Profile of the Channeled Whelk Pot Fishery

A report to the Director and Massachusetts Marine

Fisheries Advisory Commission

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Background

The channeled whelk fishery in Massachusetts has traditionally been small scale, with a small number of full-time fishermen and a moderate number of part-time fishermen who fished for whelk seasonally. The majority of channeled whelks are harvested through directed effort with "conch" pots, and a smaller portion harvested as by-catch from draggers and clam dredgers operating in Nantucket Sound. From 1950 to the late 1970's whelk landings in MA (channeled and knobbed) were less than 250,000 lbs annually (source NMFS). In the 1980's whelk landings increased substantially, exceeding 1,000,000 lbs for the first time, presumably from an increase in market demand. It was first possible to differentiate between channeled whelk and knobbed whelk landings in the early 1990's with improvements to the landings data reporting system. Channeled whelk landings varied roughly between 1.5 and 2 million pounds from the 1990's through the early 2000's (Figure 1). Some of the variation in the landings during this time period is likely explained by fluctuations in lobster landings and effort (Figure 1). Many lobstermen fish for channeled whelk seasonally to supplement their income. When lobster were abundant and landings were high there appears to be a drop in channeled whelk landings. Conversely, when lobster abundance and landings declined, channeled whelk landings and effort increased. This is especially apparent after 2002 when the lobster population in Southern New England started to collapse.

Figure 1. Massachusetts channeled whelk and American lobster landings 1992 to 2010.

Channeled whelk landings from the pot fishery from 2000 to 2005 varied between 1.5 and 2 million pounds. Since 2006 the channeled whelk landings have increased substantially, remaining at or near 2.5 million pounds (Figure 2). This increase in total harvest is the result of a dramatic increase in effort and catch observed in Nantucket Sound (Figure 3 a and 3b). The landings and total number of trap hauls (fishing effort) have more than doubled in Nantucket Sound in the last five years. Landings and effort have remained relatively stable in Buzzards Bay and Vineyard Sounds (the other two major channeled whelk producing areas in MA) over the last decade.

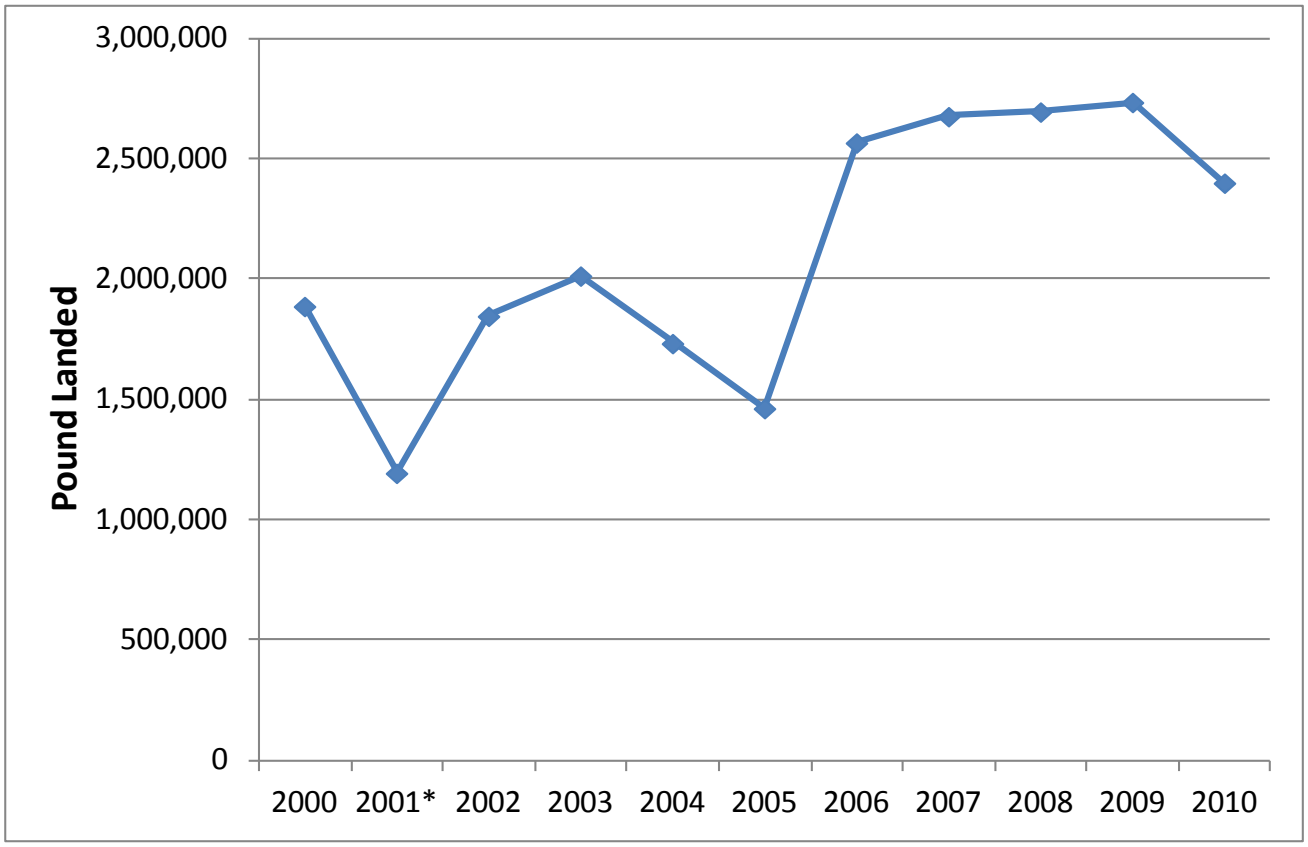

Figure 2. Massachusetts channeled whelk landings (pot gear only) 2000 to 2010.

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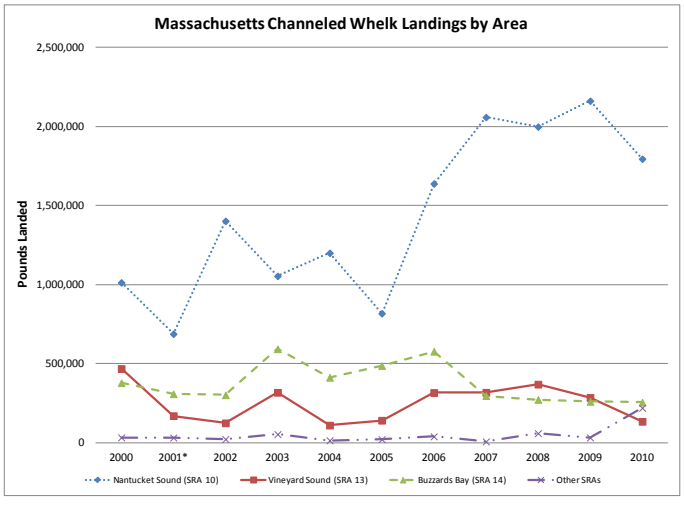

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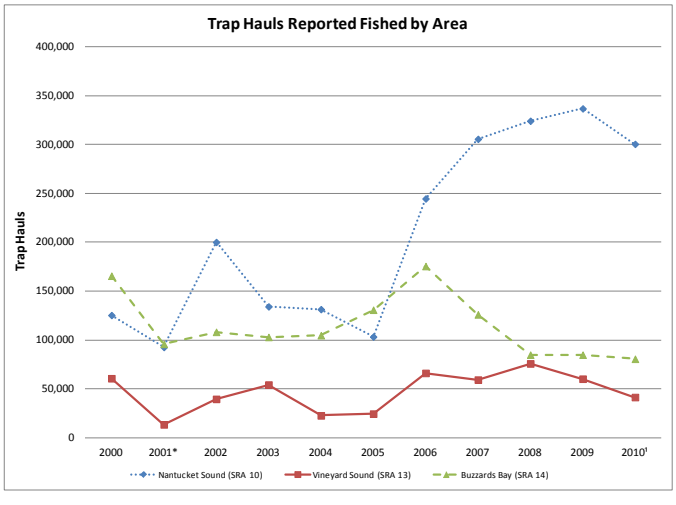

Figure 3a and 3b. Massachusetts channeled whelk landings (3a) and fishing effort by region 2000 – 2010.

Participation in the channel whelk pot fishery has remained fairly stable over the past decade. Since 2000 the number of permits issued gradually declined from a high of 166 in 2004, to a low of 151 in 2010 (Table 1). Interestingly, the number of permits actively fished during the same time period varied without trend. It is noteworthy that the large increase in catch and effort in the channeled whelk fishery between 2006 and 2010 occurred during a time when the number of actively fished permits actually declined slightly. This suggests that the observed increase in effort from 2005 to 2010 is the result of active fishermen fishing harder, rather than latent permits becoming active. Despite this there is still substantial risk of the activation of latent effort. In 2010 only 52% of the potential pots permitted were actively fished. With the ex-vessel price of conch doubling in last 5 years (Table 2), there is a substantial financial incentive for latent permit holders to start fishing.

Table 1. Conch Pot Endorsements and Reporting Status

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
ISSUED	164	161	165	166	166	159	155	155	155	153	151
FISHED	84	83*	97	87	88	79	96	96	88	90	81
DID NOT FISH	67	71	62	75	73	76	56	57	63	57	59
DID NOT REPORT	13	90	6	4	5	4	3	2	4	6	11

SOURCE: MA Commercial Catch Reports and NMFS VTRs

*83 permit holders reported fishing, however data entry problems prohibited entry of 17 reports, thus effort and landings statistics below only include 66 permits

Table 2. Dealer Reported MA Landings and Value All Conch Species (includes landings from all gear types)

Year	Live Pounds	Est. Value	Price/lbs.
2006	2,877,622	$3,523,419	$1.22
2007	2,760,765	$2,692,080	$0.98
2008	2,839,618	$3,306,214	$1.16
2009	3,021,869	$3,847,648	$1.27
2010	2,904,902	$4,360,585	$1.50
2011	3,153,630	$6,180,435	$1.96

SOURCE: SAFIS Dealer Reports

All landings reported in bushels were converted to whole pounds (includes shell weight), at 1 bushel = 62.8 lbs.

The unprecedented increases in catch and effort in the channeled whelk fishery raises questions about its long term sustainability. A species' resiliency to commercial exploitation is dependent on growth rate, rate of sexual maturation, fecundity, mode of dispersal (for adults and larvae), and its size and age relative to when it recruits to the fishery. The management of channeled whelk in Massachusetts is based on limits on participation and effort (new permit moratorium and a 200 pot limit respectively) and a 2 ¾" minimum shell width. The current limits on participation and effort are not effective at limiting the exploitation rate because of the large amount of latency (52% in 2010) in the channeled whelk pot fishery, in concert with the poorly defined relationship between pots fished and pot hauls (effective effort). In addition to this the effectiveness of the current minimum shell width is questionable because it is based on market/processing considerations, not on biological information.

MADMF received a petition in 2009 from a group of commercial whelk fishermen on Martha's Vineyard to increase the minimum shell width from 2 ¾" to 3". While this may have represented a step in the right direction for whelk management, a review of the scientific literature revealed that there was no information available to support the biological basis for this increase in minimum size. This prompted MADMF to initiate a channeled whelk life history study to generate the basic biological information necessary to make informed decisions on whelk management.

MADMF Channeled Whelk Study

In 2010 MADMF's biologist Steve Wilcox initiated a channeled whelk life history study to determine the size and age at sexual maturity of channeled whelk in MA waters with funding from a grant by the Commercial Fisheries Research Foundation. Standard commercial conch pots were deployed in Buzzards Bay, Vineyard Sound, and Nantucket Sound. A total of 969 channeled whelk (400 from Buzzards Bay, 252 from Vineyard Sound, and 317 from Nantucket Sound) were collected. For each whelk the size and weight were recorded, gender and maturity status were determined via dissection, and the operculum was removed and saved for ageing. Age for each whelk was determined by counting the annual growth rings on the operculum.

Approximately 50% of female channeled whelk are sexually mature at 89 mm (3 ½ “) (Figure 4). There was a moderate amount of variation (roughly 10 mm) in the size at 50% maturity among regions, with a smaller size at maturity observed to the west in Buzzards Bay and a larger size at maturity to the east in Nantucket Sound. None of the female channeled whelk were sexually mature at the current 2 ¾ “ minimum shell width in any of the three regions sampled. Male whelk matured at a smaller size (size at 50% was 70 mm – 2 ¾”) and there was a similar amount of variation among regions as observed with females (roughly 10 mm). Approximately 50% of male whelk are sexually mature at the current minimum size of 2 ¾ “.

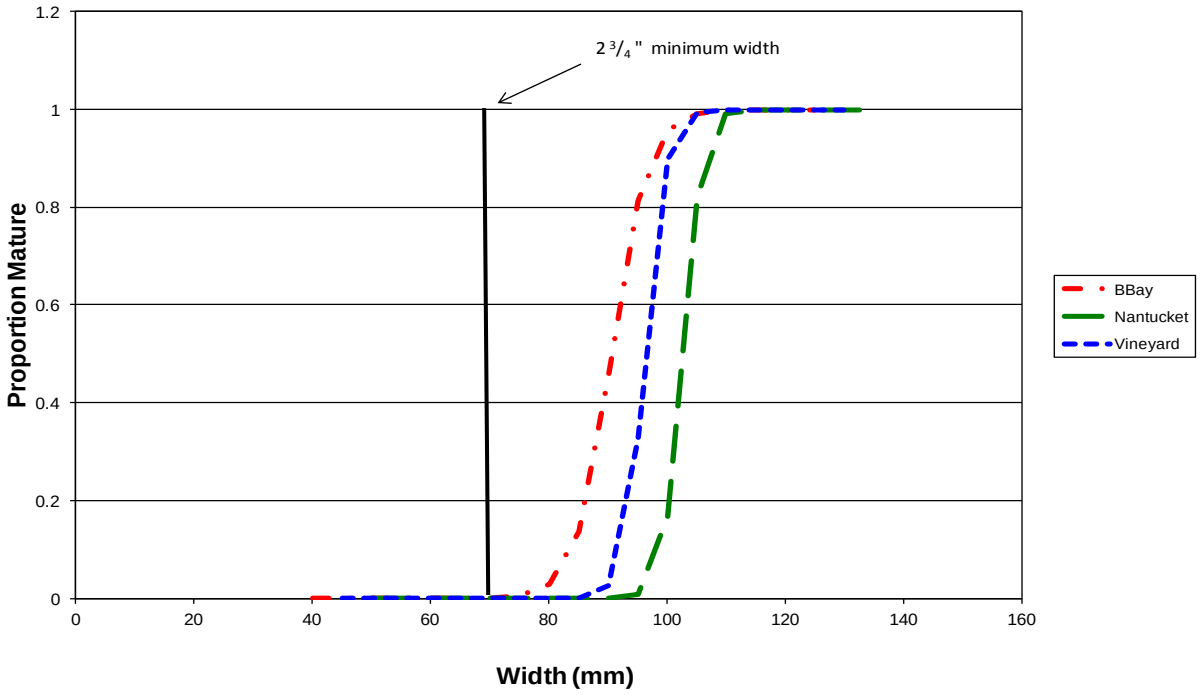

Figure 4. Size at sexually maturity for female channeled whelk in three regions in MA.

The onset of sexual maturity for female whelk occurred at age 8, with 50% maturity by age 9, and 100% maturity by age 11 (Figure 5). Male whelk reached sexual maturity at a younger age, with the first maturity occurring at age 5, 50% maturity occurring at age 6, and 100% maturity occurring by age 8. In general the growth rates of channeled whelk are slow. It takes both male and female channeled whelk between 6 and 8 years to recruit to the fishery (attain 2 ¾” minimum width) (Figure 6).

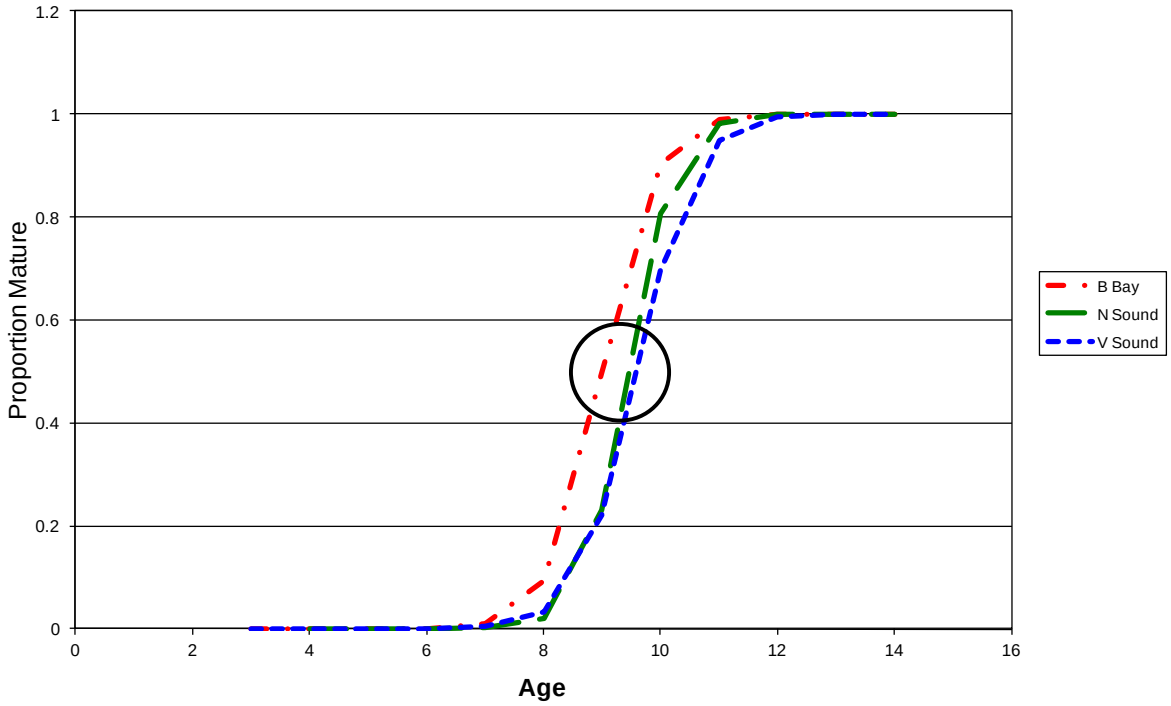

Figure 5. Age at sexually maturity for female channeled whelk in three regions in MA.

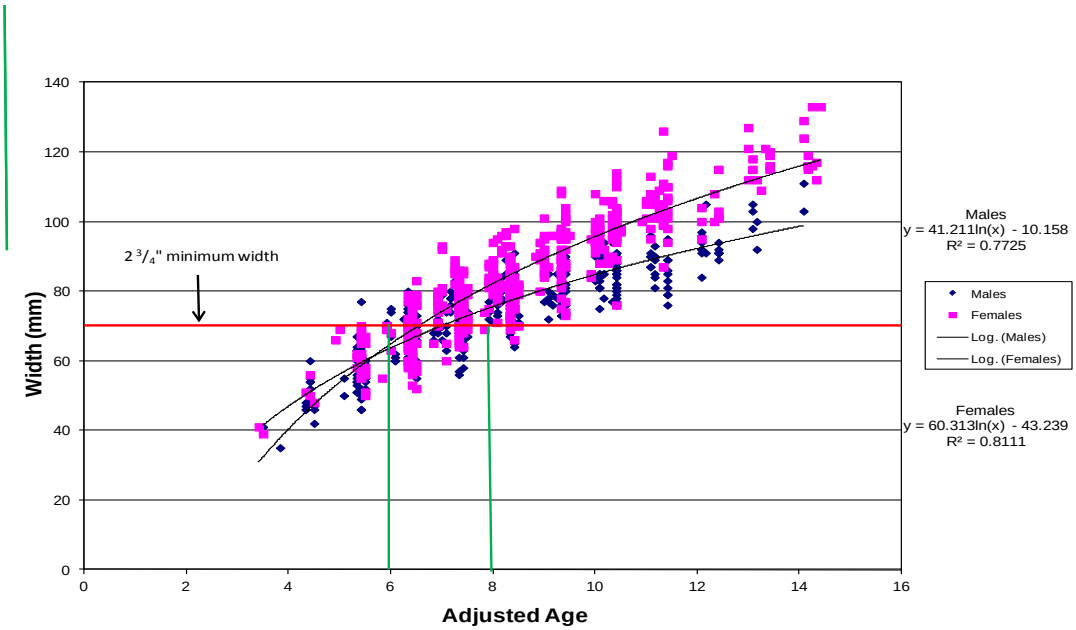

Figure 6. Growth rate for male and female channeled whelk all regions combined.

Conclusions

At the current minimum shell width for channeled whelk of 2 ¾ “, none of the females in Massachusetts coastal waters are sexually mature. The life history characteristics of channeled whelk, specifically the slow maturation, slow growth rate and lack of a dispersal mode for larvae, make them especially prone to depletion. This type of life history strategy is common in many marine snails, and the pattern of fishery booms followed by stock depletion has been consistent globally among fisheries for whelk and conch (Fahey et al. 2000, Fahey 2001, Leiva and Castilla 2002, Power et al. 2009). This pattern has been observed for common whelk (*Buccinum undatum*) in Canada (Gendron 1992), the Netherlands (de Voys and van der Meer 2009) and Ireland (Fahey et al. 2005, 2008), neptune whelk (*Neptunea arthritica*) in Japan (Miranda et al. 2008), knobbed whelk in Georgia (Power et al 2009) and South Carolina (Eversole et al 2008), black murex snail (*Hexaplex nigritus*) in Mexico (Bueno 2001), fine snails (*Zidona dufresnei*) and loco (*Concholepus concholepus*) in South America (Gimenez et al. 2005, Cleodon et al. 2005), topshell whelk (*Cittarium pica*) in Costa Rica and the US Virgin Islands (Schmidt et al. 2002, Toller and Gordon 2005), abalone (*Haliotis rufescens*) in California (Karpov et al. 2000), and queen conch (*Strombus gigas*) in Panama (Cipriani et al 2008) among others. There is no evidence to suggest that the fate of channeled whelk in Massachusetts will be any different if the high harvest rates of sexually immature whelk continue. This is supported by the dramatically declining trend of channeled whelk relative abundance in the MADMF trawl survey (Figure 7) as well as anecdotal reports from commercial fishermen who report that portion of Buzzards Bay and Nantucket Sound are already devoid of whelk.

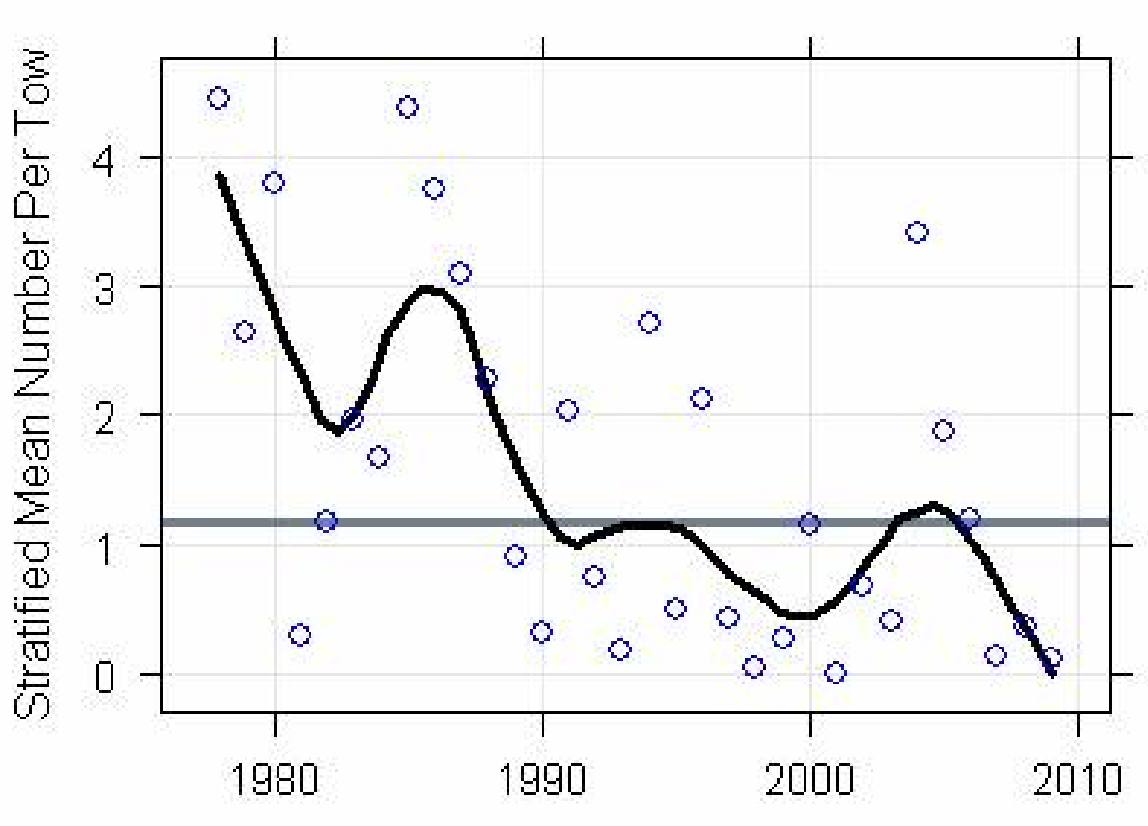

Figure 7. Stratified mean catch per tow of channeled whelk; MADMF Trawl Survey 1979 – 2010.

Recommendations

1.) Increase the minimum shell width to 3 ½" immediately.
2.) Take immediate steps to eliminate latent effort from the directed whelk pot fishery.
3.) Consider strategies to reduce effective effort (i.e. Reduced pot limits, closed hauling days).
4.) Consider adopting output controls on the channeled whelk fishery such as; hard quota's or soft TAC's.
5.) Consider adopting rolling area closures to limit the potential for localized depletion.

Literature Cited

Bueno, R.C. 2001. Co-management of the hookah diving fisheries. CEDO News Vol. 2 No. 9.

Cipriani, R., H.M. Guzman, A.J. Vega, and M. Lopez. 2008. Population assessment of the conch *Strombus galeatus* (Gastropoda, Strombidae) in Pacific Panama. J. Shellfish Res. 27: 889-896

de Vooys, C.G.N., and J. van der Meer. 2010. The whelk (*Buccinum undatum*) in the western Dutch Wadden Sea in the period 1946-1970: assessment of population characteristics and fishery impact. J. Sea Res. 63: 11-16.

Fahey, E., E. Masterson, D. Swords, and N. Forrest. 2000. A second assessment of the whelk fishery *Buccinum undatum* in the southwest Irish Sea with particular reference to its history of management by size limit. Marine Fisheries Service Division, Marine Institute, Dublin.

Fahey, E. 2001. Conflict between two inshore fisheries: for whelk (*Buccinum undatum*) and brown crab (*Cancer pagurus*), in the southwest Irish Sea. Hydrobiologia 465: 73-83.

Fahey, E., J. Carroll, M. O'Toole, C. Barry, and L. Hother-Parkes. 2005. Fishery associated changes in the whelk *Buccinum undatum* stock in the southwest Irish Sea 1995-2003. Irish Fisheries Investigations No. 15. 26 p.

Gendron, L. 1992. Determination of the size at sexual maturity of the waved whelk *Buccinum undatum* Linnaeus, 1758 in the Gulf of St Lawrence, as a basis for the establishment of a minimum catchable size. J. Shellfish Res. 11: 1-7.

Gimenez, J., M. Lasta, G. Biggatti, and P.E. Penchaszadeh. 2005. Exploitation of the volute snail *Zidona dufresnei* in Argentine waters, southwestern Atlantic Ocean. J. Shellfish Res. 24: 1135-1140.

Karpov, K.A., P.L. Haaker, I.K. Taniguchi, and L. Rogers-Bennet. 2000. Serial depletion and the collapse of the California abalone (*Haliotis sp.)* fishery. Can. J. Fish. Aquat. Sci. Spec. Publ. 130: 11-24.

Leiva, G.E. and J.C. Castilla. 2002. A review of the world gastropod fishery: evolution of catches, management and the Chilean experience. Rev. Fish Biol. Fish. 11: 283-300.

Miranda, R.M., K. Fujinaga, and S. Nakao. 2008. Age and growth of *Neptunea arthritica* estimated from growth marks in the operculum. Mar. Biol. Res. 4: 224-235.

Power, A.J., C.J. Sellers, and R.L. Walker. 2009. Growth and Sexual Maturity of the knobbed whelk, *Busycon carica* (Gmelin 1791), from a commercially harvested population in coastal Georgia. 2009. Occasional Papers of the University of Georgia Marine Extension Service Vol. 4.

Schmidt, S., M. Wolff, and J.A. Vargas. 2002. Population ecology and fishery of *Cittarium pica* (Gastropoda: Trochidae) on the Caribbean coast of Costa Rica. Rev. Biol. Trop. 50: 1079-1090.

Toller, W., and S. Gordon. 2005. A population survey of the West Indian topshell or whelk (*Cittarium pica*) in the U.S. Virgin Islands. SEAMAP-C: USVI Whelk survey final report. Division of Fish and Wildlife, US Virgin Islands.