Longfin AP Informational Document - APRIL 2014
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****Note - Data Sources for the following are generally from unpublished NMFS Survey, Dealer, VTR, Permit, and MRFSS databases unless noted…everything should be considered preliminary.**

Basic Biology

Longfin inshore squid are distributed primarily in continental shelf waters located between Newfoundland and the Gulf of Venezuela (Cohen 1976; Dawe et al. 1990). In the northwest Atlantic Ocean, longfin squid are most abundant in the waters between Georges Bank and Cape Hatteras, NC where the species is commercially exploited. The stock area extends from the Gulf of Maine to southern Florida. However, the southern limit of the species' distribution in US waters is unknown due to an overlap in geographic distribution with the congener, Loligo pleii, which cannot be visually distinguished from longfin squid using gross morphology (Cohen 1976). A recent genetics study indicates that the population inhabiting the waters between Cape Cod Bay, MA and Cape Hatteras, NC is a single stock (Shaw et al. 2010). Distribution varies seasonally. North of Cape Hatteras, longfin squid migrate offshore during late autumn to overwinter in warmer waters along the shelf edge and slope, and then return inshore during the spring where they remain until late autumn (Jacobson 2005).

The species migrates long distances during its short lifespan; inshore during spring and offshore during late fall. Recruitment occurs throughout the year with seasonal peaks in overlapping "microcohorts" which have rapid and different growth rates (Brodziak and Macy 1996; Macy and Brodziak 2001). As a result, seasonally stable biomass estimates may mask substantial population turnover (Guerra et al. 2010). Recruitment is largely driven by environmental factors (Dawe et al. 2007). For most squid species, temperature plays a large role in migrations and distribution, growth, and spawning (Boyle and Rodhouse 2005). Individuals hatched in warmer waters during the summer grow more rapidly than those hatched in winter and males grow faster and attain larger sizes than females (Brodziak and Macy 1996).

Longfin serves as a key prey species for a variety of marine mammals, diving birds, and finfish species (Clarke 1996; Overholtz et al. 2000; Jacobson 2005). Natural mortality is very high; especially for spawners. Estimates of nonspawning mortality, 0.11 per week and spawning mortality, 0.19-0.48 per week, are very high. Minimum estimates of Longfin consumption by finfish showed high inter-annual variability, but were 0.8 to 11 times the annual catches during 1977-2009. During 1987-2008, minimum consumption was much higher during the fall (median = 34,089 mt) than during the spring (median = 14,643 mt).

Status of the Stock

The life history characteristics of short-lived squid present unique challenges to stock assessment and most of the traditional approaches that have been used for finfish species have not been successfully applied to squid stocks (Boyle and Rodhouse 2005).

Based on a new proposed biomass reference point from the 2010 assessment (SAW SARC 51), the longfin inshore squid stock was not overfished in 2009, but overfishing status cannot be determined because no overfishing threshold was recommended. A new BMSY target of 50% of K (0.50*(76,329/0.90) = 42,405 mt) was recommended. The biomass (B) threshold is 50% of BMSY (= 21,203 mt). The biomass estimate, which is based on the two-year average of catchability-adjusted spring and fall survey biomass during 2008-2009, was 54,442 mt (80% CI = 38,452-71,783 mt). This is greater than the biomass (B) threshold and the biomass target. The stock exhibits very large fluctuations in abundance (from variation in reproductive success and recruitment) which is expressed as regular large inter-annual changes (2-3 fold) in survey biomass.

A new threshold reference point for fishing mortality was not recommended in the 2010 assessment because there was no clear statistical relationship between longfin catch and annual biomass estimates during 1975-2009. Furthermore, annual catches were low relative to annual estimates of minimum consumption by a subset of fish predators. The assessment and reviewers concluded that the stock appears to be relatively lightly exploited. The 2009 exploitation index of 0.176 (catch in 2009 divided by the average of the spring and fall survey biomass during 2008-2009; 80% CI = 0.124-0.232) was slightly below the 1987-2008 median of 0.237.

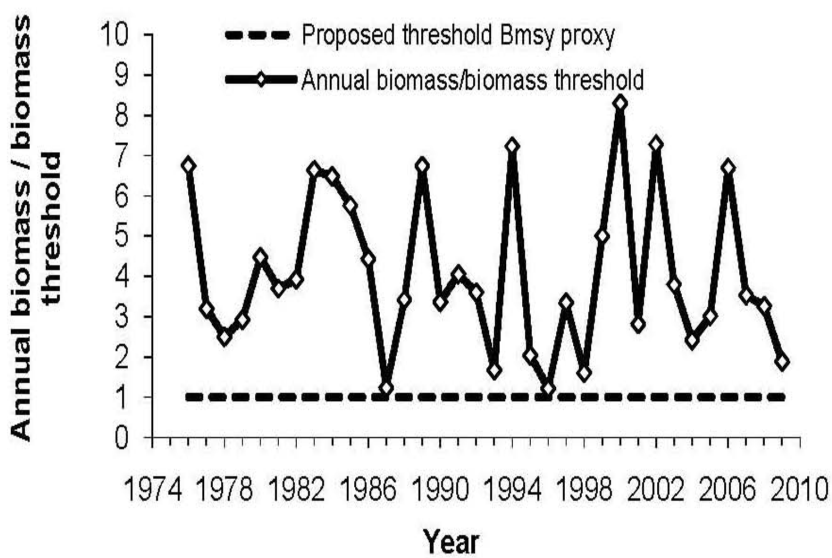

Figure 1. 2010 Assessment Figure B6 - Annual biomass in relation to the proposed biomass threshold (which is ½ of the target) - shown here as a relative value

The NMFS Northeast Science Center has provided updates regarding indices and recent biological data (http://www.mafmc.org/council-events/2014/msb-ap-meeting). This document should be read in conjunction with the Center's update and information from that document is not repeated in detail here.

Landings size composition

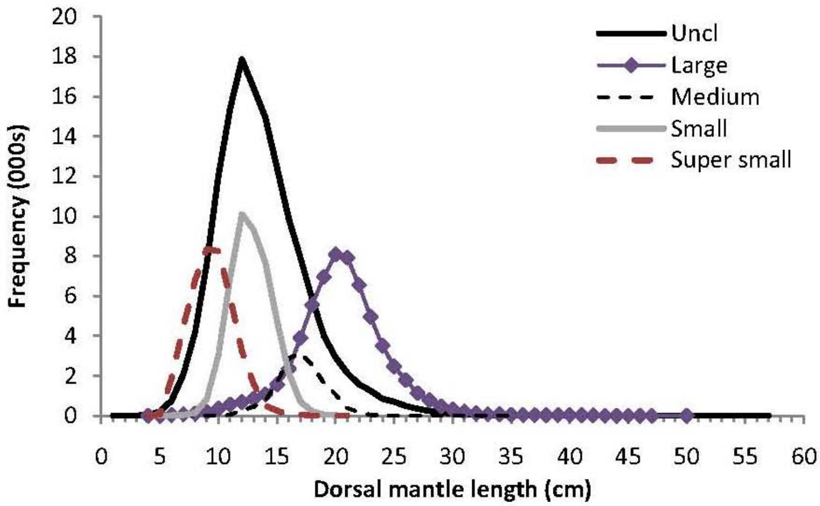

Figure 2. Longfin length composition 1996-2009 from SAW/SARC 51.

Fishery Performance

The U.S. squid fishery began in the late 1800s as a source of bait, and from 1928 to 1967, annual squid landings (including *Illex illecebrosus* landings) from Maine to North Carolina ranged from 500 to 2,000 mt (Lange 1980). During 1964 through the mid-1980s, landings of *Longfin* by distant water fleets occurred in offshore waters and landings by the U.S. fishery occurred when *Longfin* were available inshore during spring and summer (Lange *et al*. 1984). Total landings increased rapidly during 1967-1973 with the development of a directed fishery by distant water fleets in offshore waters, from 1,677 mt in 1967 to a peak of 37,613 mt in 1973, but then declined to 10,646 mt in 1978. Total landings were dominated by landings from the foreign fleets during 1967-1984, ranging between 76% and 98% of the total landings during most years and averaging 20,130 mt.

During 1978-1982, bottom trawlers engaged in directed fisheries for *Illex* and Longfin in U.S. waters were required to fish with a minimum codend mesh size of 60 mm (with specific chafing gear requirements) and were restricted to fishing seaward of the 183 m isobath and during late fall through winter (ICNAF 1978). Fishing by distant water fleets was phased out by 1987 due to the development of an offshore U.S. fishery for Longfin. There is substantial uncertainty in the landings data prior to 1987, due to the lack of observer coverage of distant water fleets prior to 1978 and low coverage thereafter, and because unspecified squid landings were as high as 20% during some years (Cadrin and Hatfield 1999).

The domestic fishery currently occurs primarily in Southern New England and Mid-Atlantic waters, but some fishing also occurs along the southern edge of Georges Bank. Spatial patterns in fishing effort reflect seasonal Longfin migration patterns whereby effort is generally directed offshore during October-March and inshore during April-September. The fishery is dominated by small-mesh otter trawlers, but seasonal near-shore pound net and weir fisheries also exist. During 1963-1982, the domestic fishery occurred primarily in inshore waters during spring and summer. Offshore fishing by U.S. vessels began in 1983.

Quotas were trimester-based in 2000, quarterly-based during 2001- 2006, and trimester based since 2007. These sub-annual seasons have led to one or more fishery closures in most years.

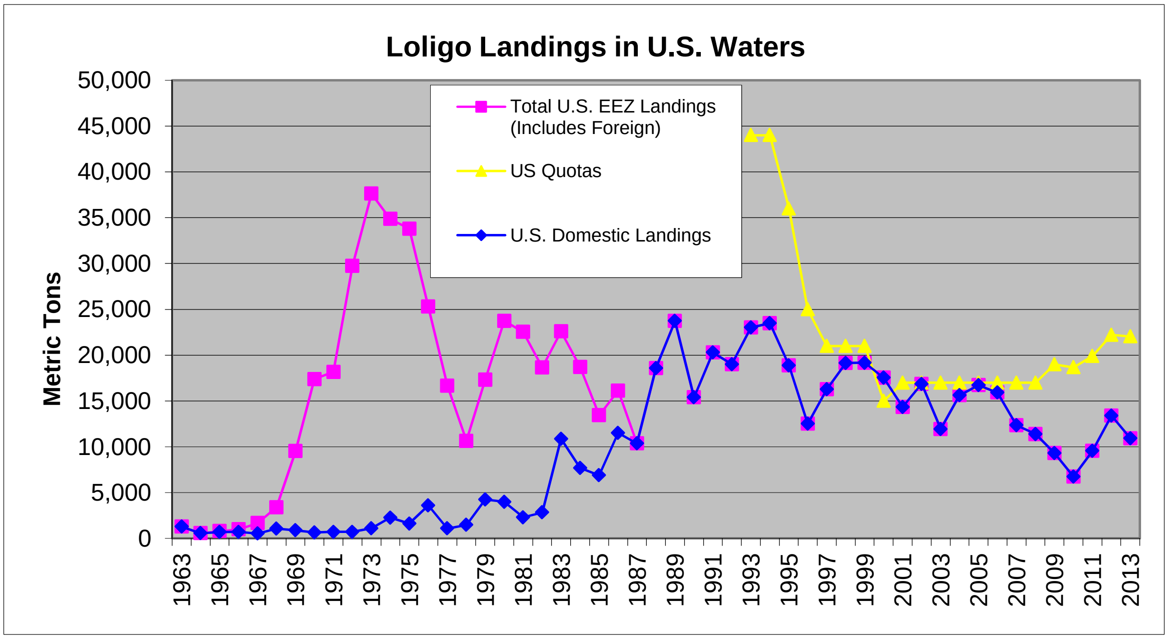

Figure 3. Longfin landings within 200 miles of U.S. Coast (2013 Preliminary).
Source: Saw/SARC 51; unpublished NEFSC dealer reports

After reaching a relative low point in 2010, landings rebounded in 2011 and 2012, primarily driven by strong Trimester 2 (summer) landings. Trimester 2 closed in both 2011 and 2012 so overall landings would have been higher if not for the relatively low Trimester 2 quota. Landings in the early half of 2013 were very low but better fall landings resulted in total landings that were lower than 2012 but higher than 2011.

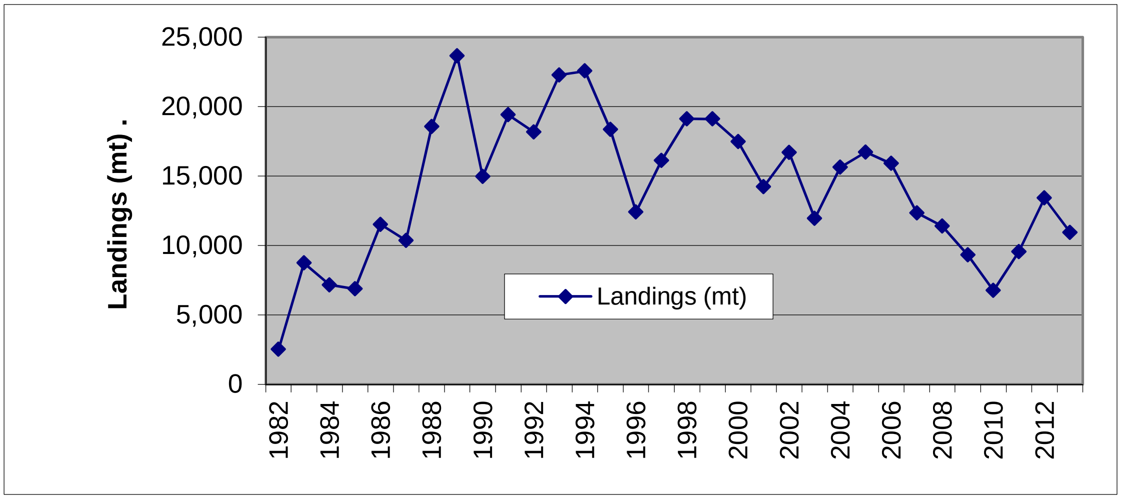

Figure 4. U.S. Longfin landings. ***Source: unpublished NEFSC dealer reports***

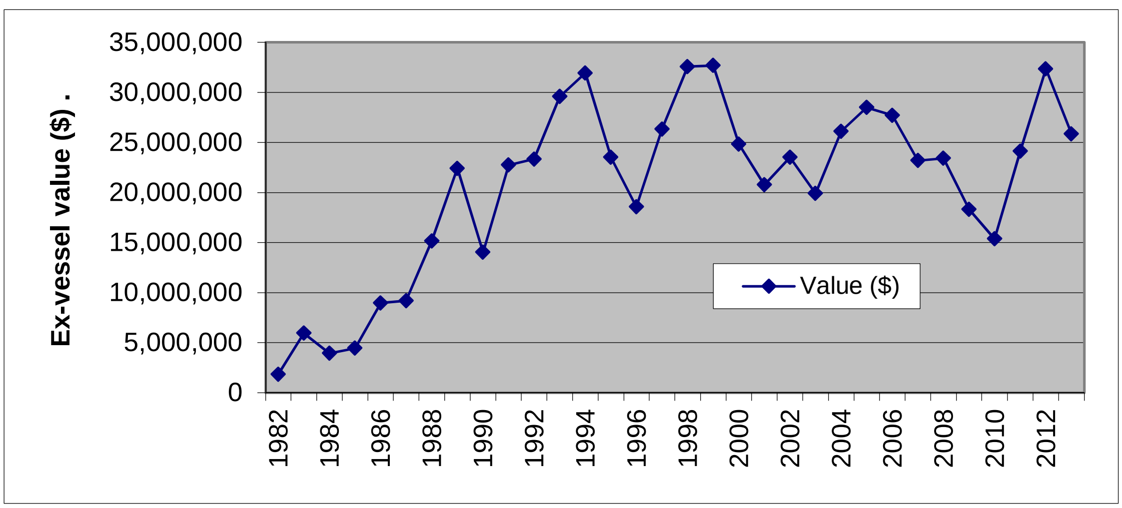

Figure 5. U.S. Longfin ex-vessel revenues (nominal). ***Source: unpublished NEFSC dealer reports***

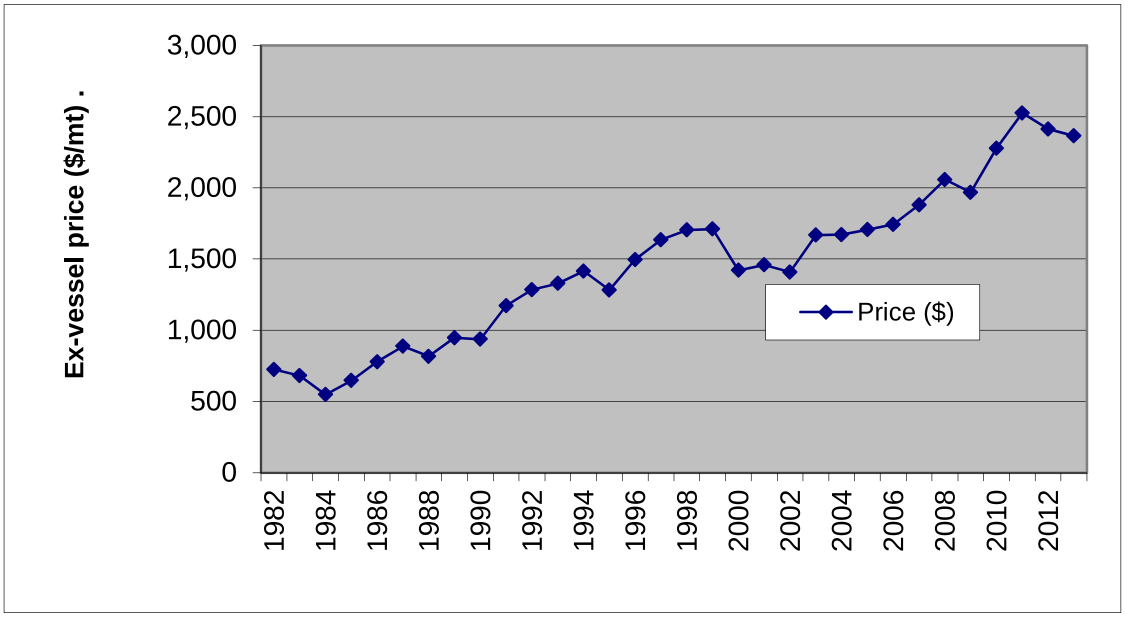

Figure 6. U.S. Longfin ex-vessel prices (Nominal)
Source: Unpublished NMFS dealer reports

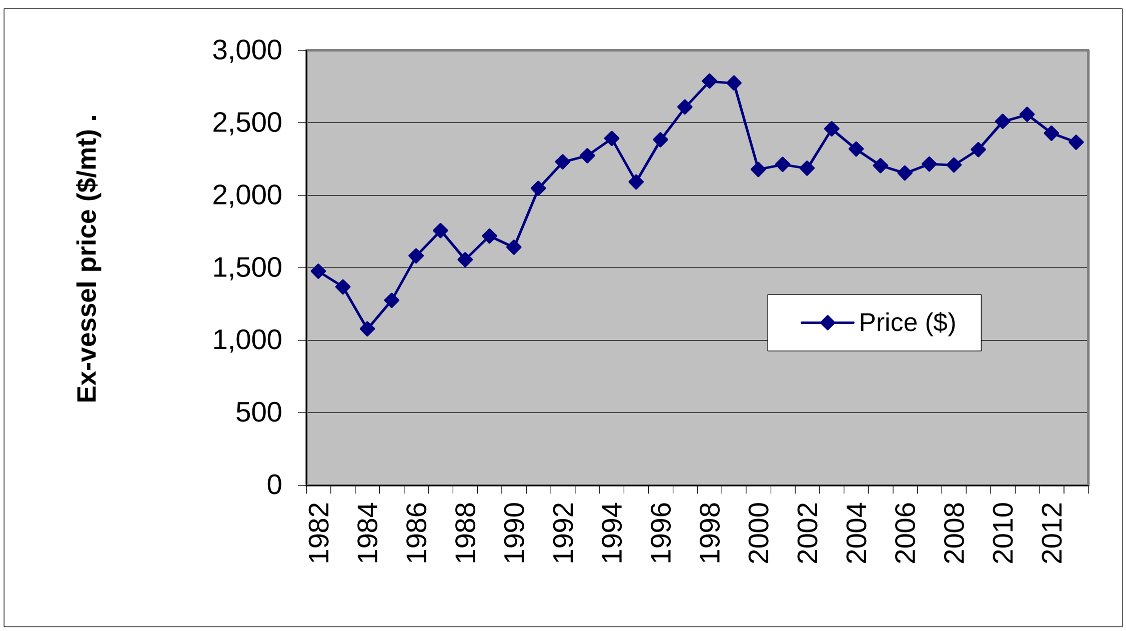

Figure 7. U.S. Longfin ex-vessel prices (Producer Price Index adjusted, 2014 dollars)
Source: Unpublished NMFS dealer reports

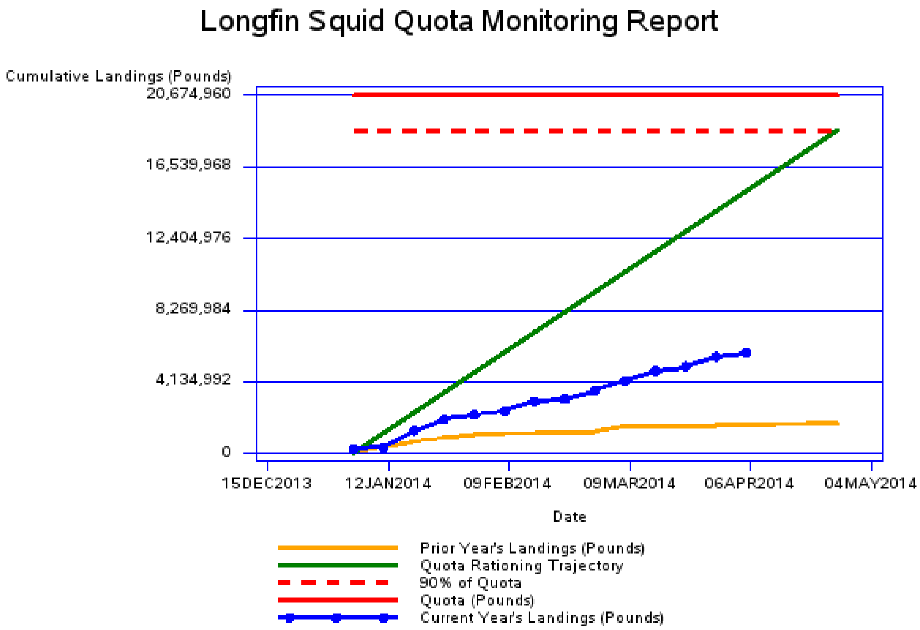

Figure 8. 2014 Landings to Date (blue - orange is 2013) (April 5, 2013)

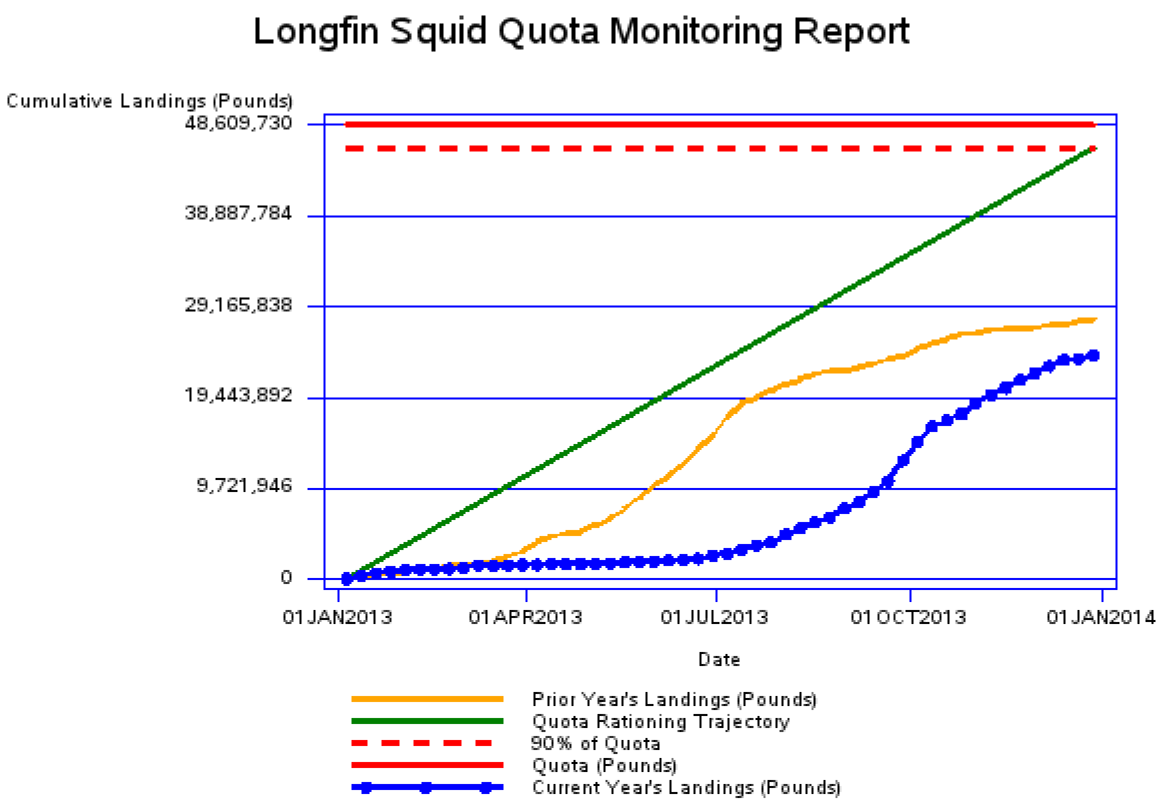

Figure 9. 2012 (orange) and 2013 longfin landings (blue)
source: http://www.nero.noaa.gov/ro/fso/reports/reports_frame.htm

Specification Performance

The principle measure used to manage longfin within a year is monitoring via dealer weighout data that is submitted weekly. The annual quota is divided into three, 4-month trimesters and the first two trimesters close when 90% of the trimester quota is projected to be reached. The Trimester ratios are 43%, 17%, 40%. The third trimester closes when 95% of the annual quota is projected to be reached. Overages from the first two trimesters roll over to the third. Some of a Trimester 1 underage can also be transferred to Trimester 2. Table 1 lists the performance of the Longfin fishery (commercial) compared to its quota.

Table 1. Longfin DAH Performance. (mt)

Year	Commercial Landings	Quota	Percent of Quota Landed
2003	11,941	17,000	70%
2004	15,629	17,000	92%
2005	16,720	17,000	98%
2006	15,920	17,000	94%
2007	12,343	17,000	73%
2008	11,394	17,000	67%
2009	9,307	19,000	49%
2010	6,749	18,667	36%
2011	9,554	19,906	48%
2012	13,408	22,220	60%
2013	10,940	22,049	50%

Source: Unpublished NMFS dealer reports

Quarter and/or Trimester Closures

Year	Closures
2000	March 25-Apr 30; Jul 1-Aug 31; Sep 7-Dec 31;
2001	May 29-Jun 30;
2002	May 28-Jun30; Aug 16-Sep 30; Nov 2 -Dec 11; Dec 24-Dec31;
2003	Mar 25-Mar 31;
2004	Mar 5- Mar 31;
2005	Feb 20-Mar 31; April 25-Jun 30; Dec 18-Dec 31;
2006	Feb 13-Mar 31; April 21-April 26; May 23-June 30; Sept 2-Sept 30;
2007	April 13-April 30;
2008	July 17 - Aug 31.
2009	Aug 6 - Aug 31.
2010	
2011	Aug 23-Aug 31
2012	April 17-April 30 (butterfish cap); July 10 - Aug 31
2013	

Table 2. 2013 Longfin landings (mt) by states with more than 100 mt.

State	Records	Metric Tons	Percent
RI	7543	5713.89	52%
NJ	1299	2112.81	19%
NY	5553	2090.16	19%
CT	1263	484.08	4%
MA	751	393.26	4%

*May not add to 100% since states with minor landings not included.

Table 3. 2013 Longfin landings (mt) by month.

MONTH	Metric Tons	Percent
1	445	4%
2	76	1%
3	176	2%
4	61	1%
5	109	1%
6	310	3%
7	820	7%
8	1,441	13%
9	2,695	25%
10	2,276	21%
11	1,612	15%
12	920	8%

Table 4. Vessels active in various annual landing ranges (pounds per vessel)

YEAR	Vessels 500,000+	Vessels 100,000 - 500,000	Vessels 50,000 - 100,000	Vessels 10,000 - 50,000
1982	0	14	16	88
1983	1	64	36	108
1984	1	41	48	111
1985	2	44	34	89
1986	1	56	44	98
1987	3	39	44	103
1988	11	65	35	95
1989	15	68	51	83
1990	11	52	47	108
1991	17	54	34	107
1992	17	48	31	67
1993	21	73	32	92
1994	24	74	26	77
1995	15	79	40	96
1996	8	68	37	93
1997	13	87	55	65
1998	18	86	46	91
1999	18	85	36	120
2000	13	96	46	97
2001	12	65	44	85
2002	13	90	32	69
2003	8	64	25	59
2004	19	59	26	56
2005	19	61	17	43
2006	16	76	26	50
2007	16	44	30	68
2008	10	58	18	78
2009	8	52	26	65
2010	3	45	23	67
2011	7	55	32	45
2012	8	75	38	41
2013	10	55	20	37

Source: unpublished NEFSC dealer reports

Table 5. Number of Vessels to reach 75% and 95% of annual landings.

	This # of vessels accounted for about 75% of landings	This is the number that accounted for about the next 20%	The total of the first 2 colums equals the number of vessels that accounted for about 95% of landings
1997	81	90	171
1998	73	93	166
1999	70	103	173
2000	84	100	184
2001	62	88	150
2002	69	70	139
2003	51	59	110
2004	50	59	109
2005	44	46	90
2006	58	59	117
2007	40	63	103
2008	49	62	111
2009	49	61	110
2010	48	59	107
2011	49	54	103
2012	56	62	118
2013	42	43	85

Table 6. Species Composition (by value) by the 60 high-liner vessels that accounted for 75% of total Longfin harvest by weight 2008-2012. Only species that accounted for at least 2% of revenues are included.

Species	For Primary Loligo Vessels, percent of total revenue that came from various species.
Loligo	31%
Illex	19%
Silver Hake	11%
Summer Flounder	7%
Scallops	6%
Scup	5%
Mackerel	4%
Monkfish	3%
Haddock	2%
Yellowtail Flounder	2%
Atl Herring	2%
Cod	2%
Total	93%

Source: unpublished NEFSC dealer reports

Table 7. Species Composition (by value) by the 61 vessels that accounted for 75% of total Longfin harvest by weight 2001-2005.

Species	For Primary Loligo Vessels, percent of total revenue that came from various species.
Loligo	35%
Silver Hake	11%
Illex	10%
Scallops	6%
Mackerel	5%
Yellowtail Flounder	5%
Haddock	5%
Summer Flounder	4%
Monkfish	3%
Cod	3%
Scup	2%
Winter Flounder	2%
Menhaden	1%
Total	92%

Source: unpublished NEFSC dealer reports

DEALER INFORMATION

Table 8. Dealer Dependence on Longfin 2011-2013 by dealers purchasing at least $10,000 Longfin over 2011-2013.

Number of Dealers	Relative Dependence on Loligo
24	<5%
6	5%-10%
20	10%-25%
14	25%-50%
6	50%+

Source: unpublished NEFSC dealer reports

Nominal LPUE

In summary, the July-December fishery shows an increasing trend in nominal LPUE during 1996-2004, followed by a decrease through 2009. The nominal LPUE trend is similar for the January-June fishery, but the trend is delayed by one year. LPUE trends for the two fisheries are correlated (r = 0.48). However, these trends are difficult to interpret because of one or more fishery closures during each year since 2000 and the lack of a clear understanding of what the LPUE values actually represent given the complex population dynamics of the species and the fact that effort has not been standardized.

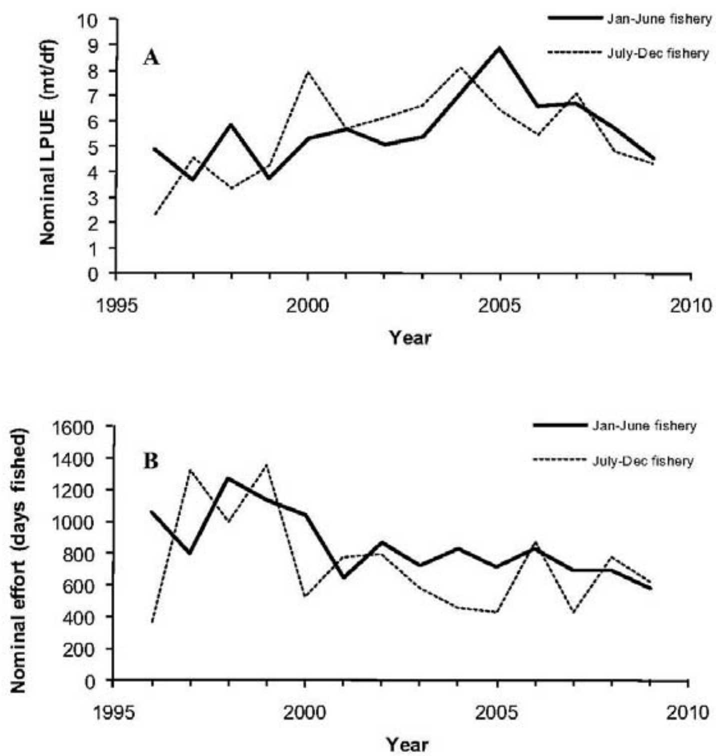

Figure 10. Figure B18 from SAW/SARC 51 - Longfin CPUE (Nominal).

Recreational Fishery

There is some amount of recreational fishing for longfin squid fishing but it is not quantifiable – MRIP (http://www.st.nmfs.noaa.gov/recreational-fisheries/index) does not collect information on invertebrates. Fishermen jig fish at night with lights in NY-MA (mostly from shore but some private boats also) and some charters jig during the day. Staff will be working with MRIP in the coming years to examine ways to estimate recreational longfin squid catches.