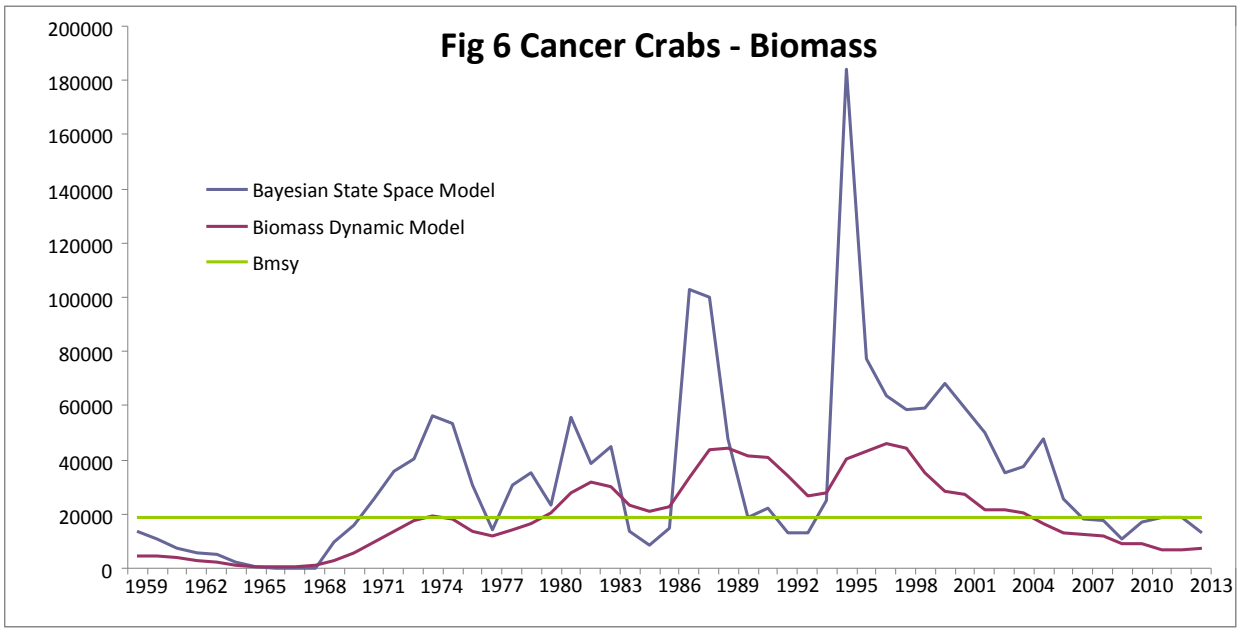
Fig 6 Cancer Crabs - Biomass
200000
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
1959
1962
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004
2007
2010
2013
Bayesian State Space Model
Biomass Dynamic Model
Bmsy

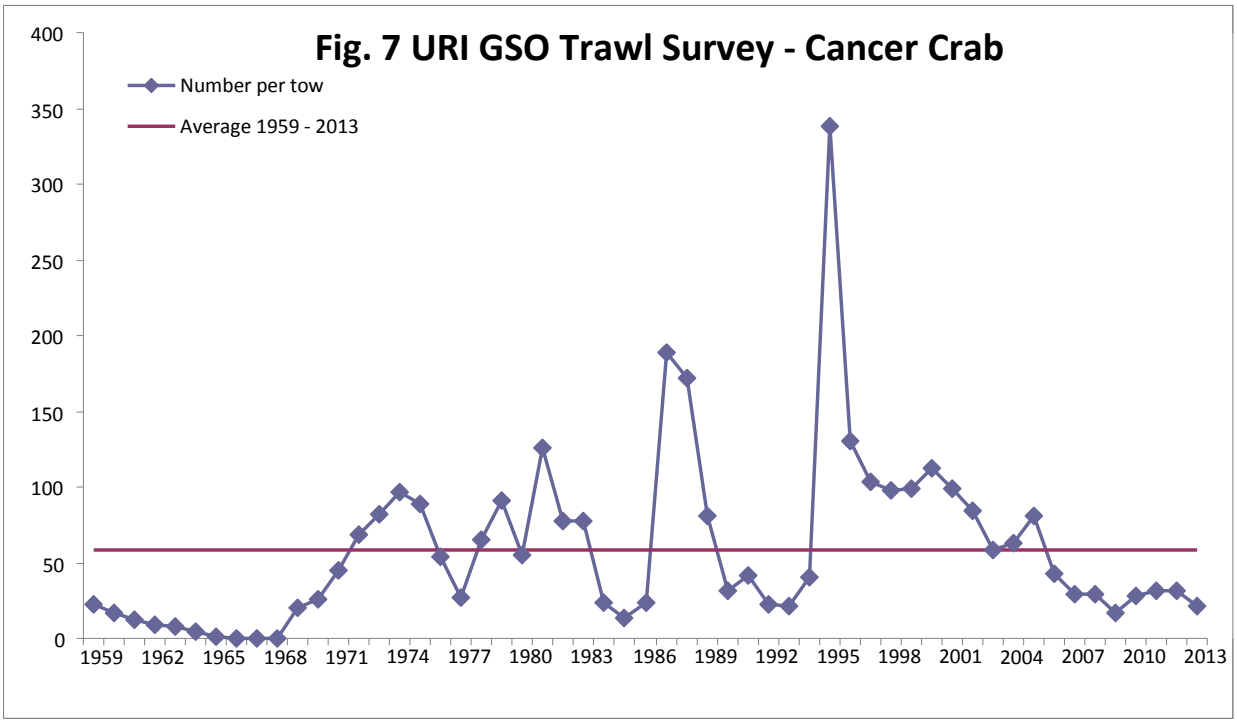
Fig. 7 URI GSO Trawl Survey - Cancer Crab
Number per tow
Average 1959 - 2013
400
350
300
250
200
150
100
50
0
1959
1962
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004
2007
2010
2013

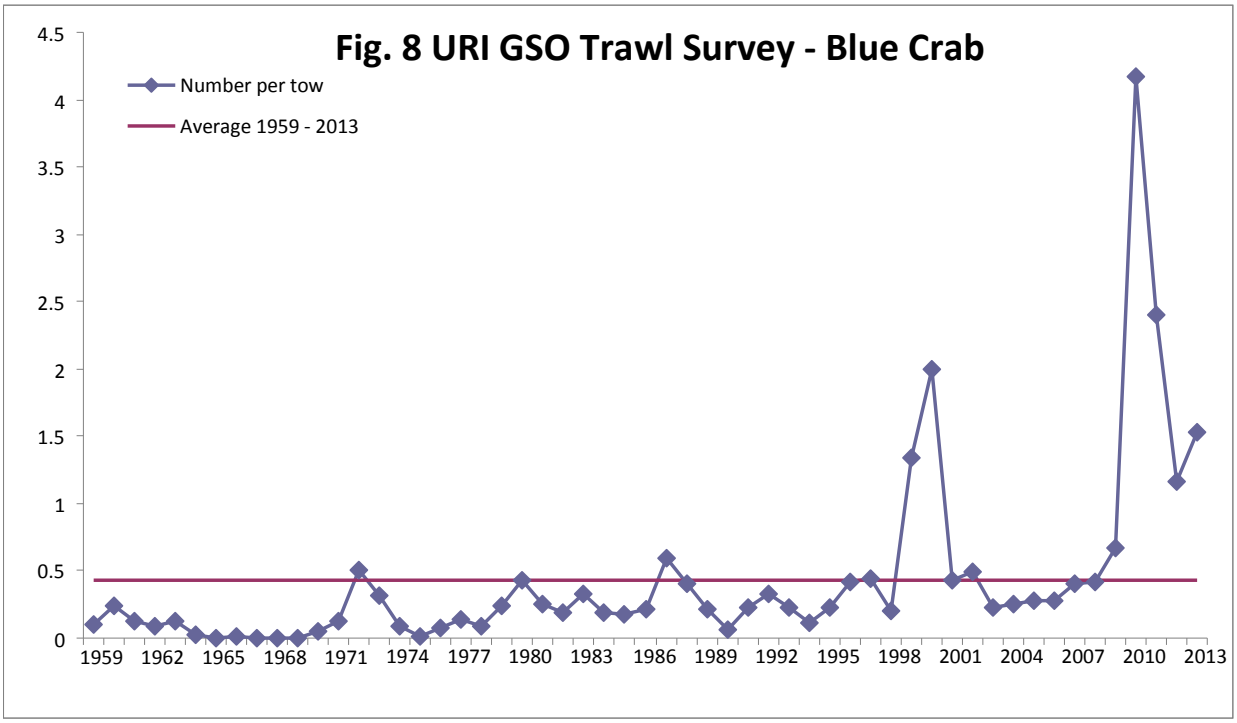
Fig. 8 URI GSO Trawl Survey - Blue Crab
Number per tow
Average 1959 - 2013
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1959
1962
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004
2007
2010
2013

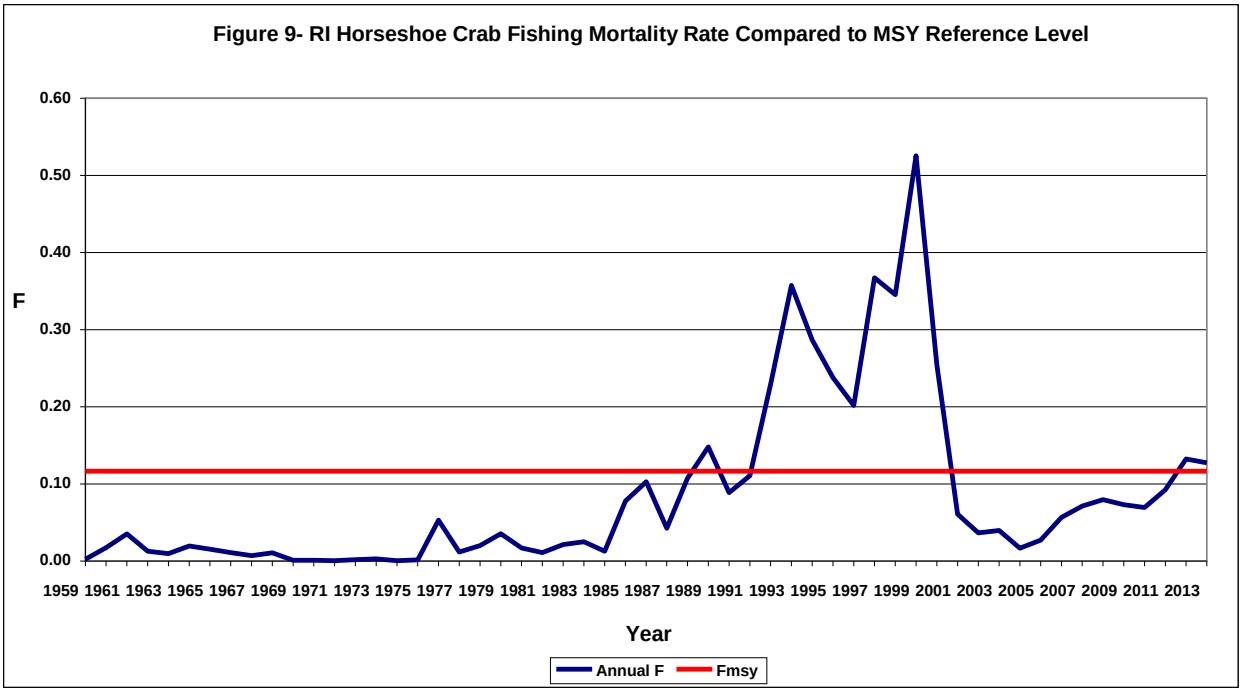
Figure 9- RI Horseshoe Crab Fishing Mortality Rate Compared to MSY Reference Level
F
0.60
0.50
0.40
0.30
0.20
0.10
0.00
1959 1961 1963 1965 1967 1969 1971 1973 1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013
Year
Annual F
Fmsy

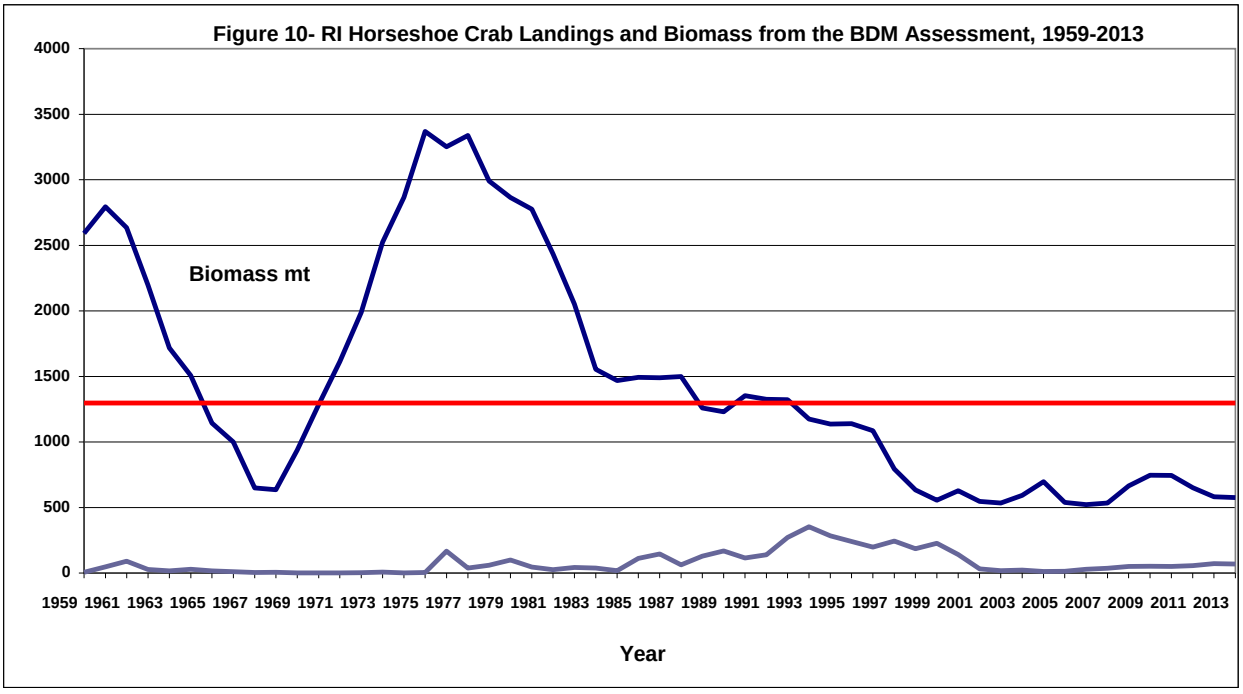
Figure 10- RI Horseshoe Crab Landings and Biomass from the BDM Assessment, 1959-2013
4000
3500
3000
2500
2000
1500
1000
500
0
Biomass mt
1959 1961 1963 1965 1967 1969 1971 1973 1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013
Year

EFFECTIVE DATE

The foregoing rules and regulations Rhode Island Marine Statutes and Regulations, after due notice, are hereby adopted and filed with the Secretary of State this 23rd day of October, 2014 to become effective 20 days from filing, unless otherwise indicated below, in accordance with the provisions of Chapter 42-17.1, Section 20-1-4, and Section 20-2.1-9, in accordance with Chapter 42-35 of the Rhode Island General Laws of 1956, as amended.

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Janet L. Coit, Director
Department of Environmental Management

Notice Given: 08/29/2013
Public Hearing: 09/30/2013

Filing date: 10/23/2014
Effective date: 11/12/2014

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