Mid-Atlantic Fishery Management Council

Golden Tilefish AP Information Document[1] - January 2013

Management System

The Fishery Management Plan (FMP) which initiated the management for this species became effective November 1, 2001 (66 FR 49136; September 26, 2001). The management unit is all golden tilefish under United States jurisdiction in the Atlantic Ocean north of the Virginia/North Carolina border. The FMP included management and administrative measures to ensure effective management of the tilefish resource. The FMP established a stock rebuilding strategy and total allowable landings (TAL) as the primary control on fishing mortality. This constant harvest strategy (905 mt) was expected to eliminate overfishing and rebuild the tilefish stock in the ten year rebuilding time frame. The FMP also implemented a limited entry program and a tiered commercial quota allocation of the overall TAL. Amendment 1 to the Golden Tilefish FMP created an IFQ (Individual Fishing Quota) program that took effect on November 1, 2009 (74 FR 42580; September 24, 2009). The Tilefish FMP, including subsequent Amendments and Frameworks, are available on the Council website at: http://www.mafmc.org/fmp/fmp.htm.

Basic Biology

Information on tilefish life history and habitat requirements can be found in the Tilefish FMP (MAFMC, 2001; http://www.mafmc.org/fmp/history/tilefish.htm) and is summarized here. Additional information on tilefish life history and habitat requirements can be found in the document titled, "Essential Fish Habitat Source Document: Tilefish, *Lopholatilus chamaeleonticeps*, Life History and Habitat Characteristics (http://www.nefsc.noaa.gov/nefsc/habitat/efh/).

Golden tilefish (*Lopholatilus chamaeleonticeps*) are found along the outer continental shelf and slope from Nova Scotia, Canada to Surinam on the northern coast of South America (Dooley 1978 and Markle et al. 1980) in depths of 250 to 1500 feet. In the southern New England/mid-Atlantic area, tilefish generally occur at depths of 250 to 1200 feet and at temperatures from 48°F to 62°F or 8.9°C to 16.7°C (Nelson and Carpenter 1968; Low et al. 1983; Grimes et al. 1986).

Katz et al. (1983) studied stock structure of tilefish from off the Yucatan Peninsula in Mexico to the southern New England region using both biochemical and morphological information. They identified two stocks -- one in the mid-Atlantic/southern New England and the other in the Gulf of Mexico and the south of Cape Hatteras.

[1] Data employed in the preparation of this document are from unpublished National Marine Fisheries Service (NMFS) Dealer, Vessel Trip Reports (VTRs), and Marine Recreational Statistics (MRIP) databases, as of January 2013, unless otherwise noted.

Tilefish are shelter seeking and perhaps habitat limited. There are indications that at least some of the population is relatively nonmigratory (Turner 1986). Warme et al. (1977) first reported that tilefish occupied excavations in submarine canyon walls along with a variety of other fishes and invertebrates, and they referred to these areas as "pueblo villages." Valentine et al. (1980) described tilefish use of scour depressions around boulders for shelter. Able et al. (1982) observed tilefish use of vertical burrows in Pleistocene clay substrates in the Hudson Canyon area, and Grimes et al. (1986) found vertical burrows to be the predominant type of shelter used by tilefish in the mid-Atlantic/southern New England region. Able et al. (1982) suggested that sediment type might control the distribution and abundance of the species, and the longline fishery for tilefish in the Hudson Canyon area is primarily restricted to areas with Pleistocene clay substrate (Turner 1986).

Lengths at age suggest that males grow faster than females, but the observed ages showed that females live longer. The largest male was 44.1 inches at 20 years old, and the largest female was 39 years at 40.2 inches FL. The oldest fish was a 46 year old female of 33.5 inches, while the oldest male was 41.3 inches and 29 years. On average, tilefish (sexes combined) grow about 3.5 to 4 inches fork length (FL) per year for the first four years, and thereafter growth slows, especially for females. After age 3, mean last back-calculated lengths of males were larger than those of females. At age 4 males and females averaged 19.3 and 18.9 inches FL, respectively, and by the tenth year males averaged 32.3 while females averaged 26.4 inches FL (Turner 1986). The largest male was 44.1 inches at 20 years old, and the largest female was 39 years at 40.2 inches FL. The oldest fish was a 46 year old female of 33.5 inches, while the oldest male was 41.3 inches and 29 years (Turner 1986).

The size of sexual maturity of tilefish collected off New Jersey in 1971-73 was 24-26 inches TL in females and 26-28 inches TL in males (Morse 1981). Idelberger (1985) reported that 50% of females were mature at about 20 inches FL, a finding consistent with studies of the South Atlantic stock, where some males delayed participating in spawning for 2-3 years when they were 4-6 inches larger (Erickson and Grossman 1986). Grimes et al. (1988) reported that in the late 1970s and early 1980s, both sexes were sexually mature at about 19-26 inches FL and 5-7 years of age; the mean size at 50% maturity varied with the method used and between sexes. Grimes et al. (1986) estimated that 50% of the females were mature at about 19 inches FL using a visual method and about 23 inches FL using a histological method. For males, the visual method estimated 50% maturity at 24 inches FL while the histological method estimated 50% maturity at 21 inches FL. The visual method is consistent with NEFSC estimates for other species (O'Brien et al. 1993). Grimes *et al.* (1988) reported that the mean size and age of maturity in males (but not females) was reduced after 4-5 years of heavy fishing effort. Vidal (2009) conducted an aging study to evaluate changes in growth curves since 1982, the last time the reproductive biology was evaluated by Grimes et al (1988). Histological results from Vidal's study indicate that size at 50% maturity was 18 inches for females and 19 inches for males. Vidal (in 48th SAW Assessment Report - NEFSC 2009a) summarizes the following:

> "*These results show a significant decrease in size and age at maturation since the last evaluation of this stock in the early 1980's (Grimes et al. 1986). An environment in which survival rates are low for potentially reproducing individuals,*

often favors selection of individuals that are able to reproduce at smaller sizes and younger ages (Hutchings 1993; Reznick et al. 1990). In a hook fishery, it is assumed that the smallest fish in the population are less vulnerable to the gear depending on the hook size. In this fishery, hook size has been intentionally increased to avoid catch of the smallest fish in the population. The fact that such dramatic changes have manifested in this stock may suggest a density-dependent effect of decreased population size. It is uncertain at this point in time, whether these changes are consequences of phenotypic plasticity or selection towards genotypes with lower size and age at maturation."

Nothing is known about the diets and feeding habits of tilefish larvae, but they probably prey on zooplankton. The examination of stomach and intestinal contents by various investigators reveal that tilefish feed on a great variety of food items (Collins 1884, Linton 1901a and 1901b, and Bigelow and Schroeder 1953). Among those items identified by Linton (1901a and 1901b) were several species of crabs, mollusks, annelid worms, polychaetes, sea cucumbers, anemones, unicates and fish bones. Bigelow and Schroeder (1953) identified shrimp, sea urchins and several species of fishes in tilefish stomachs. Freeman and Turner (1977) reported examining nearly 150 tilefish ranging in length from 11.5 to 41.5 inches. Crustaceans were the principal food items of tilefish with the squat lobster (*Munida*) and spider crabs (*Euprognatha*) were by far the most important crustaceans. The authors report that crustaceans were the most important food item regardless of the size of tilefish, but that small tilefish fed more on mollusks and echinoderms than larger tilefish. Tilefish burrows provide habitat for numerous other species of fish and invertebrates (Able et al. 1982 and Grimes et al. 1986) and in this respect they are similar to "pueblo villages" (Warme et al. 1977).

Able et al. (1982) and Grimes et al. (1986) concluded that a primary function of tilefish burrows was predator avoidance. The NEFSC database only notes goosefish as a predator. While tilefish are sometimes preyed upon by spiny dogfish and conger eels, by far the most important predator of tilefish is other tilefish (Freeman and Turner 1977). It is also probable that large bottom-dwelling sharks of the genus *Carcharhinus*, especially the dusky and sandbar, prey upon free swimming tilefish.

Status of the Stock

A surplus production model (ASPIC) was used in the 2009 Golden tilefish stock assessment (48th SAW). The ASPIC surplus production model has been the basis of the stock assessment for the last three assessments. The assessment summary report and the entire assessment report can be found at http://www.nefsc.noaa.gov/.

The Golden tilefish stock is not overfished and overfishing is not occurring (Figures 1 and 2). The 2009 SARC 48 updated reference points derived from the SARC 48 are: B_{MSY} = 11,400 mt, F_{MSY} = 0.16 and MSY = 1,868 mt. The updated biomass reference points (B_{MSY} and K) increased by 21% from the 2005 SAW 41 estimates, updated F_{MSY} decreased by 24%, and updated MSY decreased by 6%. The current 2009 assessment provides a more optimistic evaluation of stock status in 2004 than did the 2005 SAW 41 assessment. Furthermore, based on the 2009 assessment model results and updated reference points, fishing mortality (F) in 2008 is estimated to be 0.06, 38% of F_{MSY} and stock biomass (B) in 2008 is estimated to be 11,910 mt, 4% above B_{MSY}.

The SARC 48 review panel accepted the ASPIC model but concluded that the biomass estimates for recent years are over-optimistic because "*trends in commercial VTR CPUE declined recently in a manner consistent with the passage of the strong 1999 cohort through the population (an interpretation further supported by the length frequency data). The current assessment model (ASPIC) does not account for those factors. Much of the confidence interval around the 2008 biomass estimate falls below the updated B_{MSY} listed above. Based on these considerations there is no convincing evidence that the stock has rebuilt to levels above B_{TARGET}.*" Furthermore, the 48th SAW Assessment Summary Report states that: *"The SARC48 Review Panel concluded that the tilefish projections are useful for displaying the extent of uncertainty in future stock size, but not for predicting future stock size. They noted that the projections were highly variable depending on both the assumed future trend in commercial CPUE and to small changes in the magnitude of the assumed CPUE values. They also concluded that for the most recent years (e.g., 2008) the biomass estimates from the ASPIC model are likely overestimates and that the estimates are more uncertain than the model suggests."* (NEFSC 2009b). *(SARC reports are available at* http://www.nefsc.noaa.gov/ *under the heading "SARC 48 Panelist Reports")."*

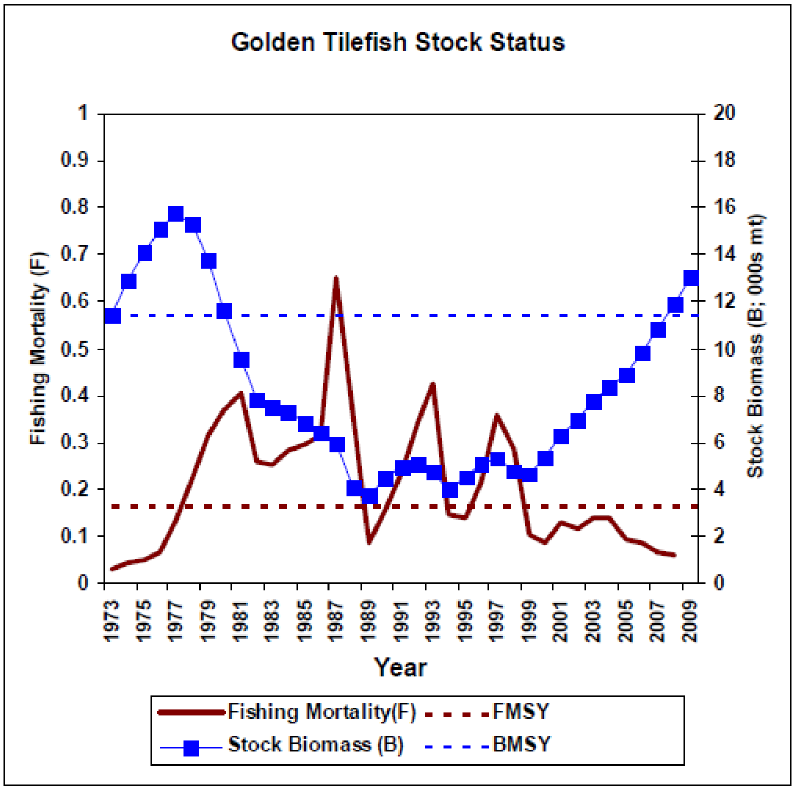

Figure 1. Estimates of tilefish stock biomass (1973-2009) and fishing mortality rate (1973-2008) derived from the ASPIC model. The two horizontal dashed lines represent the Biological Reference Points for the overfishing threshold (FMSY, lower red line) and biomass target (BMSY, upper blue line). Source: 48th SAW Assessment Summary Report, NEFSC.

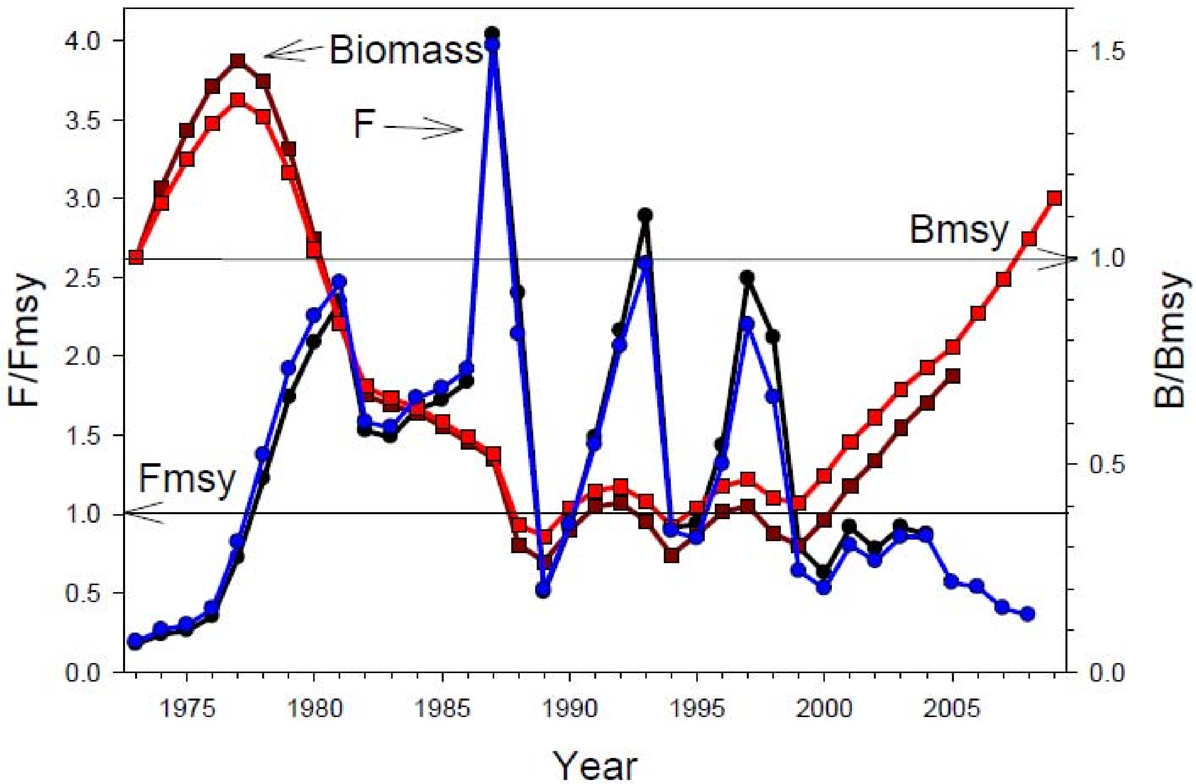

Figure 2. Estimates of tilefish B/B_{MSY} ratios (1973-2009) and F/F_{MSY} ratios (1973-2008). Estimates are from the 'base' ASPIC run which fixed the B1/K ratio at 0.5 and used three CPUE series (Turner, Weighout, and VTR) for tilefish. Source: 48th SAW Assessment Summary Report, NEFSC.

Updated Effort Information

In February 2012, the NEFSC provided updated effort information. This information is presented in Appendix I and summarized below.

- Catch per unit effort (CPUE) has increased since the last stock assessment (SAW/SARC 48). The increase in CPUE appears to be due to the presence of one or more strong year classes (2005-2006).

- There is evidence that there is a broader size distribution of the fish being caught.

Rebuilding Timeline

The Tilefish FMP was implemented in November of 2001. Rebuilding of the tilefish stock to B_{MSY} was based on a ten-year constant harvest quota of 905 mt (1.995 M lb). Under the current management program, the tilefish stock was to be fully rebuilt by October 31, 2011. While the most recent stock assessment indicates that the 2008 stock biomass (11,910 mt or 26.257 M lb) was 4% above B_{MSY}, the stock has not been declared rebuilt due to the uncertainty issues described above.

Fishery Performance

For the 1970 to 2012 period golden tilefish landings have ranged from 128 thousand pounds (1970) to 8.7 million pounds (1979). Since 2001, golden tilefish landings have ranged from 1.6 (2007) to 2.7 (2004) million pounds (Figure 3).

The principal measure used to manage golden tilefish is monitoring via dealer weighout data that is submitted weekly. A vessel fishing under a tilefish IFQ Allocation Permit must submit a tilefish catch report by using the interactive voice response (IVR) phone line system within 48 hours after returning to port and offloading.

The directed fishery is managed via an IFQ program. If a permanent IFQ allocation is exceeded, including any overage that results from tilefish landed by a lessee in excess of the lease amount, the permanent allocation will be reduced by the amount of the overage in the subsequent fishing year. If a permanent IFQ allocation overage is not deducted from the appropriate allocation before the IFQ allocation permit is issued for the subsequent fishing year, a revised IFQ allocation permit reflecting the deduction of the overage will be issued. If the allocation cannot be reduced in the subsequent fishing year because the full allocation had already been landed or transferred, the IFQ allocation permit would indicate a reduced allocation for the amount of the overage in the next fishing year.

A vessel that holds a Commercial/Incidental Permit can possess up to 500 lb live weight (455 lb gutted) at one time without an IFQ Allocation Permit. If the incidental harvest exceeds 5 percent of the TAL for a given fishing year, the Regional Administrator may close the incidental fishery in-season and the incidental trip limit of 500 lb may be reduced in the following fishing year. For each, 2011 and 2012 fishing years (FY), incidental landings were less than half of the incidental quota of 99,750 lb. For the current fishing year (2013), incidental landings are on track to underperform when compared to the 2012 fishing year (Figure 4).

Table 1 summarizes the tilefish management measures for the 2002-2014 fishing years (FY). With the exception of FY 2003, 2004, and 2010 commercial tilefish landings have been below the commercial quota specified each year since the Tilefish FMP was first implemented. As a result of the decision of the Hadaja v. Evans lawsuit, the permitting and reporting requirements for the FMP were postponed for close to a year (May 15, 2003 through May 31, 2004). During that time period, it was not mandatory for permitted tilefish vessels to report their landings. In addition, during that time period, vessels that were not part of the tilefish limited entry program also landed tilefish.

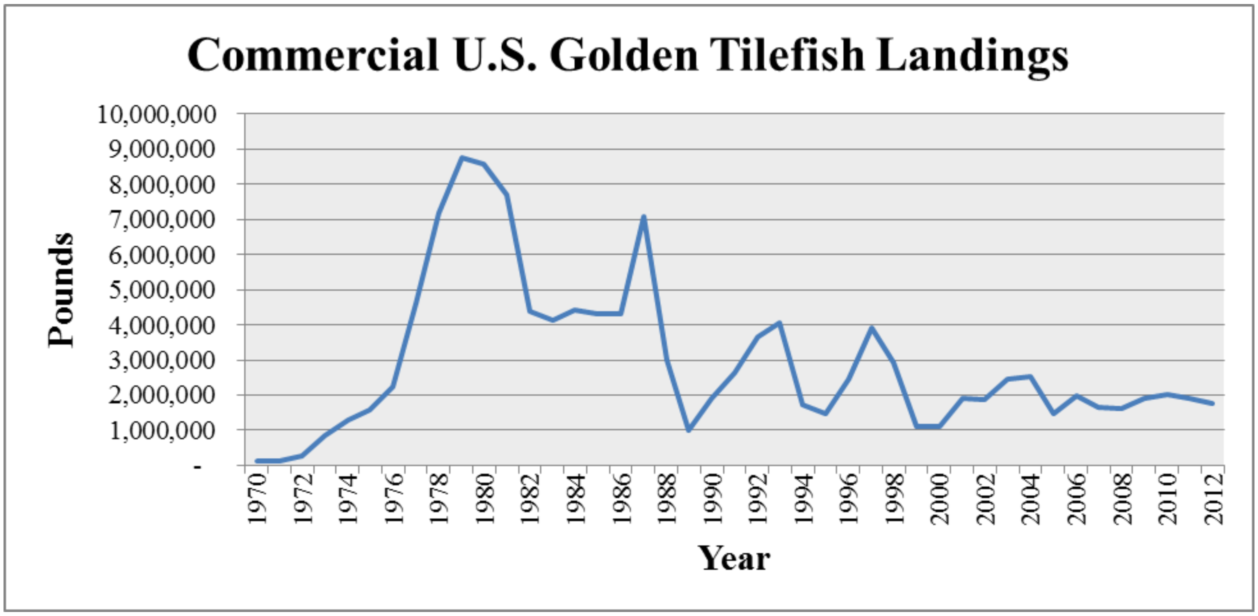

Figure 3. Commercial U.S. Golden Tilefish Landings (Pounds) from Maine-Virginia, 1970-2011 (calendar year). Source: 1970-1993 Tilefish FMP. 1994-2012 NMFS unpublished dealer data, as of January 2013.

Figure 4. Incidental tilefish commercial landings (as of January 2, 2013) for fishing years 2012 (yellow line) and 2013 (blue line). Source: NMFS quota monitoring website: http://www.nero.noaa.gov/ro/fso/reports/reports_frame.htm.

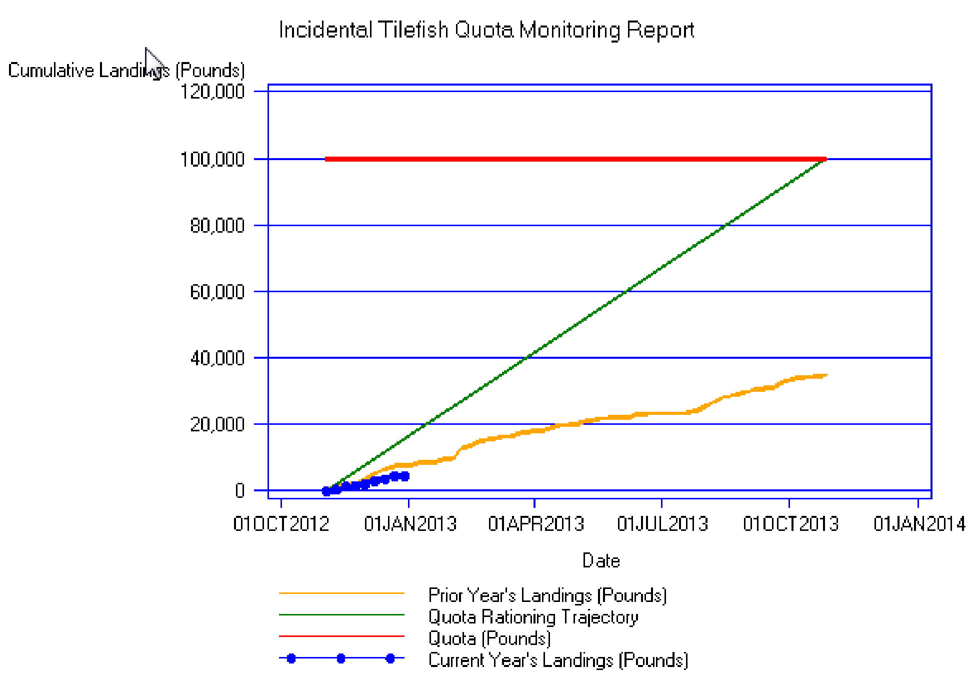

Table 1. Summary of management measures and landings for FY[a] 2002 through 2014.

Management measures	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
ABC (m lb)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.013	2.013
TAL (m lb)	1.995	1.995	1.995	1.995	1.995	1.995	1.995	1.995	1.995	1.995	1.995	1.995	1.995
Com. quota-initial (m lb)	1.995	1.995	1.995	1.995	1.995	1.995	1.995	1.995	1.995	1.995	1.995	1.995	1.995
Com. quota-adjusted (m lb)	1.995	1.995	1.995	1.995	1.995	1.995	1.995	1.995	1.995	1.995	1.995	1.995	1.995
Com. landings	1.935	2.318[b]	2.647[b]	1.497	1.897	1.777	1.672	1.887	1.997	1.946	1.829	NA	NA
Com. overage/underage (m lb)	-0.060	+0.323	+0.652	-0.498	-0.098	-0.218	-0.323	-0.108	+0.002	-0.049	-0.166	NA	NA
Incidental trip limit (lb)	300	300	300	133	300	300	300	300	300	300	500	500	500
Rec. possession limit	-	-	-	-	-	-	-	-	8[c]	8[c]	8[c]	8[c]	8[c]

[a] FY 2002 (November 1, 2001 - October 31, 2002).
[b] Lawsuit period (see text above).
[c] Eight fish per person per trip.
NA = Not applicable or not yet available.

Tilefish are primarily caught by longline and bottom otter trawl. Based on dealer data from 2008 through 2012, the bulk of the tilefish landings are taken by longline gear (97.6%) followed by bottom trawl gear (1.5%). No other gear had any significant commercial landings. Minimal catches were also recorded for hand line, dredge (other), gillnets, and lobster pot/traps (Table 2).

Table 2. Tilefish commercial landings ('000 lb live weight) by gear, Maine through Virginia, 2008-2012 combined.

Gear	Pounds	Percent
Otter Trawl Bottom, Fish	133	1.5
Otter Trawl Bottom, Scallop	1	*
Otter Trawl Bottom, Other	4	*
Otter Trawl, Midwater	2	*
Gillnet, Anchored/Sink/Other	7	*
Pots and Traps, Lobster, Inshore/Offshore Combined	*	*
Pots and Traps, Fish/Other Combined	*	*
Lines Hand	7	*
Lines Long Set with Hooks	8,987	97.6
Dredge, Other	12	*
Unknown, Other Combined Gears	50	1.0
All Gear	9,204	100

Note: * = less than 1,000 pounds or less than 1 percent.

Nearly 55 percent of the landings for 2012 were caught in statistical area 537, which includes Atlantis and Block Canyons; statistical area 616 had 43 percent of the landings, which includes Hudson Canyon; and statistical area 613 had 1 percent of the landings (Table 3). Less than 1 percent of the total landings were caught in statistical areas 525 (includes Oceanographer, Lydonia, and Gilbert Canyons) and 526 (includes Hydrographer and Veatch Canyons). NMFS statistical areas are shown in Figure 4.

Table 3. Tilefish percent landings by statistical area and year, 1996-2012.

Year	Unk	525	526	536	537	539	612	613	616	622	626	Other
1996	19.88	0.07	5.18	-	43.02	0.38	*	1.07	27.99	0.01	-	1.39
1997	23.30	0.03	0.67	-	56.21	0.02	*	2.59	16.40	0.01	*	0.76
1998	16.22	1.25	2.15	-	65.86	0.04	-	5.45	8.53	*	*	0.50
1999	2.57	0.97	0.22	-	55.07	0.01	0.11	3.68	36.79	0.02	0.02	0.54
2000	*	0.36	3.79	-	46.10	0.01	0.05	2.37	43.93	0.47	0.14	2.78
2001	-	0.23	3.09	-	23.92	*	0.01	3.16	68.96	*	0.10	0.52
2002	-	0.12	8.73	-	35.86	0.07	0.01	15.39	39.64	0.02	0.02	0.14
2003	-	0.88	1.79	-	38.48	0.10	-	11.85	46.51	0.05	0.05	0.28
2004	-	1.03	2.59	-	61.67	0.06	5.28	0.70	25.92	0.03	0.06	2.66
2005	-	0.12	0.25	-	62.99	0.02	0.03	6.11	25.68	0.03	0.20	4.56
2006	-	*	1.54	1.93	61.70	0.50	1.24	0.71	30.09	0.04	0.05	2.16
2007	-	0.02	0.42	4.80	55.15	0.01	-	5.53	31.56	0.85	0.43	1.23
2008	-	1.09	0.06	8.17	39.57	0.01	-	4.62	43.26	2.05	0.02	1.15
2009	-	2.17	0.01	4.18	42.62	1.28	0.04	4.37	41.72	1.34	1.16	1.10
2010	-	0.01	0.01	2.68	55.10	1.30	0.02	7.28	33.30	0.69	0.04	0.32
2011		0.01	*	1.37	51.59	0.55	-	3.24	39.80	0.32	0.06	3.58
2012		0.01	0.01	-	54.96	0.01	*	0.66	43.47	0.19	0.09	0.59
All	5.17	0.50	1.81	1.17	51.29	0.19	0.57	4.48	30.01	0.30	0.13	1.38

Note: - = no landings; * = less than 0.01 percent.

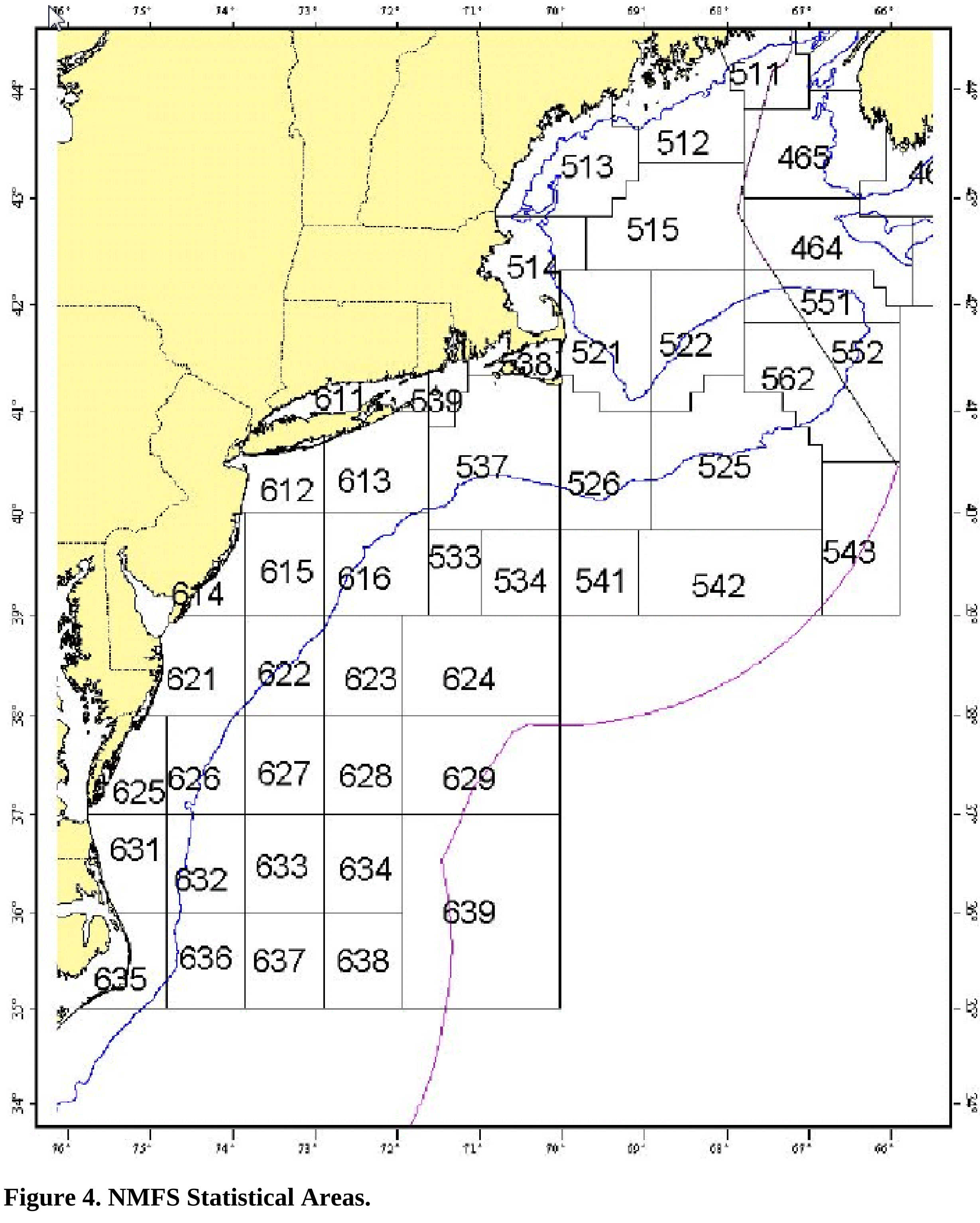

Figure 4. NMFS Statistical Areas.

Commercial tilefish ex-vessel revenues have ranged from $2.5 to $5.6 million for the 1999 through 2011 period. The mean price for tilefish (adjusted) has ranged from $1.05/lb in 2004 to $3.20/lb in 2011 (Figure 5). In 2012, 1.6 million pounds of golden tilefish were landed generating $4.9 million in revenues ($3.06/lb).

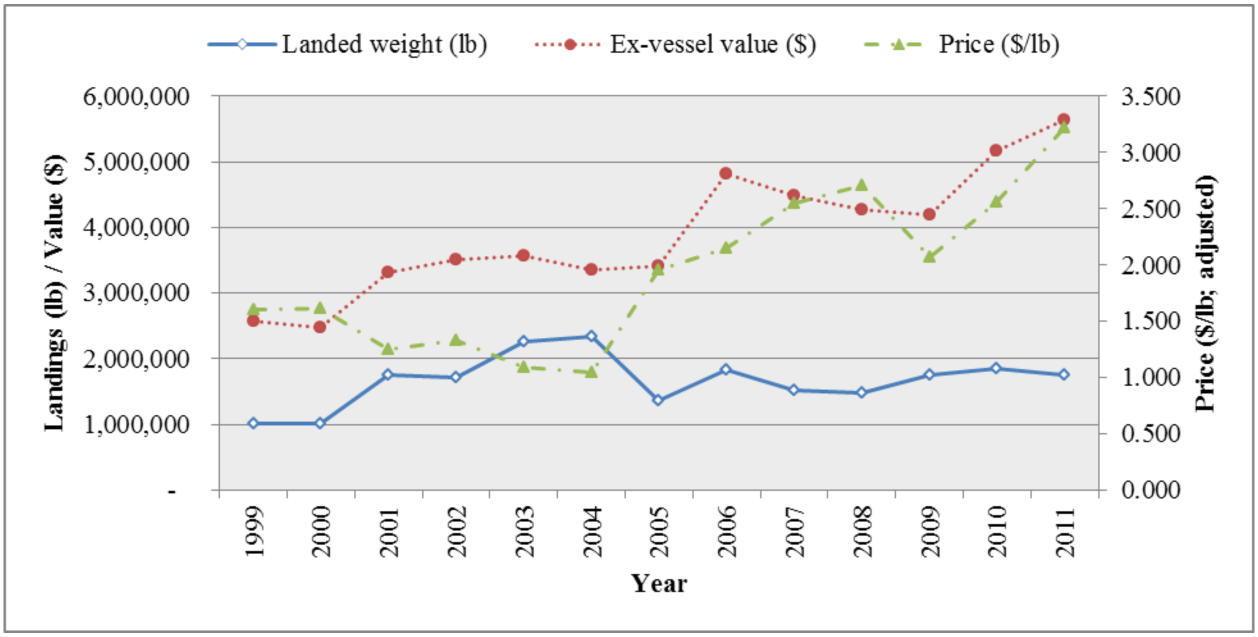

Figure 5. Landings, ex-vessel value, and price for tilefish, Maine through Virginia combined, 1999-2011 (calendar year). Note: Prices were adjusted to 2011 values using the Bureau of Labor Statistics Producer Price Index.

The 2008 through 2012 coastwide average ex-vessel price per pound for all market categories combined was $2.86, $3.11 for extra large, $3.55 for large, $2.77 for medium, $2.16 for kittens, $1.84 for small-kittens; $1.69 for small, and $3.17 for unclassified. Price differentials for the 2008 through 2012 period combined indicate that the ex-vessel price per pound for extra large tilefish was 44 percent and 84 percent greater than for small-kittens and small size categories, respectively. Price differentials for the same time period indicate that large tilefish was 64 percent and 110 percent greater than for small-kittens and small size categories, respectively. This price differential indicates that larger fish tend to bring higher prices (Table 4). Nevertheless, even though there is a price differential for various sizes of tilefish landed, tilefish fishermen land all fish caught as the survival rate of discarded fish is very low (L. Nolan 2006; Kitts et al. 2007).

Table 4. Landings, ex-vessel value, and price of tilefish by size category, from Maine thought Virginia, 2008 through 2012 combined.

Size Category	Landings ('000 lb)	Value ($1,000)	Price ($/lb)
Extra large	180,827	562,279	3.11
Large	2,364,834	8,405,844	3.55
Medium	2,798,422	7,758,857	2.77
Kittens	1,684,827	3,632,972	2.16
Small-Kittens	168,107	308,699	1.84
Small	299,963	507,932	1.69
Unclassified	955,007	3,025,343	3.17
All	8,451,987	24,201,926	2.86

The ports and communities that are dependent on tilefish are fully described in Amendment 1 to the FMP (section 6.5; MAFMC 2009; found at http://www.mafmc.org/fmp/pdf/Tilefish_Amend_1_Vol_1.pdf). Additional information on "Community Profiles for the Northeast US Fisheries" can be found at http://www.nefsc.noaa.gov/read/socialsci/community_profiles/.

To examine recent landings patterns among ports, 2011-2012 NMFS dealer data are used. The top commercial landings ports for tilefish are shown in Table 5. A “top port” is defined as any port that landed at least 10,000 lb of golden tilefish. Ports that received 1% or greater of their total revenue from tilefish are shown in Table 6.

Table 5. Top ports of landing (in lb) for golden tilefish, based on NMFS 2011 - 2012 dealer data. Since this table includes only the “top ports,” it may not include all of the landings for the calendar year. (Note: values in parenthesis correspond to IFQ vessels).

Port	2011		2012	
	Landings	# Vessels	Landings	# Vessels
MONTAUK, NY	1,260,873 (1,255,216)	15 (4)	1,131,852 (1,126,854)	18 (4)
BARNEGAT LIGHT/LONG BEACH, NJ	354,621 (354,405)	7 (5)	397,610 383,021	12 (6)
HAMPTON BAYS, NY	256,898 (C)	5 (C)	195,361 (C)	3 (C)
POINT JUDITH, RI	13,922 (0)	51 (0)	7,789 (0)	48 (0)

Note: C = Confidential.

Table 6. Ports that generated 1% or greater of total revenues from golden tilefish, 2008-2012.

Port	State
BARNEGAT	NEW JERSEY
BARNEGAT LIGHT /LONG BEACH	NEW JERSEY
MONTAUK	NEW YORK
HAMPTON BAYS	NEW YORK
MATTICUT	NEW YORK
SHINNECOCK	NEW YORK
OTHER, R.I.	RHODE ISLAND

In 2012 there were 71 Federally permitted dealers who bought golden tilefish from 141 vessels that landed this species from Maine through Virginia. In addition, 67 dealers bought tilefish from 125 vessels that landed this species from Maine through Virginia in 2011. These dealers bought approximately $5.6 and $4.9 million of tilefish in 2011 and 2012, respectively, and are distributed by state as indicated in Table 7. Table 8 shows relative dealer dependence on tilefish.

Table 7. Dealers reporting buying golden tilefish, by state in 2011 - 2012.

	MA		RI		CT		NY		NJ		MD		VA		Other	
	'11	'12	'11	'12	'11	'12	'11	'12	'11	'12	'11	'12	'11	'12	'11	'12
# of Dealers	16	11	13	11	7	7	17	19	7	12	C	5	3	6	4	0

Note: C = Confidential.

Table 8. Dealer dependence on tilefish, 2007-2011.

Number of Dealers	Relative Dependence on Tilefish
77	<5%
4	5-10%
1	10% - 25%
3	25% - 50%
1	>50%

According to VTR data, very little (< 0.1%) discarding was reported by longline vessels that targeted tilefish for the 2003 through 2012 period (Table 9). In addition, the 2009 stock assessment indicates that recent observer directed tilefish longline trips also suggest that discards of tilefish is minimal. Observer trawl data for the 1989 through 2008 period indicates that discard to kept ratios for trawl trips that either kept or discarded tilefish in the observer data varied from 0 in 1993 to 1.4 in 2001 (NEFSC 2009a).

Table 9. Catch disposition for directed tilefish trips[a], Maine through Virginia, 2003-2012 combined.

Common Name	Kept lb	% species	% total	Discarded lb	% species	% total	Total lb	Disc: Kept Ratio
GOLDEN TILEFISH	16,155,189	100.00%	99.76%	0	0.00%	0.00%	16,155,189	0.00
SPINY DOGFISH	5,771	33.41%	0.04%	11,500	66.59%	90.92%	17,271	1.99
BLUELINE TILEFISH	4,881	100.00%	0.03%	0	0.00%	0.00%	4,881	0.00
CONGER EEL	4,716	96.13%	0.03%	190	3.87%	1.50%	4,906	0.04
BLACK BELLIED ROSEFISH	3,279	100.00%	0.02%	0	0.00%	0.00%	3,279	0.00
SKATES	3,201	100.00%	0.02%	0	0.00%	0.00%	3,201	0.00
GROUPER	3,043	100.00%	0.02%	0	0.00%	0.00%	3,043	0.00
TILEFISH UNKNOWN	2,692	100.00%	0.02%	0	0.00%	0.00%	2,692	0.00
SILVER HAKE	1,878	99.95%	0.01%	1	0.05%	0.01%	1,879	0.00
DOGFISH SMOOTH	1,699	100.00%	0.01%	0	0.00%	0.00%	1,699	0.00
ANGLER	1,346	99.63%	0.01%	5	0.37%	0.04%	1,351	0.00
SAND TILEFISH	1,068	100.00%	0.01%	0	0.00%	0.00%	1,068	0.00
BLUEFISH	998	63.65%	0.01%	570	36.35%	4.51%	1,568	0.57
YELLOWFIN TUNA	694	100.00%	0.00%	0	0.00%	0.00%	694	0.00
BLACK SEA BASS	517	100.00%	0.00%	0	0.00%	0.00%	517	0.00
MAKO SHORTFIN SHARK	465	100.00%	0.00%	0	0.00%	0.00%	465	0.00
AMERICAN EEL	460	100.00%	0.00%	0	0.00%	0.00%	460	0.00
BLUEFIN TUNA	440	100.00%	0.00%	0	0.00%	0.00%	440	0.00
RED HAKE	412	97.63%	0.00%	10	2.37%	0.08%	422	0.02
POLLOCK	282	100.00%	0.00%	0	0.00%	0.00%	282	0.00
MIX RED & WHITE HAKE	279	100.00%	0.00%	0	0.00%	0.00%	279	0.00
OTHER FISH	218	100.00%	0.00%	0	0.00%	0.00%	218	0.00
PORBEAGLE SHARK	200	100.00%	0.00%	0	0.00%	0.00%	200	0.00
DOLPHIN FISH	191	100.00%	0.00%	0	0.00%	0.00%	191	0.00
WHITE HAKE	182	100.00%	0.00%	0	0.00%	0.00%	182	0.00
CUSK	179	100.00%	0.00%	0	0.00%	0.00%	179	0.00
MAKO SHARK	132	100.00%	0.00%	0	0.00%	0.00%	132	0.00
ALBACORE TUNA	109	100.00%	0.00%	0	0.00%	0.00%	109	0.00
COD	100	100.00%	0.00%	0	0.00%	0.00%	100	0.00
REDFISH	72	100.00%	0.00%	0	0.00%	0.00%	72	0.00

Table 9 (continued). Catch disposition for directed tilefish trips[a], Maine through Virginia, 2003-2012 combined.

Common Name	Kept lb	% species	% total	Discarded lb	% species	% total	Total lb	Disc: Kept Ratio
SUMMER FLOUNDER	50	100.00%	0.00%	0	0.00%	0.00%	50	0.00
BLACK WHITING	24	100.00%	0.00%	0	0.00%	0.00%	24	0.00
LOLIGO SQUID	20	100.00%	0.00%	0	0.00%	0.00%	20	0.00
AMBER JACK	18	100.00%	0.00%	0	0.00%	0.00%	18	0.00
BUTTERFISH	15	100.00%	0.00%	0	0.00%	0.00%	15	0.00
DOGFISH CHAIN	0	0.00%	0.00%	145	100.00%	1.15%	145	--
HAMMERHEAD SHARK	0	0.00%	0.00%	100	100.00%	0.79%	100	--
SHARK UNKOWN	0	0.00%	0.00%	60	100.00%	0.47%	60	--
JONAH CRAB	0	0.00%	0.00%	35	100.00%	0.28%	35	--
LOBSTER	0	0.00%	0.00%	33	100.00%	0.26%	33	--
ALL SPECIES	16,194,820	99.92%	100.00%	12,649	0.08%	100.00%	16,207,469	0.00

[a] Directed trips for tilefish were defined as trips comprising 75 percent or more by weight of tilefish landed. Number of trips = 1,124.

Recreational Fishery

A small recreational fishery briefly occurred during the mid 1970's, with less than 100,000 pounds annually (MAFMC 2000). Subsequent recreational catches have been low for the 1982 - 2009 period, ranging from zero for most years to less than 12,000 pounds in 2007 according to MRIP data (Table 10). In 2010, it is estimated that 30,326 tilefish were landed (A + B1 in number) weighing approximately 219,162 pounds (A + B1 in pounds); the PSE's associated with these values are 71 and 74, respectively[2].

VTR data indicates that the number of tilefish caught by party/charter vessels from Maine through Virginia is low, ranging from 81 fish in 1996 to 4,727 fish in 2012 (Table 11). Mean party/charter effort ranged from approximately one for most years to eight fish per angler in 1998, averaging 1.7 fish for the entire time series (1996 - 2012).

According to VTR data, for the 1996 through 2012 period, the largest amount of tilefish caught by party/charter vessels were made by New Jersey vessels (10,648), followed by New York (5,661), Massachusetts (496), Virginia (418), Maryland (230), Rhode Island (182), and Delaware

[2] The PSE, or proportional standard error, expresses the standard error of an estimate as a percentage of the estimate and is a measure of precision. In general terms, large PSE's indicate high variability around estimates and therefore low precision. A PSE value greater than 50 indicates a very imprecise estimate. It is desirable to have small PSE's and more precise estimates.

(222). Party/charter boats from New Jersey have shown a significant uptrend in the number of tilefish caught in the last six years while the boats from Rhode Island and Delaware have shown a downward trend in the number of fish caught for the same time period (Table 12).

The number of tilefish discarded by recreational anglers is low. According to VTR data, on average, approximately two fish per year were discarded by party/charter recreational anglers for the 1996 through 2012 period. The quantity of tilefish discarded by party/charter recreational anglers ranged from zero in most years to 13 in 2010.

Recreational anglers typically fish for tilefish when tuna fishing especially during the summer months (Freeman, pers. comm. 2006). However, some for hire vessels from New Jersey and New York are tilefish fishing in the winter months (Caputi pers. comm. 2006). In addition, recreational boats in Virginia are also reported to be fishing for tilefish (Pride pers. comm. 2006). However, it is not known with certainty how many boats may be targeting tilefish.

Anglers are highly unlikely to catch tilefish while targeting tuna on tuna fishing trips. However, these boats may fish for tilefish at any time during a tuna trip (i.e., when the tuna limit has been reached, on the way out or on the way in from a tuna fishing trip, or at any time when tuna fishing is slow). While fishing for tuna recreational anglers may troll using rod and reel (including downriggers), handline, and bandit gear. Rod and reel is the typical gear used in the recreational tilefish fishery. Because tilefish are found in relatively deep waters, electric reels may be used to facilitate landing (Freeman and Turner 1977).

Table 10. Recreational tilefish data from marine recreational information program (MRIP).

Year	no. of fish measured	Landed no. A and B1*	Released no. B2*	A and B1 kg*	A and B1 lb
1982	0	984	0	98	216
1983	0	0	0	0	0
1984	0	0	0	0	0
1985	0	0	0	0	0
1986	0	0	0	0	0
1987	0	0	0	0	0
1988	0	0	0	0	0
1989	0	0	0	0	0
1990	0	0	0	0	0
1991	0	0	0	0	0
1992	0	0	0	0	0
1993	0	0	0	0	0
1994	0	608	0	0	0
1995	0	0	0	0	0
1996	0	6,842	0	0	0
1997	0	0	0	0	0
1998	0	0	0	0	0
1999	0	0	0	0	0
2000	0	0	0	0	0
2001	0	148	0	0	0
2002	0	20,068	1,338	0	0
2003	18	722	0	2,126	4,687
2004	3	62	0	304	670
2005	0	0	0	0	0
2006	0	541	0	2,687	5,924
2007	2	1,330	0	5,632	12,416
2008	0	0	0	0	0
2009	--	177	0	2,133	4,702
2010	--	30,326	0	99,410	219,162
2011	0	0	0	0	0
2012	0	0	0	0	0

1 kg = 2.20462 lb.
Source: Table modified from SAW 48 (NEFSC 2009b; fishery statistics from Maine through North Carolina).
*Values updated using MRIP data.

Table 11. Number of tilefish kept by party/charter anglers and mean effort from Maine through Virginia, 1996 through 2012.

Year	Number of tilefish kept	Mean effort
1996	81	1.4
1997	400	7.5
1998	243	8.1
1999	91	0.4
2000	147	0.5
2001	222	0.6
2002	774	0.9
2003	991	1.6
2004	737	1.2
2005	498	0.9
2006	477	1.2
2007	1,077	1.2
2008	1,100	1.3
2009	1,451	1.3
2010	1,843	2.0
2011	2,900	3.4
2012	4,727	2.7
All	17,759	1.7

Table 12. Number of tilefish caught by party/charter vessels by state, 1996 through 2012.

Year	ME	NH	MA	RI	CT	NY	NJ	DE	MD	VA	All
1996	0	0	0	0	0	81	0	0	0	0	81
1997	0	0	0	0	0	400	0	0	0	0	400
1998	0	0	0	102	0	141	0	0	0	0	243
1999	0	0	0	1	0	88	0	0	2	0	91
2000	0	0	0	0	0	108	39	0	0	0	147
2001	0	0	0	0	0	122	101	0	0	0	223
2002	0	0	0	0	0	401	373	0	0	0	774
2003	0	0	0	3	0	86	902	0	0	0	991
2004	0	0	0	0	0	12	628	0	0	104	744
2005	0	0	0	72	0	82	318	14	0	16	502
2006	0	0	0	0	0	265	65	2	133	12	477
2007	0	0	0	0	0	447	459	88	5	80	1,079
2008	0	0	0	3	0	488	545	22	32	10	1,100
2009	0	0	0	0	0	720	675	18	7	31	1,451
2010	0	0	0	0	0	585	1,181	19	23	48	1,856
2011	0	0	496	0	0	720	1,654	22	5	14	2,911
2012	0	0	0	1	0	915	3,648	37	23	103	4,727
All	0	0	496	182	0	5,661	10,588	222	230	418	17,797

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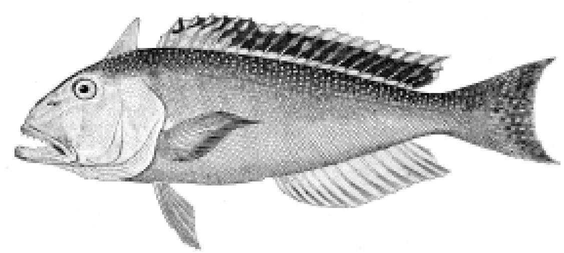
Appendix I

This appendix contains updated data on commercial landings, landings per unit effort, and size distribution of commercial landings. The information presented in this appendix was tabulated by Paul Nitschke (NEFSC, Tilefish Assessment Lead).

Golden Tilefish data update through 2011, *Lopholatilus chamaeleonticeps,* in the Middle Atlantic-Southern New England Region



2/23/2012
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Introduction

Golden tilefish, *Lopholatilus chamaeleonticeps*, inhabit the outer continental shelf from Nova Scotia to South America, and are relatively abundant in the Southern New England to Mid-Atlantic region at depths of 80 to 440 m. Tilefish have a narrow temperature preference of 9 to 14 C. Their temperature preference limits their range to a narrow band along the upper slope of the continental shelf where temperatures vary by only a few degrees over the year. They are generally found in and around submarine canyons where they occupy burrows in the sedimentary substrate. Tilefish are relatively slow growing and long-lived, with a maximum observed age of 46 years and a maximum length of 110 cm for females and 39 years and 112 cm for males (Turner 1986). At lengths exceeding 70 cm, the predorsal adipose flap, characteristic of this species, is larger in males and can be used to distinguish the sexes. Tilefish of both sexes are mature at ages between 5 and 7 years (Grimes et. al. 1988).

Golden Tilefish was first assessed at SARC 16 in 1992 (NEFSC 1993). The Stock Assessment Review Committee (SARC) accepted a non-equilibrium surplus production model (ASPIC). The ASPIC model estimated biomass-based fishing mortality (F) in 1992 to be 3-times higher than F_{MSY}, and the 1992 total stock biomass to be about 40% of B_{MSY}. The intrinsic rate of increase (r) was estimated at 0.22.

The Science and Statistical (S&S) Committee reviewed an updated tilefish assessment in 1999. Total biomass in 1998 was estimated to be 2,936 mt, which was 35% of B_{MSY} = 8,448 mt. Fishing mortality was estimated to be 0.45 in 1998, which was about 2-times higher than F_{MSY} = 0.22. The intrinsic rate of increase (r) was estimated to be 0.45. These results were used in the development of the Tilefish Fishery Management Plan (Mid-Atlantic Fishery Management Council 2000). The Mid-Atlantic Fishery Management Council implemented the Tilefish Fishery Management Plan (FMP) in November of 2001. Rebuilding of the tilefish stock to B_{MSY} was based on a ten-year constant harvest quota of 905 mt.

SARC 41 reviewed a benchmark tilefish assessment in 2005. The surplus production model indicated that the tilefish stock biomass in 2005 has improved since the assessment in 1999. Total biomass in 2005 is estimated to be 72% of B_{MSY} and fishing mortality in 2004 is estimated to be 87% of F_{MSY}. Biological reference points did not change greatly from the 1999 assessment. B_{MSY} is estimated to be 9,384 mt and F_{MSY} is estimated to be 0.21. The SARC concluded that the projections are too uncertain to form the basis for evaluating likely biomass recovery schedules relative to B_{MSY}. The TAC and reference points were not changed based on the SARC 41 assessment.

The current status for this stock from SARC 48 (2009) is based on the ASPIC surplus production model which was the basis of the stock assessment for the last three assessments. The model is calibrated with CPUE series, as there are no fishery-independent sources of information on trends in population abundance. While the Working Group expressed concern about the lack of fit of the model to the VTR CPUE index at the end of the time series, they agreed to accept the estimates of current fishing mortality and biomass and associated reference points. The instability of model results in the scenario projections was also a source of concern. It was noted that the bootstrap uncertainty estimates do not capture the true uncertainty in the assessment. The ASPIC model indicates that the stock is rebuilt. However, the working group acknowledges that there is high uncertainty on whether the stock is truly rebuilt.

In this update commercial landings, longline fishery CPUE, and landings size distributions were updated through 2011 to help inform decisions on setting ABCs for golden tilefish in fishing year (November 1st) 2012 and 2013. Time constraints prevented a full vetting of an updated ASPIC model using data through 2011. However, updated data through 2011 suggests that the conclusions from SARC 48 would not change. ASPIC model results would likely still suffer process error caused from year class effects.

Commercial catch data

Total commercial landings (live weight) increased from less than 125 metric tons (mt) during 1967-1972 to more than 3,900 mt in 1979 and 1980. Annual landings have ranged between 666 and 1,838 mt from 1988 to 1998. Landings from 1999 to 2002 were below 900 mt (ranging from 506 to 874 mt). An annual quota of 905 mt was implemented in November of 2001. Landings in 2003 and 2004 were slightly above the quota at 1,130 mt and 1,215 mt respectively. Landing from 2005 to 2009 have been at or below the quota. Landings in 2010 were slightly above the quota at 922 mt (Table 1, Figure 1). The preliminary landings retrieval for 2011 as of 2/9/12 was 864 mt. During the late 1970s and early 1980s Barnegat, NJ was the principal tilefish port; more recently Montauk, NY has accounted for most of the landings. Most of the commercial landings are taken by the directed longline fishery. Discards in the trawl and longline fishery appear to be a minor component of the catch. Recreational catches have also appeared to be low over the last 25 years.

Commercial CPUE data

A fishery independent index of abundance does not exist for tilefish. Analyses of catch (landings) and effort data were confined to the longline fishery since directed tilefish effort occurs in this fishery (e.g. the remainder of tilefish landings are taken as bycatch in the trawl fishery). Most longline trips that catch tilefish fall into two categories: (a) trips in which tilefish comprise greater than 90% of the trip catch by weight and (b) trips in which tilefish accounted for less than 10% of the catch. Effort was considered directed for tilefish when at least 75% of the catch from a trip consisted of tilefish.

Three different series of longline effort data were analyzed. The first series was developed by Turner (1986) who used a general linear modeling approach to standardize tilefish effort during 1973-1982 measured in kg per tub (0.9 km of groundline with a hook every 3.7 m) of longline obtained from logbooks of tilefish fishermen. Two additional CPUE series were calculated from the NEFSC weighout (1979-1993) and the VTR (1995-2011) systems. Effort from the weighout data was derived by port agents' interviews with vessel captains whereas effort from the VTR systems comes directly from mandatory logbook data. In the SARC 48 assessment and in the 1998 and 2005 tilefish assessments we used Days absent as the best available effort metric. In the 1998 assessment an effort metric based on Days fished (average hours fished per set / 24 * number of sets in trip) was not used because effort data were missing in many of the logbooks and the effort data were collected on a trip basis as opposed to a haul by haul basis. In the SARC 48 assessment effort was calculated as:

Effort = days absent (time & date landed - time & date sailed) - number of trips.

For some trips, the reported days absent were calculated to be a single day. This was considered unlikely, as a directed tilefish trip requires time for a vessel to steam to near the edge of the continental shelf, time for fishing, and return trip time. Thus, to produce a realistic effort metric based on days absent, a one day steam time for each trip (or the number of trips) was subtracted from days absents and therefore only trips with days absent greater than one day were used.

The number of vessels targeting tilefish has declined since the 1980s (Table 2, Figure 2); during 1994-2003 and 2005-2011, five vessels accounted for more than 70 percent of the total tilefish landings. The number of vessels targeting tilefish has remained fairly constant since the assessment in 2005. The length of a targeted tilefish trip had been generally increasing until the mid 1990s. At the time of the 2005 assessment trip lengths have shorten to about 5 days. Trip length has increased slightly until 2008 and has subsequently declined (Figure 2). In the weighout data the small number of interview is a source of concern; very little interview data exists at the beginning of the time series (Table 2, Figure 3). The 5 dominant tilefish vessels make up almost all of the VTR reported landings.

The number of targeted tilefish trips declined in the early 1980s while trip length increased at the time the FMP was being developed in 2000 (Figures 2 and 4). During the 2005 assessment the number of trips became relatively stable as trip length decreased. The interaction between the number of vessels, the length of a trip and the number of trips can be seen in the total days absent trend in Figure 4. Total days absent remained relatively stable in the early 1980s, but then declined at the end of the weighout series (1979-1994). In the beginning of the VTR series (1994-2004) days absent increased through 1998 but declined to 2005. Since 2005 total days absent has increase until 2008. Since 2008 the total days absent has declined slightly. Figure 4 also shows that a smaller fraction of the total landings were included in the calculation of CPUE compared to the VTR series.

CPUE trends are very similar for most vessels that targeted tilefish (Figure 5). A sensitivity test of the GLM using different vessel combinations was done in SARC 41. The SARC 41 GLM was found not to be sensitivity to different vessels entering the CPUE series.

Very little CPUE data exist for New York vessels in the 1979-1994 weighout series despite the shift in landing from New Jersey to New York before the start of the VTR series in 1994. Splitting the weighout and VTR CPUE series can be justified by the differences in the way effort was measured and difference in the tilefish fleet between the series. In breaking up the series we omitted 1994 because there were very little CPUE data. The sparse 1994 data that existed came mostly from the weighout system in the first quarter of the year. Very similar trends exist in the four years of overlap between Turner (1986) CPUE and the weighout series (Figure 6).

Since 1979, the tilefish industry has changed from using cotton twine to steel cables for the backbone and from J hooks to circle hooks. The gear change to steel cable and snaps started on New York vessels in 1983. In light of possible changes in catchability associated with these changes in fishing gear, the working group considered that it would be best to use the three available indices separately rather than combined into one or two series. The earliest series (Turner 1986) covered 1973-1982 when gear construction and configuration was thought to be relatively consistent. The Weightout series (1979-1993) overlapped the earlier series for four years and showed similar patterns and is based primarily on catch rates from New Jersey vessels. The VTR (1995-2004) series is based primarily on information from New York vessels using steel cable and snaps.

The NEFSC Weighout and VTR CPUE series were standardized using a general linear model (GLM) incorporating year and individual vessel effects. The CPUE was standardized to an individual longline vessel and the year 1984; the same year used in the last assessment. For the VTR series the year 2000 was used as the standard. Model coefficients were back-transformed to a linear scale after correcting for transformation bias. The full GLM output for the Weighout and the VTR CPUE series is included as Appendix 1. The updated GLM model that accounted of individual vessel effects appears to show more of an overall increasing trend in CPUE in comparison to the nominal series (figure 7).

More recently changes in the CPUE can be generally explained with evidence of strong incoming year classes that track through the landings size composition over time (See below). Since the SARC 48 assessment there appear to be increases in CPUE due to one or two new strong year classes. In general, strong year classes appear to persist longer in the fishery after FMP and the constant quota management came into effect which is evident in both the CPUE and size composition data.

Commercial market category and size composition data

Six market categories exist in the database. From smallest to largest they are: small, kitten, medium, large and extra large as well as an unclassified category. The proportion of landings in the kittens and small market categories increased in 1995 and 1996. Evidence of two strong recruitment events can be seen tracking through these market categories. At the time of the 2005 tilefish assessment the proportion of large market category has declined since the early 1980s. However more recently a greater proportion of the landings are coming from the large market category as the last strong year class (1999) has grown (Table 3, Figure 8). Commercial length sampling has been inadequate over most of the time series. However some commercial length sampling occurred in the mid to late 1990s. More recently there has been a substantial increase in the commercial length sampling from 2003 to 2011 (Table 4).

Commercial length frequencies were expanded for years where sufficient length data exist (1995-1999 and 2002-2011) (Table 4). The large length frequency samples from 1996 to 1998 were used to calculate the 1995 to 1999 expanded numbers at length while the large length samples from 2001 and 2003 were used to calculate the 2002 expanded numbers at length. Evidence of strong 1992/1993 and 1998/1999 year classes can be seen in the expanded numbers at length in the years when length data existed (1995-1999, 2002-2008, and 2008-2011) (Figures 9 and 10). The matching of modes in the length frequency with ages was done using Turner's (1986) and Vidal's (2009) aging studies. In 2004 and 2005 the 1998/1999 year class can be seen growing into the medium market category and in 2006 and 2007 the year class has entered the large market category (Figure 9). From 2002 to 2007 it appears that most of the landings were comprised of this year class. The catch appears to be comprised of multiple year classes in 2008 when catch rates have declined in the VTR series. An increase in the landings and CPUE can be seen when the 1992/1993 and 1998/1999 year classes recruit to the longline fishery. As the year classes gets older the catch rates decline (Figure 11).

Concern was expressed at SARC 48 with little evidence of an incoming year class, catch rates declining and the mismatch between the biomass trends predicted by the model in comparison to the observed CPUE at the end of the time series. However since the last 2009 assessment there is evidence of another strong year class (2005-2006) tracking through the landings size distributions which results in increases in the CPUE. There is also some evidence of the broader size distribution of the fish being caught. However concerns with model process error due to the year class effects on CPUE still exist and will likely still produce instability in the results of the surplus production model.

SARC 48 Southern Demersal Working Group Stock Assessment Report Conclusions

The possibility of unknown refuge effects due to conflicts with lobster and trawl gear, effects of targeting incoming year classes, and the unknown effects on tilefish CPUE due to competition/interference from increased dogfish abundance introduce uncertainty in interpreting CPUE from this fishery as a measure of stock abundance. CPUE index of abundance and catch length frequency distributions are likely a reflection of both the population abundance and the unaccounted changes in fishing practice.

The Working Group accepted the ASPIC model solution but noted that there is very high uncertainty regarding whether the stock is rebuilt. The SARC 48 review panel concluded that the ASPIC model is likely over optimistic and that the stock has not rebuilt above B_{MSY}. The surplus production model inability to fit the decline in CPUE due to a year class effect at the end of the time series is a source of concern. The bootstrap uncertainty estimates from the ASPIC model likely do not capture the true uncertainty in this assessment. Results from the SCALE model which incorporates the species lifespan, growth, and recruitment dynamics evident in the commercial length distributions provide reason to be concerned that the stock is not rebuilt. However the overall lack of data within the scale model and questions on the estimated selectivity may result in a pessimistic stock status determination (Figures 12 and 13). The uncertainty in this assessment is encompassed by the results from two very different models which resulted in different status determinations. However increases in biomass and lower fishing mortality rates since the beginning of the FMP are evident in the results from both models. Consideration should be given to the possibility that the SCALE model results may be a reflection of the true state of nature when setting ABCs rather than using the results of the ASPIC surplus production model which states that the stock is rebuilt.

SARC 48 State of Stock/Review Panel Conclusions from the Assessment Summary Report

The Golden Tilefish stock is not overfished and overfishing is not occurring (Figures 14 and 15). Fishing mortality in 2008 was estimated to be 0.06, 38% of the updated F_{MSY} = 0.16. Total biomass in 2008 was estimated to be 11,910 mt, 104% of the updated B_{MSY} = 11,400 mt (Table 5, Figure 15). The 50% confidence interval (25%ile to 75%ile) for F in 2008 is between 0.05 and 0.07 (Figure 16). The 50% confidence interval (25%ile to 75%ile) for total biomass in 2008 is between 9,550 mt and 13,538 mt (Figure 17). The biomass estimates for recent years from the ASPIC model are likely over-optimistic because trends in commercial VTR CPUE declined recently in a manner consistent with the passage of the strong 1999 cohort through the population (an interpretation further supported by the length frequency data). The current assessment model (ASPIC) does not account for those factors. Much of the confidence interval around the 2008 biomass estimate falls below the updated B_{MSY} listed above. Based on these considerations there are no convincing evidence that the stock has rebuilt to levels above B_{TARGET}. The review panel also concluded that for the most recent years (e.g., 2008) the biomass estimates from the ASPIC model are likely overestimates and that the estimates are more uncertain than the model suggests. An immediate increase in the commercial landings from the *status quo* TAC = 905 mt to the updated MSY = 1,868 mt would be risky considering the uncertainty of the assessment and stock status determination.

Table 1. Landings of tilefish in live metric tons from 1915-2008. Landings in 1915-1972 are from Freeman and Turner (1977), 1973-1989 are from the general canvas data, 1990-1993 are from the weighout system, 1994-2003 are from the dealer reported data, and 2004-2011 is from Dealer electronic reporting. - indicates missing data.
* Preliminary data retrieved on 2/9/12

year	mt	year	mt	year	mt
1915	148	1960	1,064	2005	676
1916	4,501	1961	388	2006	907
1917	1,338	1962	291	2007	751
1918	157	1963	121	2008	737
1919	92	1964	596	2009	864
1920	5	1965	614	2010	922
1921	523	1966	438	2011	*864
1922	525	1967	50		
1923	623	1968	32		
1924	682	1969	33		
1925	461	1970	61		
1926	904	1971	66		
1927	1,264	1972	122		
1928	1,076	1973	394		
1929	2,096	1974	586		
1930	1,858	1975	710		
1931	1,206	1976	1,010		
1932	961	1977	2,082		
1933	688	1978	3,257		
1934	-	1979	3,968		
1935	1,204	1980	3,889		
1936	-	1981	3,499		
1937	1,101	1982	1,990		
1938	533	1983	1,876		
1939	402	1984	2,009		
1940	269	1985	1,961		
1941	-	1986	1,950		
1942	62	1987	3,210		
1943	8	1988	1,361		
1944	22	1989	454		
1945	40	1990	874		
1946	129	1991	1,189		
1947	191	1992	1,653		
1948	465	1993	1,838		
1949	582	1994	786		
1950	1,089	1995	666		
1951	1,031	1996	1,121		
1952	964	1997	1,802		
1953	1,439	1998	1,334		
1954	1,582	1999	508		
1955	1,629	2000	504		
1956	707	2001	871		
1957	252	2002	843		
1958	672	2003	1,130		
1959	380	2004	1,215		

Table 2. Total commercial and vessel trip report (VTR) landings in live mt and the commercial catch-per-unit effort (CPUE) data used for tilefish. Dealer landings before 1990 are from the general canvas data. CPUE data from 1979 to the first half of 1994 are from the NEFSC weighout database, while data in the second half of 1994 to 2011 are from the vtr system (below the dotted line). Effort data are limited to longline trips which targeted tilefish (= or >75% of the landings were tilefish) and where data existed for the days absent. Nominal CPUE series are calculated using landed weight per days absent minus one day steam time per trip. Da represents days absent.

	Weighout		Commerical CPUE data subset								
year	& Dealer landings	vtr landings	interview landings	No. interviews	% interview trips	No. vessels	subset landings	days absent	No. trips	da per trip	nominal cpue
1979	3,968		0.0	0	0.0%	20	1,807	1,187	330	3.6	1.93
1980	3,889		0.8	1	0.3%	18	2,153	1,390	396	3.5	1.99
1981	3,499		35.0	4	1.2%	21	1,971	1,262	333	3.8	1.95
1982	1,990		90.7	13	5.7%	18	1,267	1,282	229	5.6	1.10
1983	1,876		85.8	16	8.9%	21	1,013	1,451	179	8.1	0.73
1984	2,009		140.1	25	18.2%	20	878	1,252	138	9.1	0.72
1985	1,961		297.1	64	30.6%	25	933	1,671	209	8.0	0.59
1986	1,950		120.7	31	16.5%	23	767	1,186	188	6.3	0.71
1987	3,210		198.5	38	18.5%	30	1,014	1,343	206	6.5	0.82
1988	1,361		148.2	30	19.4%	23	422	846	154	5.5	0.56
1989	454		92.8	11	15.7%	11	165	399	70	5.7	0.46
1990	874		32.4	8	11.9%	11	241	556	68	8.2	0.45
1991	1,189		0.8	3	2.8%	7	444	961	107	9.0	0.48
1992	1,653		58.0	9	8.6%	13	587	969	105	9.2	0.62
1993	1,838		71.9	11	10.5%	10	571	959	105	9.1	0.61
1994	-		0	0	0.0%	7	127	385	42	9.2	0.34
1994	786	30				4	26	76	9	8.4	0.36
1995	666	547				5	470	964	100	9.6	0.50
1996	1,121	865				8	822	1,318	134	9.8	0.64
1997	1,810	1,439				6	1,427	1,332	133	10.0	1.09
1998	1,342	1,068				9	1,034	1,517	158	9.6	0.70
1999	525	527				10	516	1,185	133	8.9	0.45
2000	506	446				11	427	942	110	8.6	0.47
2001	874	705				8	691	1,046	116	9.0	0.68
2002	851	724				8	712	951	114	8.3	0.78
2003	1,130	790				7	788	691	101	6.8	1.22
2004	1,215	1,153				12	1,136	811	134	6.1	1.54
2005	676	808				11	802	470	93	5.1	1.95
2006	907	870				12	852	682	105	6.5	1.35
2007	749	710				12	691	727	101	7.2	1.01
2008	737	675				14	672	1,119	124	9.0	0.62
2009	864	812				12	800	1,106	130	8.5	0.75
2010	922	871				11	845	689	107	6.4	1.33
2011	830	761				9	729	485	84	5.8	1.67

Table 3. Landing (metric tons) by market category. Small-kitten market category was added to kittens.

year	small	kittens	medium	large	xl	unclassified	total
1990	24	14	103	45	0	687	871
1991	43	16	154	85	0	891	1,189
1992	193	136	88	86	0	1,149	1,653
1993	237	131	206	66	4	1,193	1,838
1994	8	11	89	54	7	617	786
1995	26	73	88	91	2	386	666
1996	169	423	149	156	2	221	1,121
1997	249	878	257	110	2	306	1,802
1998	97	375	699	103	6	54	1,334
1999	37	143	197	106	8	17	508
2000	17	193	153	114	8	19	504
2001	11	553	160	124	6	18	871
2002	26	341	311	128	3	34	843
2003	132	644	170	144	5	34	1,130
2004	169	248	523	129	9	137	1,215
2005	6	12	335	149	1	173	676
2006	8	9	233	369	1	287	907
2007	17	81	148	397	4	105	751
2008	68	99	194	297	18	60	737
2009	55	279	179	226	28	61	864
2010	28	256	373	166	17	81	922
2011	6	143	336	216	10	154	864

Table 4. Number of lengths (1995-2008), samples (2002-2008), and metric tons landed per sample (2002-2011) for Golden tilefish. Number of lengths includes borrowing across years in bold. Trawl lengths were not used in the expansion. Large lengths used from 1995 to 1999 were taken from years 1996, 1997, and 1998. Large lengths in 2002 also used large lengths from 2003. Unclassified were redistributed according to mkt and qtr proportions.

Number of lengths.

year	half	sm	ki	med	lg	xl	total
1995	1		244	208	**332**		
	2						784
1996	1		312	100	**332**		
	2						744
1997	1		958	688	**332**		
	2						1978
1998	1		202	407	**332**		
	2						941
1999	1		211	155	**332**		
	2						698

Number of lengths.

year	half	sm	ki	med	lg	xl	total
2002	1		353	206	**492**		
	2						1051
2003	1	735	385	396	467	32	
	2		522	958			3495
2004	1	788	115	882	432		
	2	106	197	427			2947
2005	1		393	1378	825		
	2			763			3359
2006	1	112	346	1856	1284		
	2	218		1079	752		5647
2007	1	396	379	1128	898	25	
	2	220	1152	1871	1316		7385
2008	1	93	719	1356	1506	20	
	2		369	339			4402
2009	1	508	650	731	658	5	
	2	402	470	1024	322		4770
2010	1	1122	858	2363	1995	43	
	2	213	1081	2031	1140		10846
2011	1	852	1236	2682	2011	35	
	2		1104	1626	851		10397

Number of samples

year	half	sm	ki	med	lg	xl	total
2002	1		6	2	**8**		
	2				↑		16
2003	1	5	4	3	7	2	
	2		6	5			32
2004	1	4	1	6	7		
	2	1	2	4			25
2005	1		6	10	12		
	2			8			36
2006	1	3	6	14	11		
	2	2		11	8		55
2007	1	4	4	12	12	1	
	2	1	5	9	8		56
2008	1	1	9	16	28	3	
	2		4	6			67
2009	1	5	11	13	11	2	
	2	4	8	17	11		82
2010	1	11	13	30	29	3	
	2	2	11	23	27		149
2011	1	10	16	30	24	3	
	2		12	17	10		122

mt/samples

year	half	sm	ki	med	lg	xl	total
2002	1		61	156	**19**		
	2						54
2003	1	26	98	22	21	3	
	2		42	21			34
2004	1	37	209	50	20		
	2	23	20	55			43
2005	1		3	19	12		
	2			18			14
2006	1	2	1	9	19		
	2	2		9	21		11
2007	1	1	6	6	18	4	
	2	12	11	8	23		12
2008	1	49	8	7	11	6	
	2		12	13			10
2009	1	9	8	8	14	14	
	2		25	5	6		9
2010	1	2	10	7	3	6	
	2		10	8	3		6
2011	1	1	4	7	5	3	
	2		6	8	9		6

Table 5. Biological reference point estimates from the 2000 SSC committee review, 2005 SARC 41 assessment, and the 2009 BASE run from SARC 48.

	SSC 2000 1999	SARC 41 2004	SARC 48 2008
BMSY			
Point	8,448	9,384	11,400
Boot mean	-	9,764	10,336
Boot sd	-	5,152	2,089
Boot median	-	9,193	10,135
Boot 25%ile	-	8,379	8,974
Boot 75%ile	-	10,263	11,436
Boot bias	-	4%	-9%
FMSY			
Point	0.22	0.21	0.16
Boot mean	-	0.24	0.2
Boot sd	-	0.21	0.06
Boot median	-	0.22	0.19
Boot 25%ile	-	0.19	0.16
Boot 75%ile	-	0.25	0.23
Boot bias	-	15%	21%
MSY	1,858	1,988	1,868
r	0.45	0.42	0.33
Turner Q	0.009	0.010	0.009
Weighout	0.222	0.225	0.175
VTR Q	-	0.392	0.260

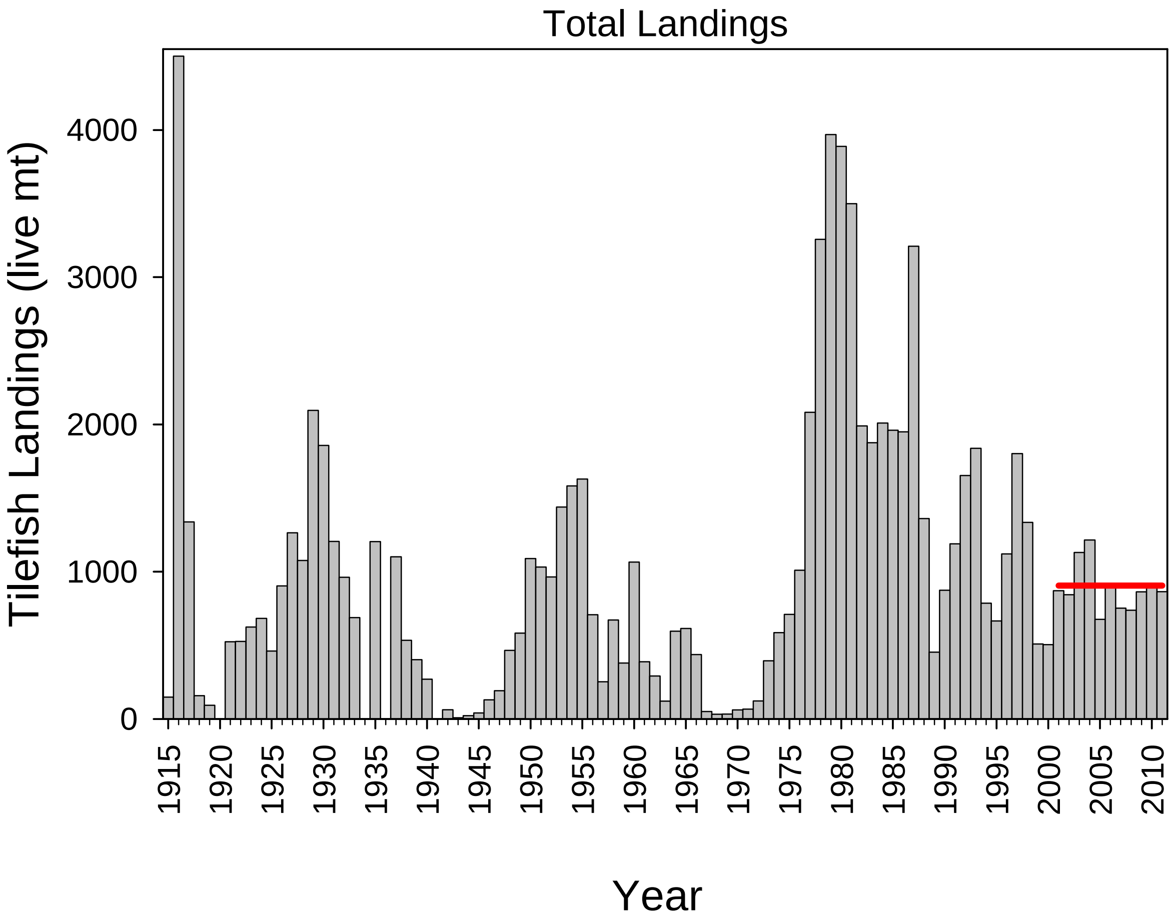

Figure 1. Landings of tilefish in metric tons from 1915-2004. Landings in 1915-1972 are from Freeman and Turner (1977), 1973-1989 are from the general canvas data, 1990-1993 are from the weighout system, 1994-2003 are from the dealer reported data, and 2004-2011 is from dealer electronic reporting. Preliminary landings data for 2011 retrieved on 2/9/12. Red line is the constant TAC of 905 mt.

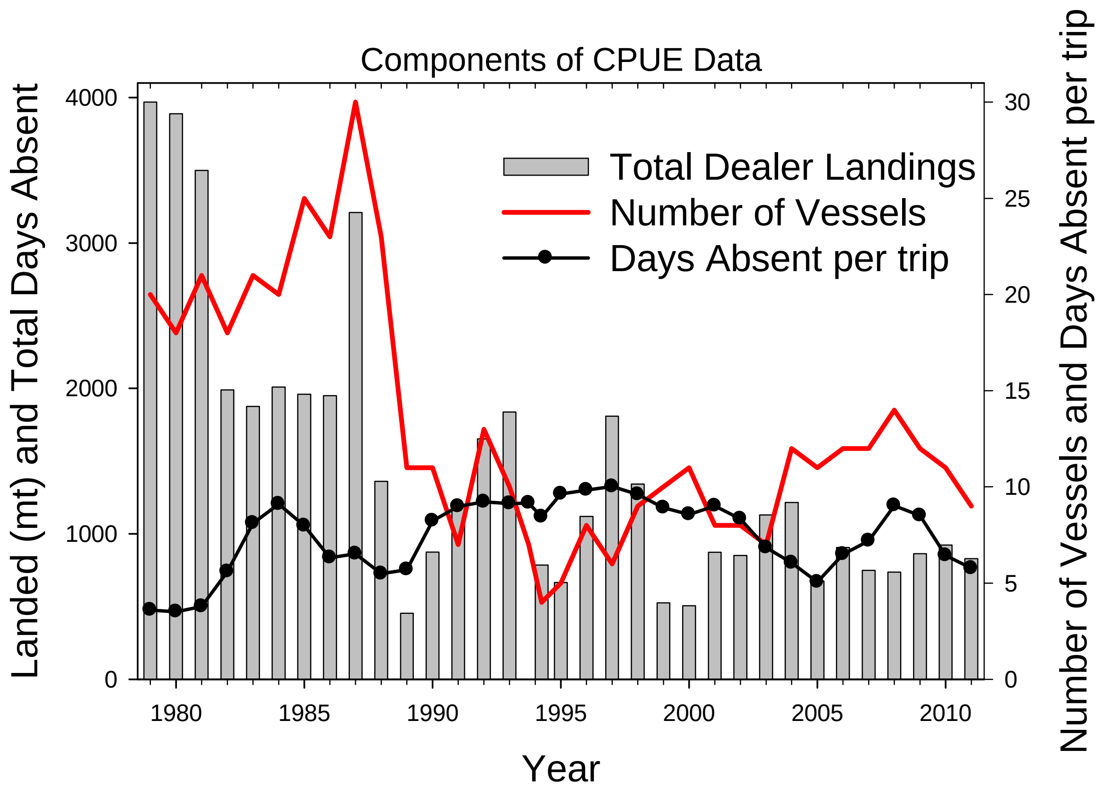

Figure 2. Number of vessels and length of trip (days absent per trip) for trips targeting tilefish (= or >75% tilefish) from 1979-2008. Total Dealer landings are also shown.

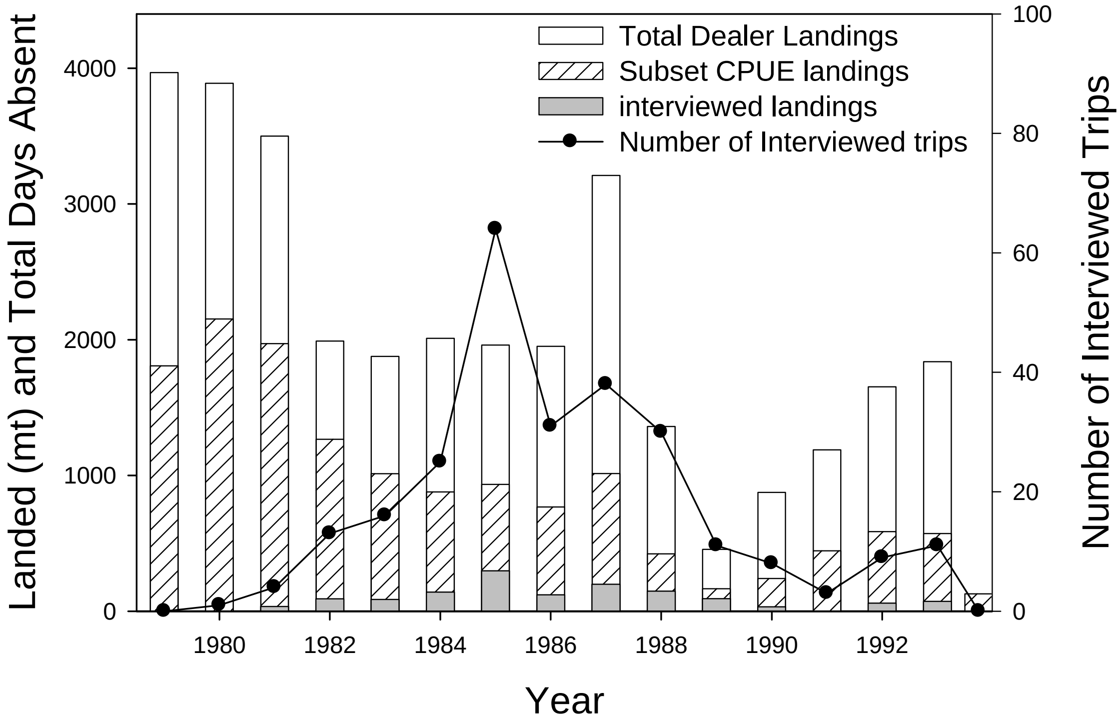

Figure 3. Number of interviewed trips and interviewed landings for trips targeting tilefish (= or >75% tilefish) for the Weighout data from 1979-1994. Total Weighout landings and the subset landings used in CPUE estimate are also shown.

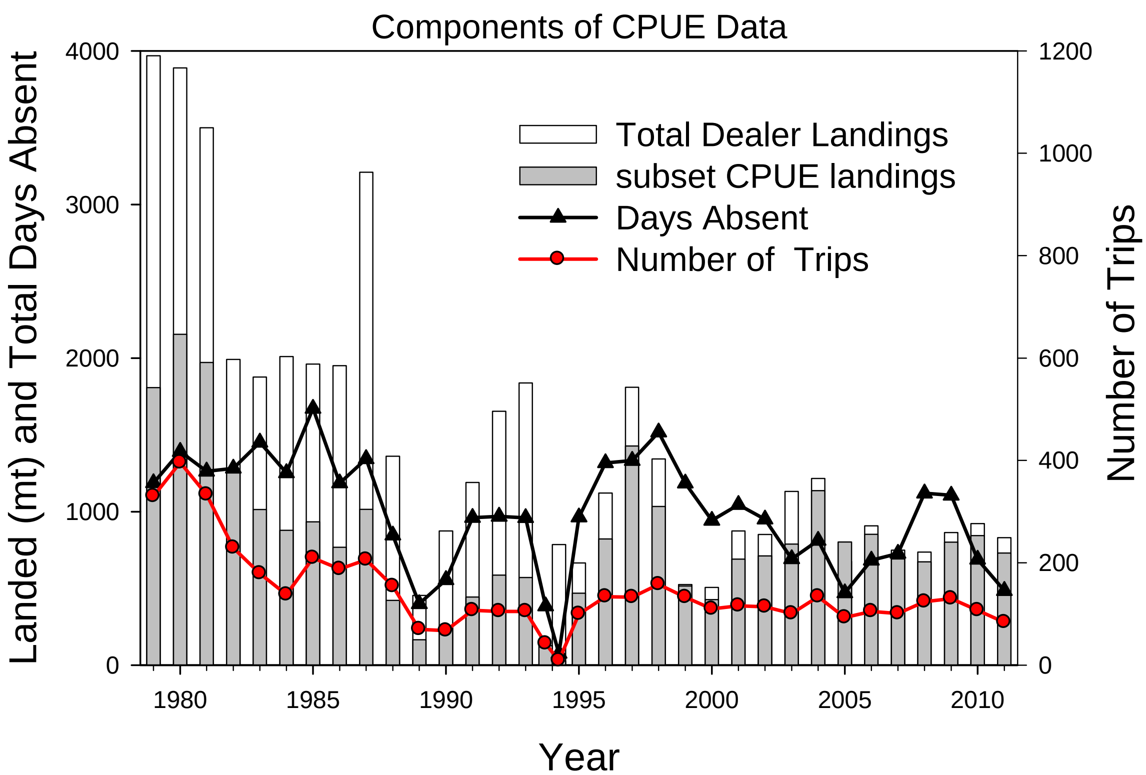

Figure 4. Total number of trips and days absent for trips targeting tilefish (= or >75% tilefish) from 1979-2008. Total Dealer and CPUE subset landings are also shown

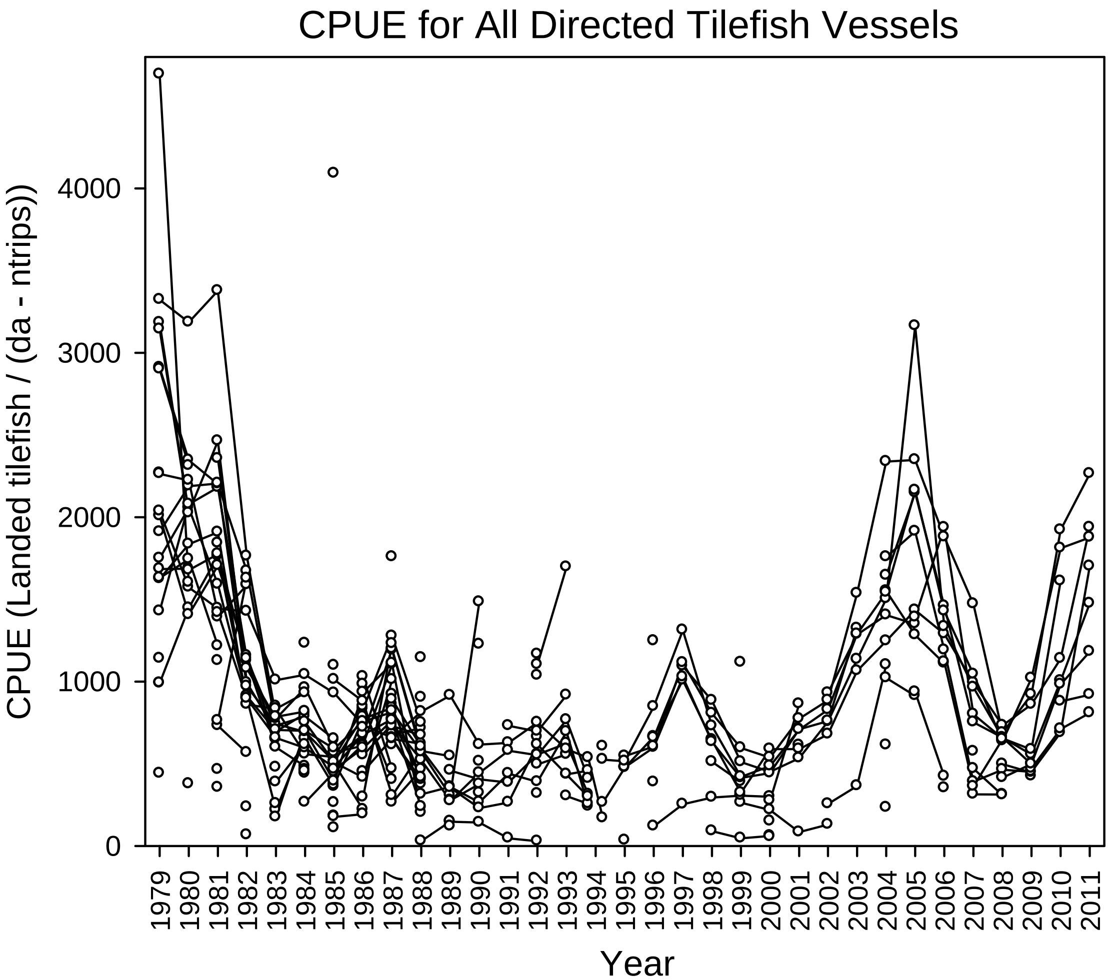

Figure 5. All individual tilefish vessel CPUE data for trips targeting tilefish (= or >75% tilefish) from 1979-2011.

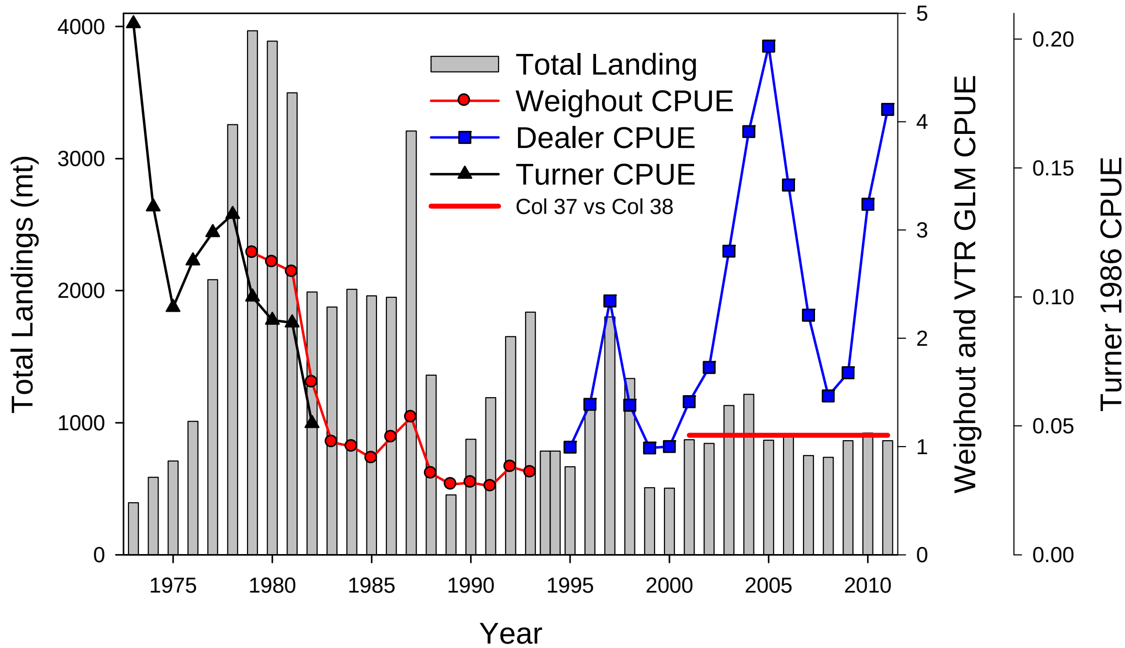

Figure 6. GLM CPUE for the Weighout and VTR data split into two series. Four years of overlap between Turner's and the Weighout CPUE series can be seen. Assumed total landings are also shown. Landing in 2005 was taken from the IVR system. Red line is the constant TAC of 905 mt.

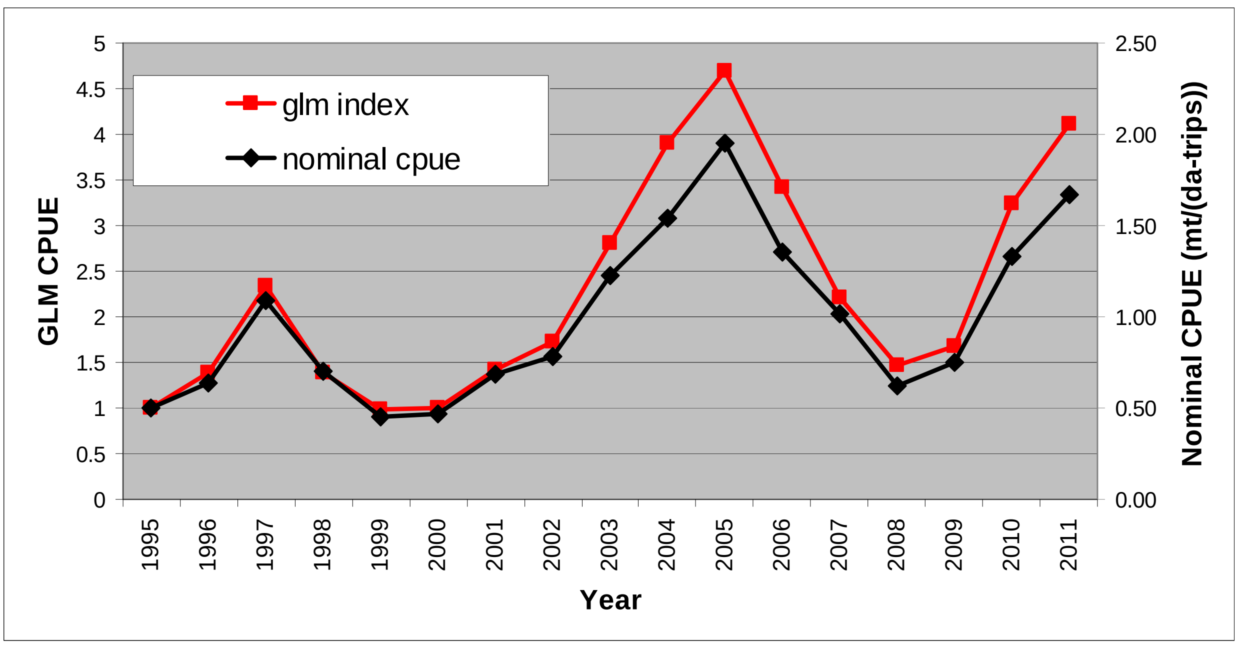

Figure 7. Comparison of the nominal and GLM VTR CPUE indices for golden tilefish.

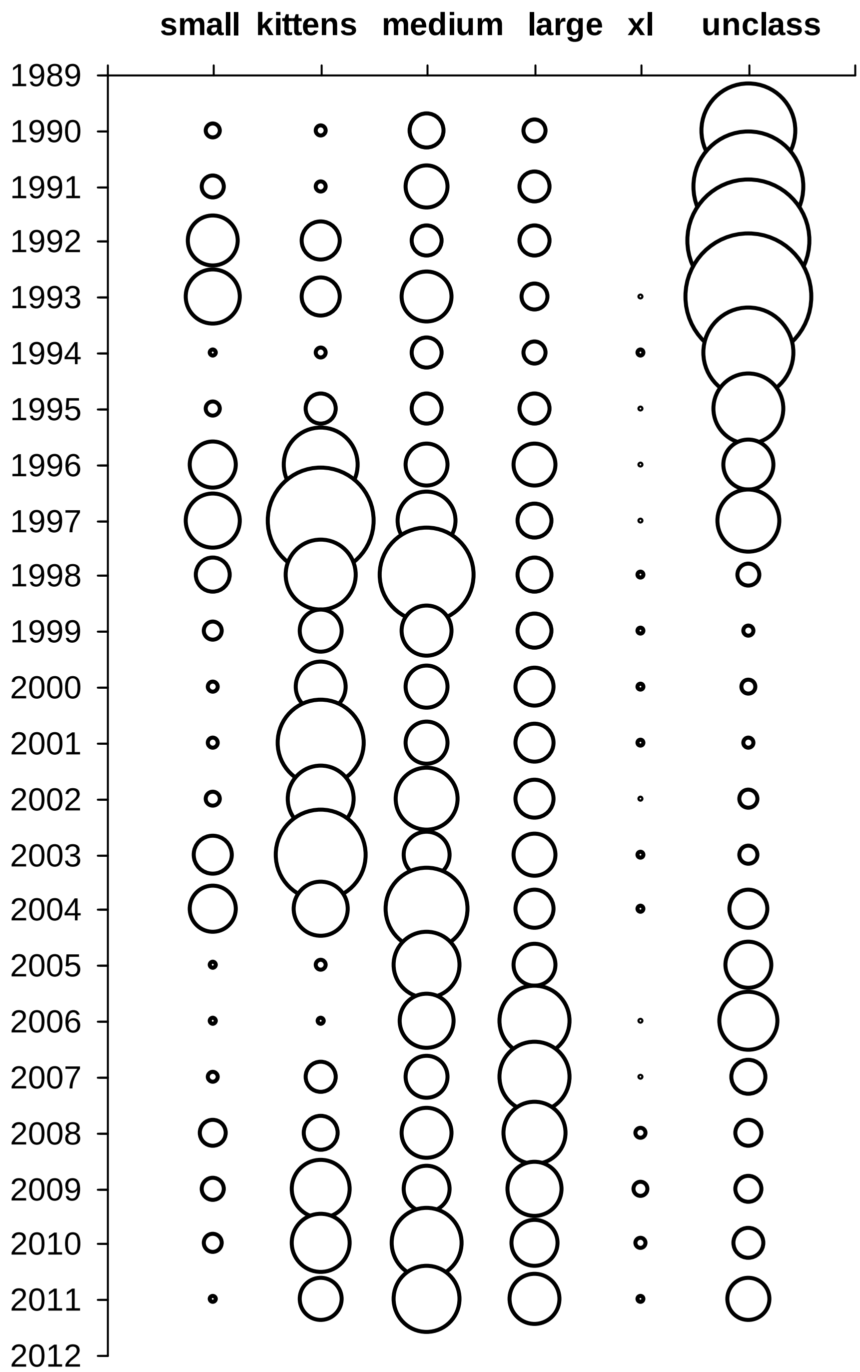

Figure 8. Bubble plot of Golden tilefish landings by market category.

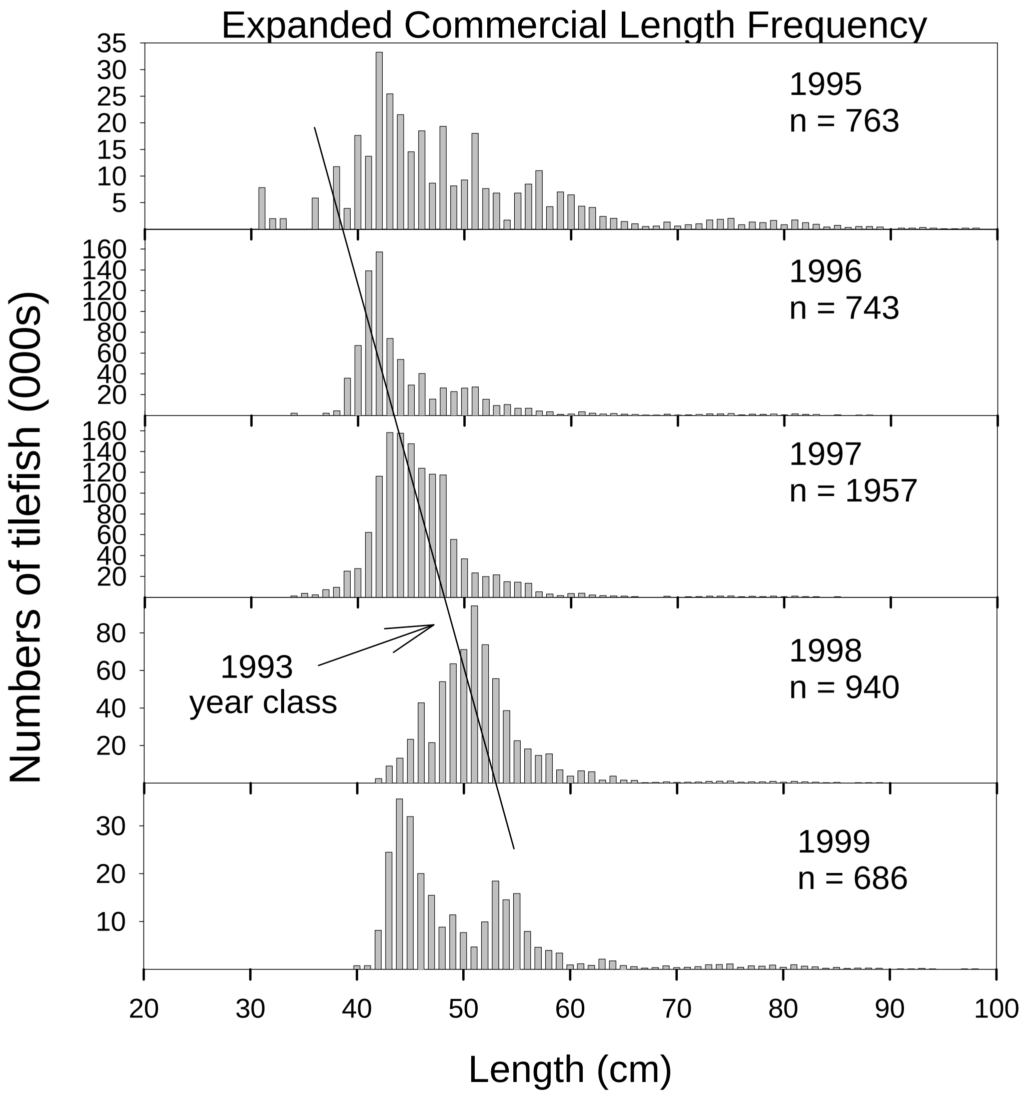

Figure 9. Expanded length frequency distributions by year. Large market category lengths used from 1995 to 1999 were taken from years 1996, 1998, and 1998. Smalls and kittens were combined and large and extra large were also combined.

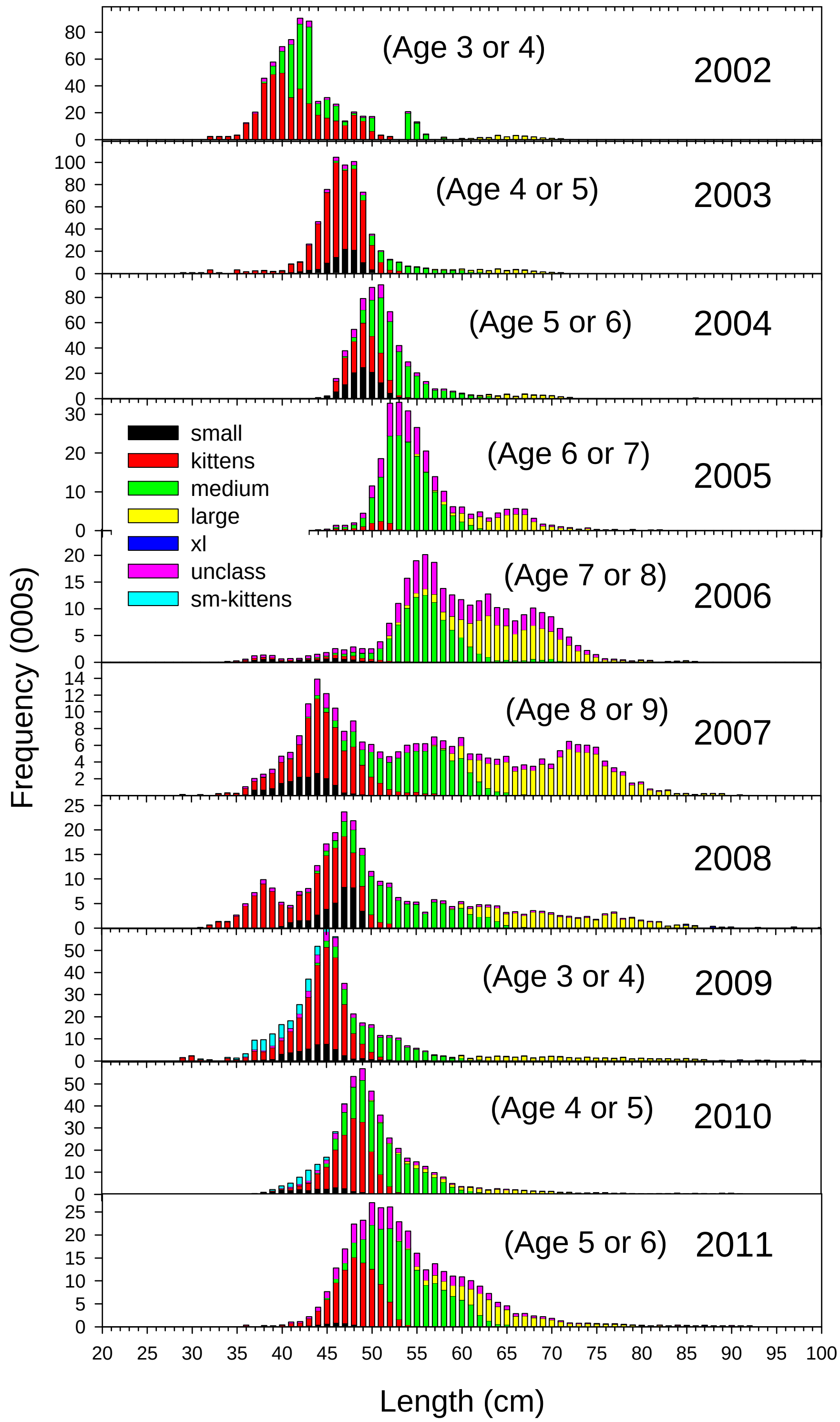

Figure 10. Expanded length frequency distributions by year. Y-axis is allowed to rescale.

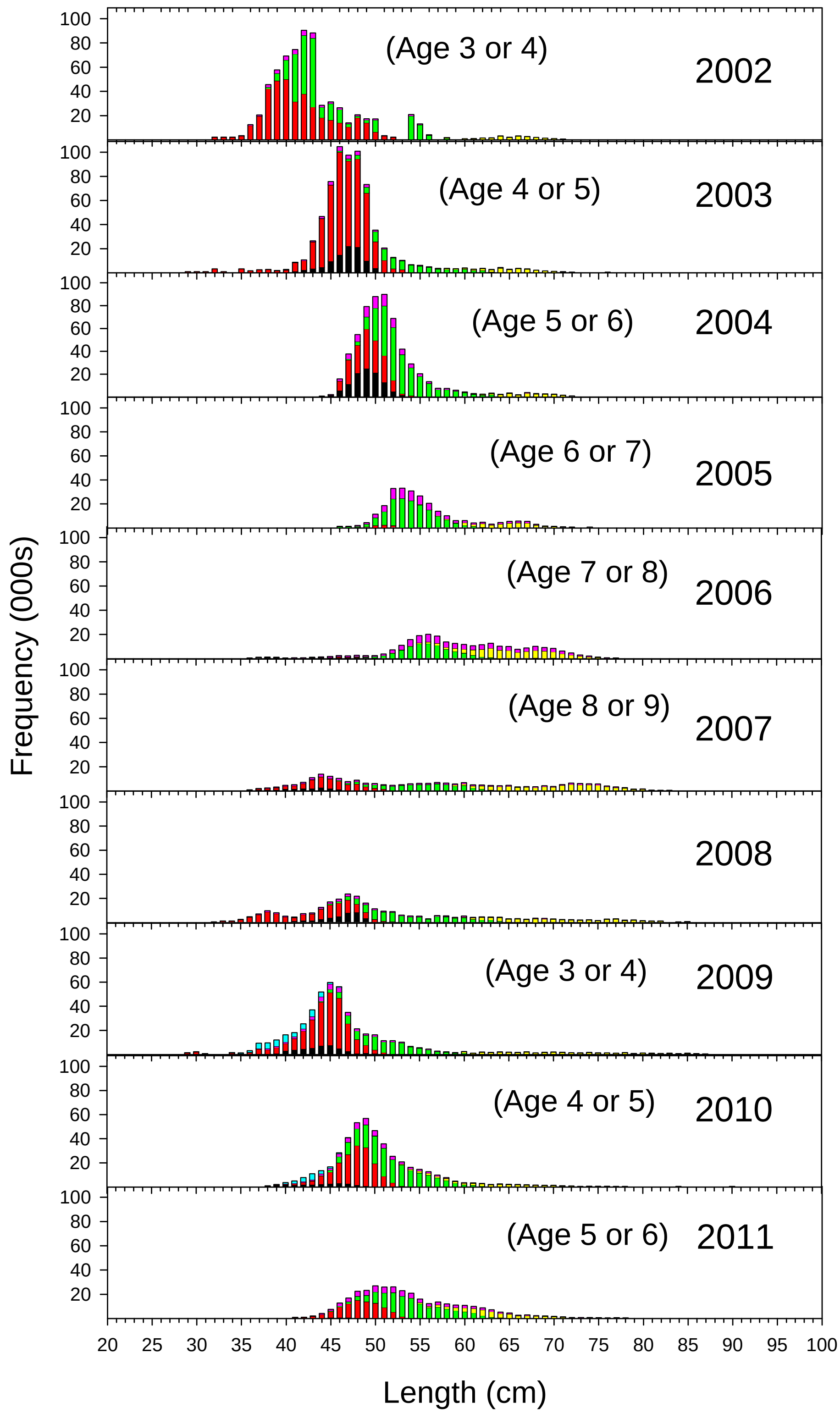

Figure 11. Expanded length frequency distributions by year. Y-axis scale is fixed.

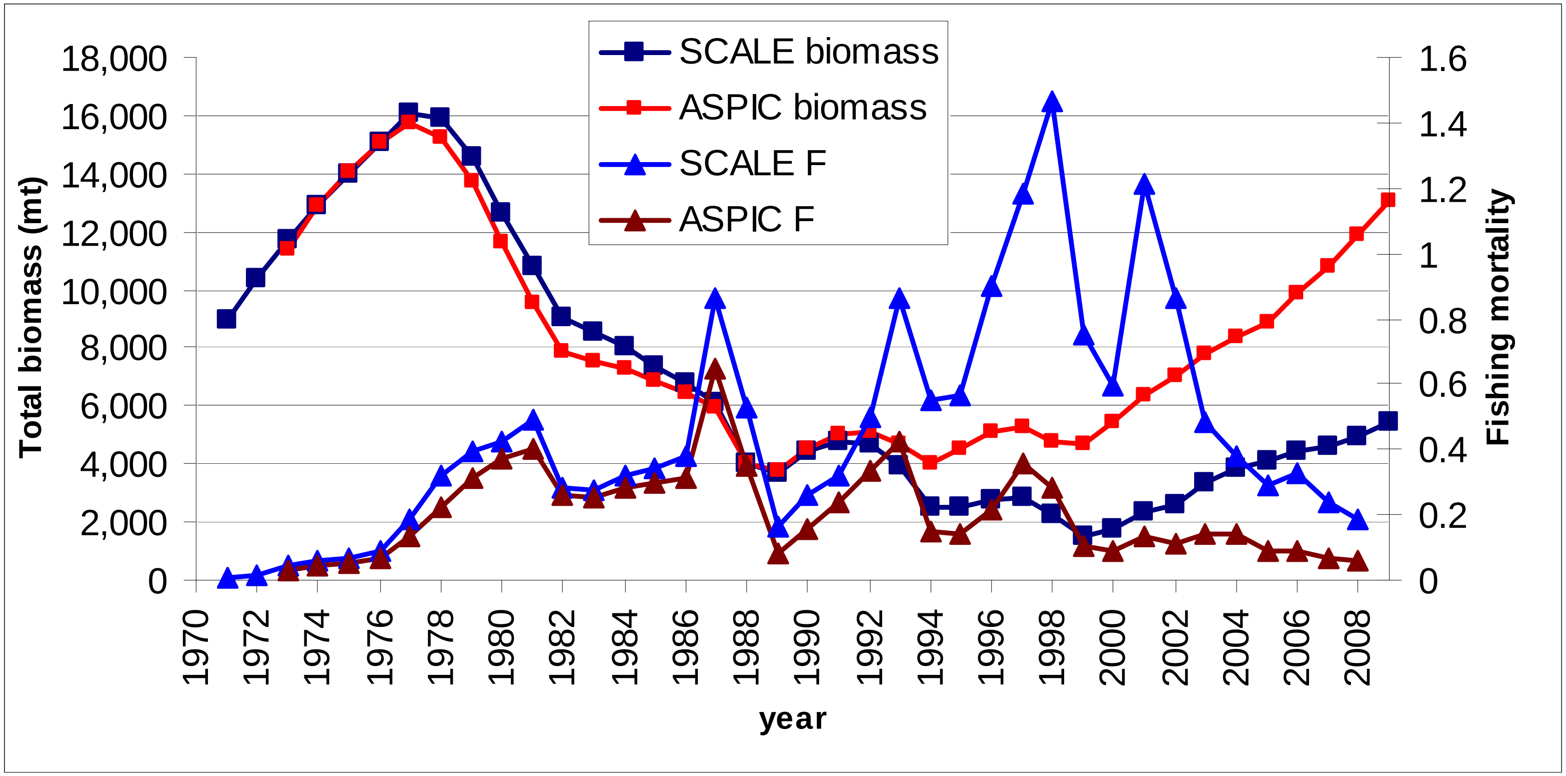

Figure 12. Comparison of F (triangles) and total biomass (squares) between the ASPIC base run 1 with the SCALE base run 1. Note ASPIC base run fixed the biomass in 1973 at Bmsy and SCALE base run estimated Fstart at 0.20.

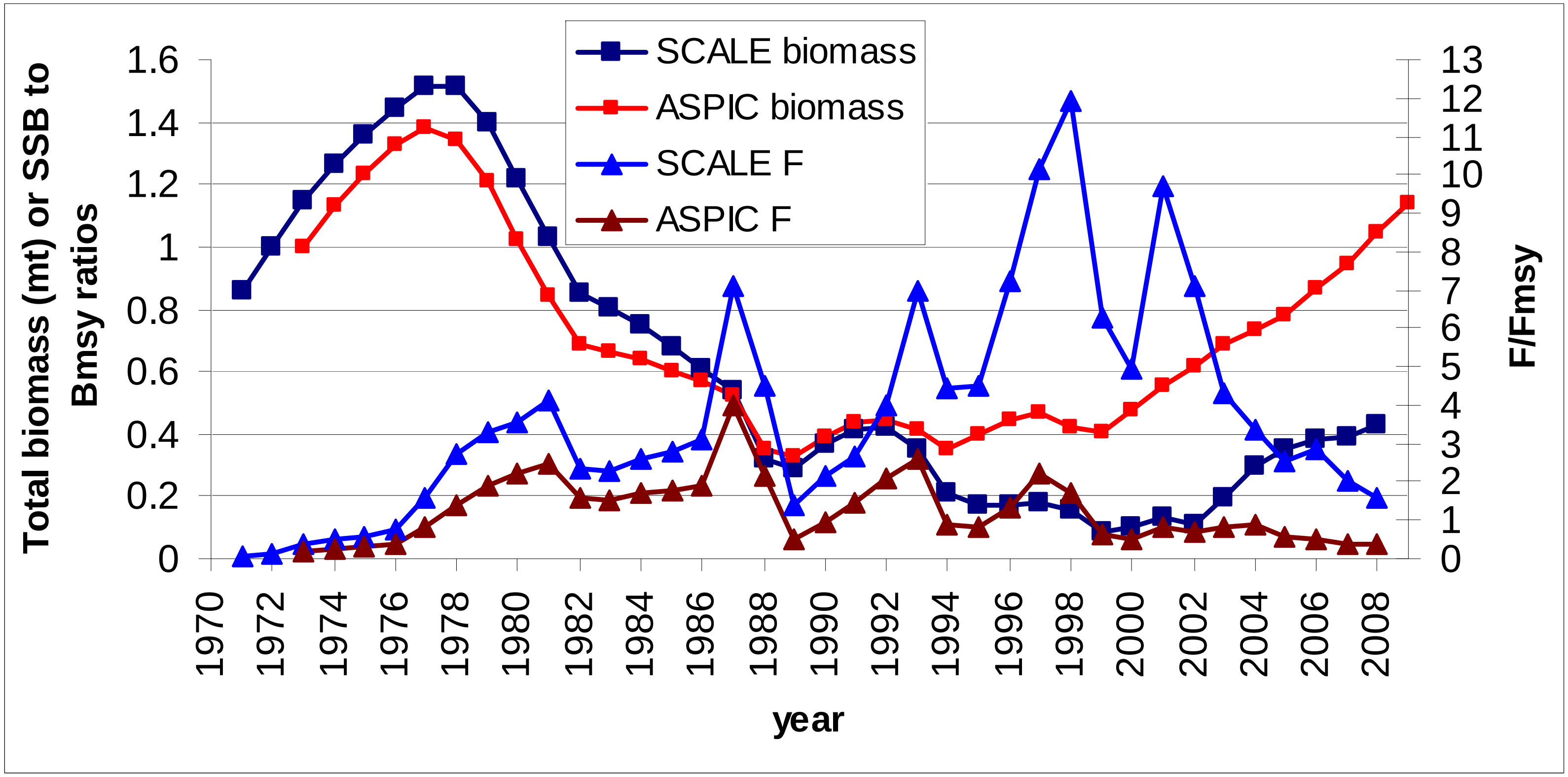

Figure 13. Comparison of F to Fmsy ratio (triangles) and total biomass or SSB to Bmsy ratios (squares) between the ASPIC base run 1 with the SCALE base run 1. Note ASPIC base run fixed the biomass in 1973 at Bmsy and SCALE base run estimated Fstart at 0.20. Fmax (0.128) is used as a proxy for Fmsy and SSBmsy (5,335 mt) is for females only in the SCALE base run 1.

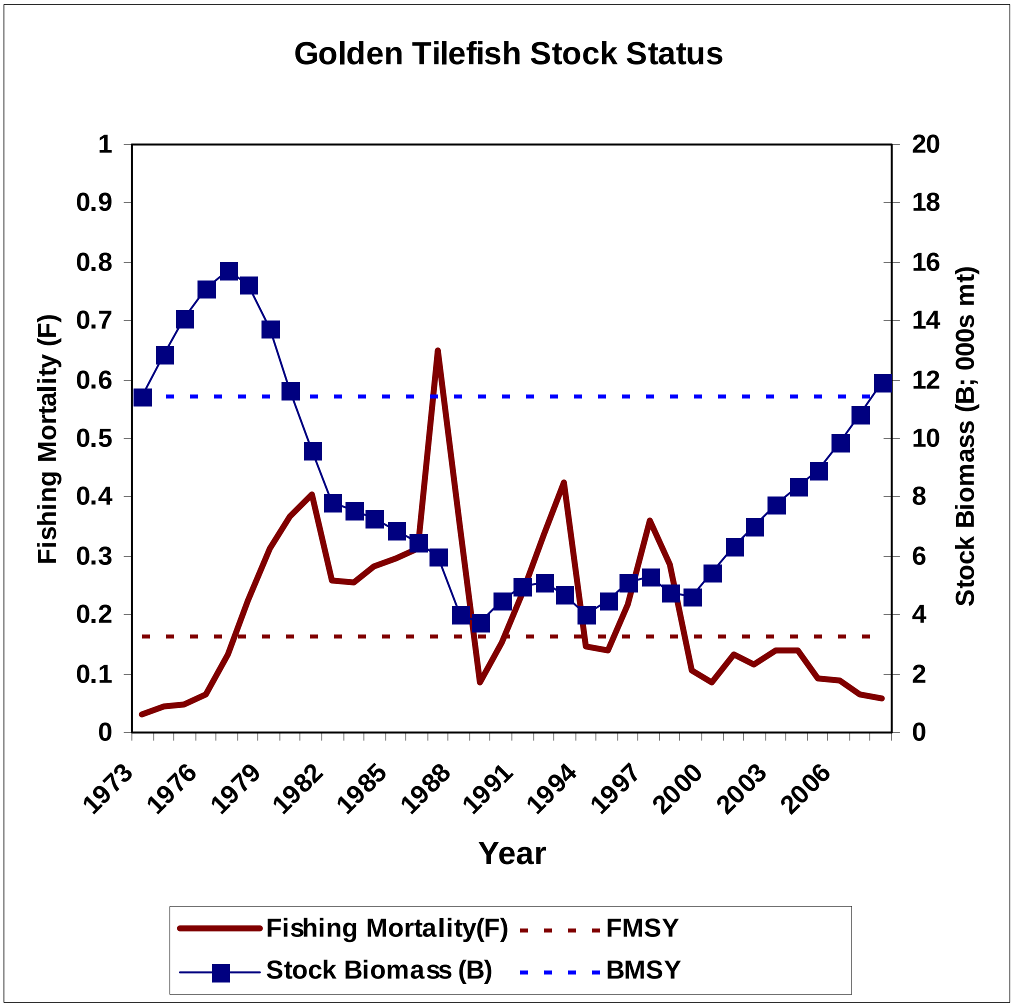

Figure 14. Stock status evaluation for Golden tilefish: 2009 BASE model run.

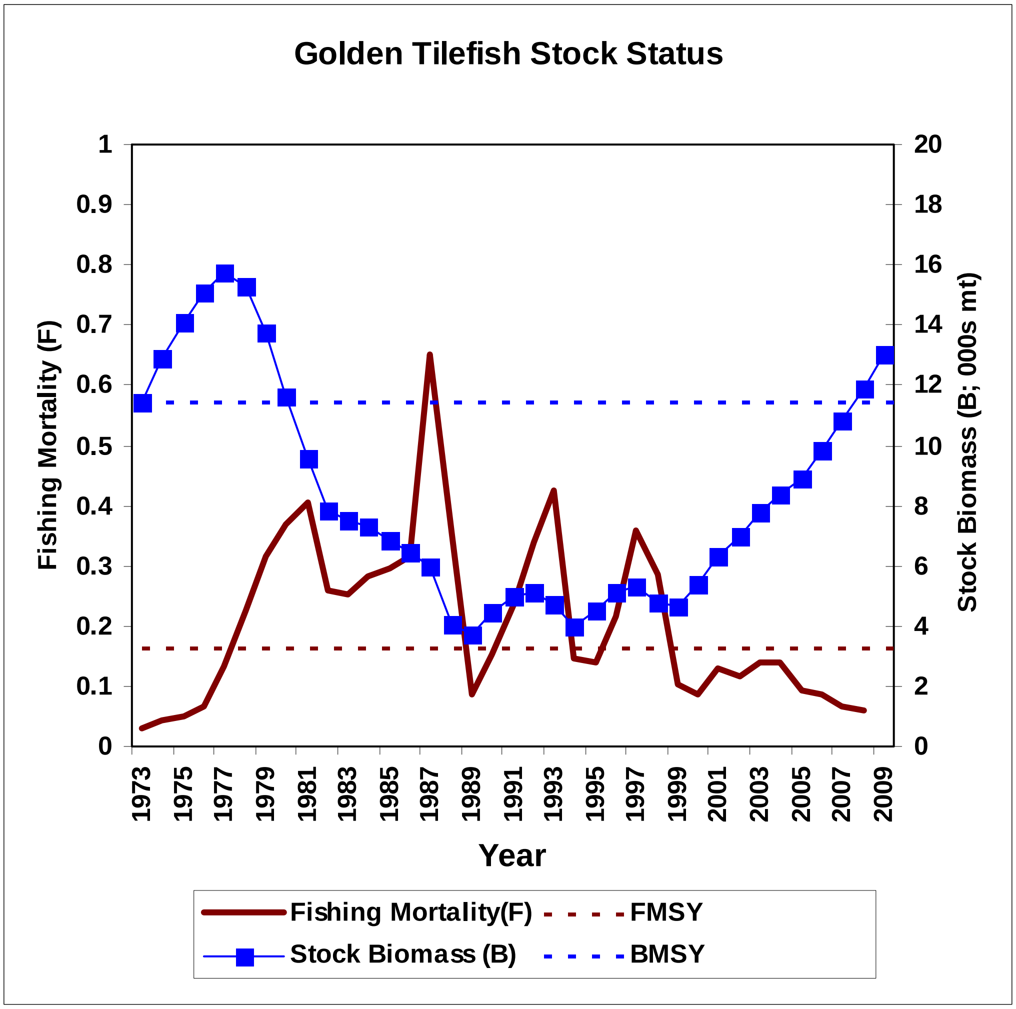

Figure 15. Estimates of tilefish stock biomass (1973-2009) and fishing mortality rate (1973-2008) derived from the ASPIC model. The two horizontal dashed lines represent the Biological Reference Points for the overfishing threshold (F_{MSY}, lower red line) and biomass target (B_{MSY}, upper blue line).

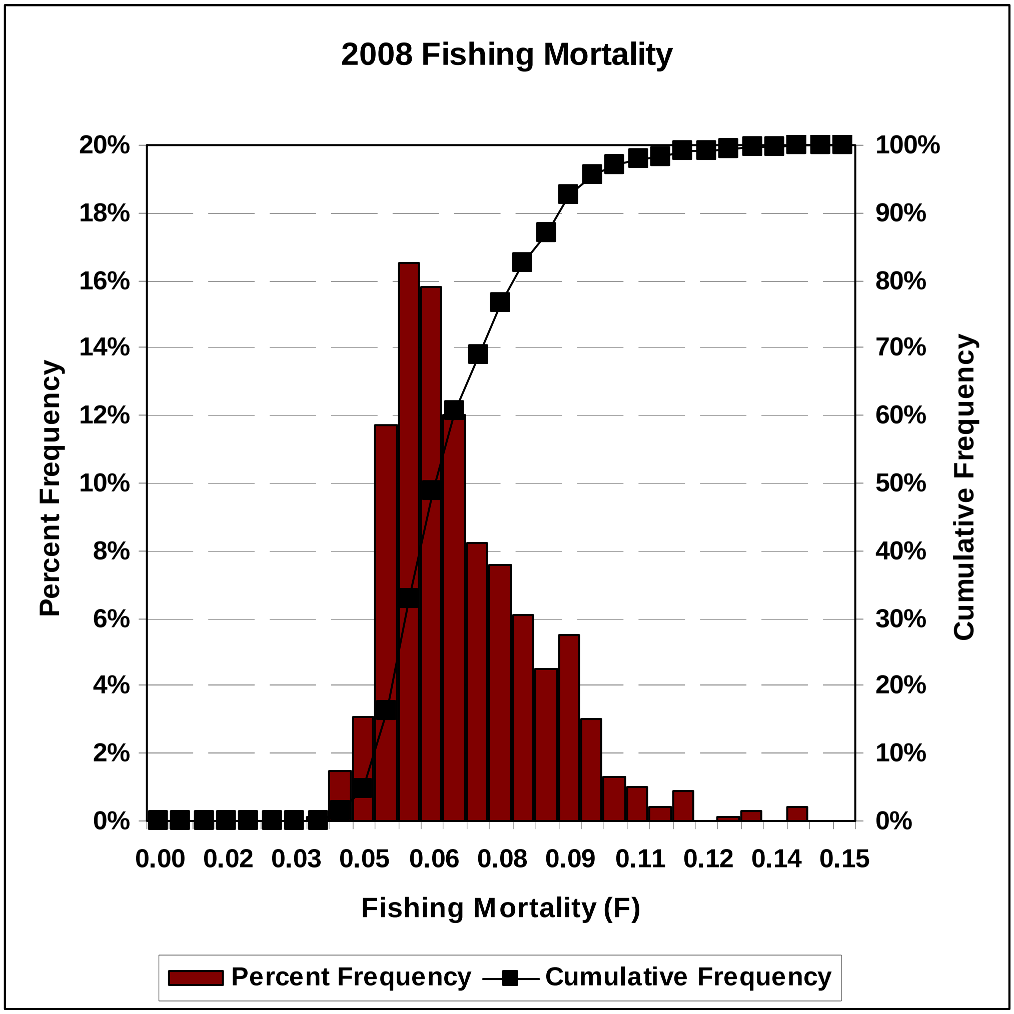

Figure 16. Bootstrap estimates (1000 iterations) of the precision of 2008 fishing mortality from the 2009 BASE run. Vertical bars display the range of the bootstrap estimates; the percent confidence intervals can be taken from the cumulative frequency. The 2008 point estimate of fishing mortality = 0.059.

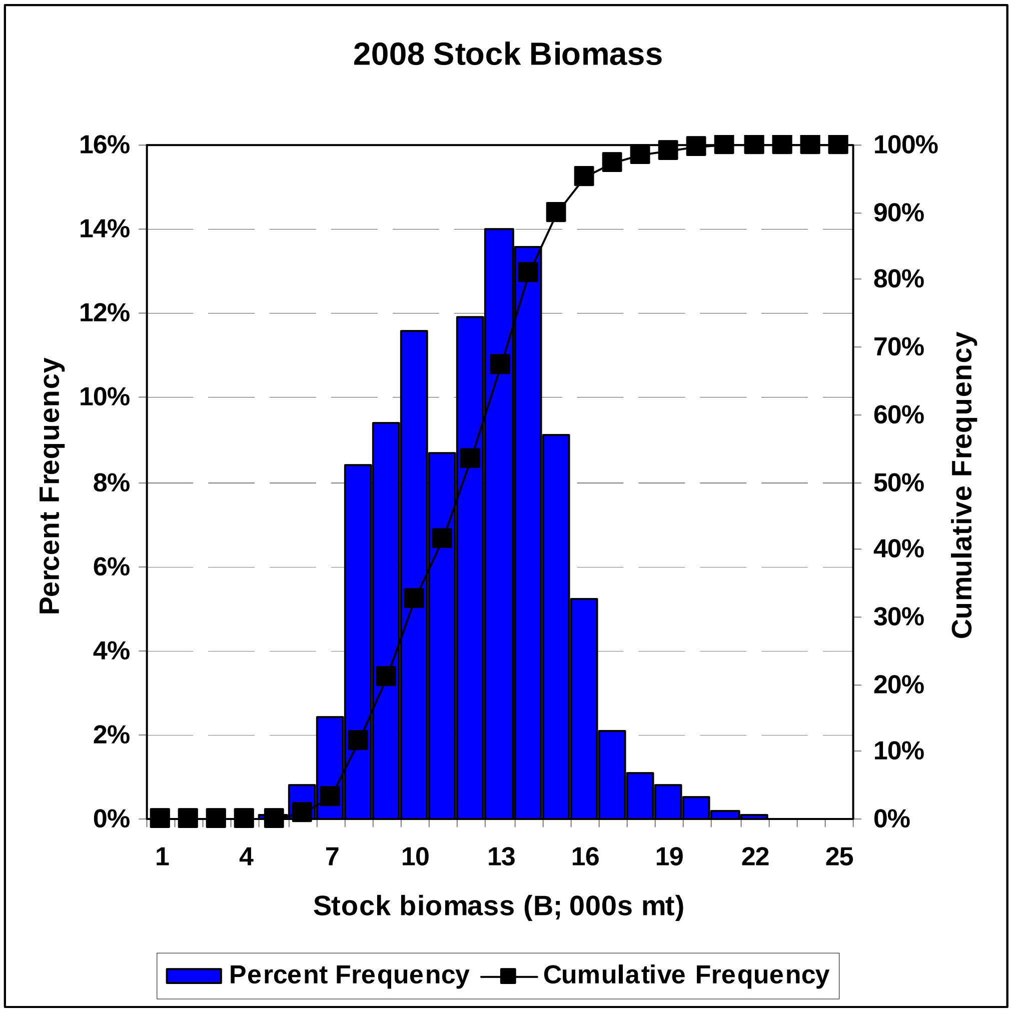

Figure 17. Bootstrap estimates (1000 iterations) of the precision of 2008 stock biomass from the 2009 BASE run. Vertical bars display the range of the bootstrap estimates; the percent confidence intervals can be taken from the cumulative frequency. The 2008 point estimate of stock biomass = 11.910 thousand mt.

Appendix 1. VTR GLM CPUE output

```
The SAS System
                   16:04 Thursday, January 5, 2012   1

The GLM Procedure

                                                                  Class Level Information

Class       Levels  Values

lndyear         17  1995 1996 1997 1998 1999 2001 2002 2003 2004 2005 2006
2007 2008 2009 2010 2011 9999

permit          32  XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX
XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX
XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX
XXXXXX XXXXXX

Number of Observations Read        1976
Number of Observations Used        1976

The SAS System
                   16:04 Thursday, January 5, 2012   2

The GLM Procedure

Dependent Variable: LNCPUE
```

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	47	599.302523	12.751118	59.32	<.0001
Error	1928	414.403480	0.214940		
Corrected Total	1975	1013.706002			

R-Square	Coeff Var	Root MSE	LNCPUE Mean
0.591200	6.937351	0.463616	6.682893

Source	DF	Type I SS	Mean Square	F Value	Pr > F
lndyear	16	427.4585651	26.7161603	124.30	<.0001
permit	31	171.8439577	5.5433535	25.79	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
lndyear	16	381.0006951	23.8125434	110.79	<.0001
permit	31	171.8439577	5.5433535	25.79	<.0001

Parameter		Estimate	Standard Error	t Value	Pr > |t|
Intercept		5.070094812 B	0.27513903	18.43	<.0001
lndyear	1995	-0.008702201 B	0.06556108	-0.13	0.8944
lndyear	1996	0.326559314 B	0.06154246	5.31	<.0001
lndyear	1997	0.849732701 B	0.06046921	14.05	<.0001
lndyear	1998	0.320383735 B	0.05882433	5.45	<.0001
lndyear	1999	-0.015266611 B	0.06068007	-0.25	0.8014
lndyear	2001	0.343794609 B	0.06246719	5.50	<.0001
lndyear	2002	0.545494601 B	0.06286482	8.68	<.0001

lndyear	2003	1.028876483	B	0.06517252	15.79	<.0001
lndyear	2004	1.360819900	B	0.06367858	21.37	<.0001
lndyear	2005	1.544471211	B	0.06768749	22.82	<.0001
lndyear	2006	1.225682092	B	0.06705189	18.28	<.0001
lndyear	2007	0.791866323	B	0.06643600	11.92	<.0001
lndyear	2008	0.380375477	B	0.06384426	5.96	<.0001
lndyear	2009	0.517120753	B	0.06493323	7.96	<.0001
lndyear	2010	1.172444570	B	0.06646148	17.64	<.0001
lndyear	2011	1.411486278	B	0.07074618	19.95	<.0001
lndyear	9999	0.000000000	B	.	.	.
permit	xxxxxx	1.003455567	B	0.53895182	1.86	0.0628
permit	xxxxxx	-1.019346098	B	0.34114288	-2.99	0.0028
permit	xxxxxx	-0.176118247	B	0.42798512	-0.41	0.6807
permit	xxxxxx	0.653428537	B	0.29417626	2.22	0.0265
permit	xxxxxx	0.646975277	B	0.29092999	2.22	0.0263
permit	xxxxxx	1.081147448	B	0.53852706	2.01	0.0448
permit	xxxxxx	0.009760362	B	0.30102550	0.03	0.9741
permit	xxxxxx	0.208125616	B	0.29745646	0.70	0.4842
permit	xxxxxx	0.672888159	B	0.30229067	2.23	0.0261
permit	xxxxxx	0.833182336	B	0.33244379	2.51	0.0123
permit	xxxxxx	0.472322378	B	0.28148080	1.68	0.0935
permit	xxxxxx	0.090525234	B	0.28183930	0.32	0.7481
permit	xxxxxx	0.949603814	B	0.27269078	3.48	0.0005
permit	xxxxxx	-0.019040808	B	0.29011911	-0.07	0.9477
permit	xxxxxx	0.723422129	B	0.28023223	2.58	0.0099
permit	xxxxxx	0.532958195	B	0.31510418	1.69	0.0909
permit	xxxxxx	0.314515761	B	0.32520045	0.97	0.3336
permit	xxxxxx	0.751136368	B	0.27919709	2.69	0.0072
permit	xxxxxx	1.963004154	B	0.53877637	3.64	0.0003
permit	xxxxxx	0.947589049	B	0.27274106	3.47	0.0005
permit	xxxxxx	-0.537227341	B	0.53881701	-1.00	0.3189
permit	xxxxxx	0.387062345	B	0.30378866	1.27	0.2028
permit	xxxxxx	-1.056097298	B	0.53911135	-1.96	0.0503
permit	xxxxxx	0.097721984	B	0.30112713	0.32	0.7456
permit	xxxxxx	0.990653148	B	0.27326957	3.63	0.0003
permit	xxxxxx	0.886845048	B	0.28228796	3.14	0.0017
permit	xxxxxx	1.202406719	B	0.27191592	4.42	<.0001
permit	xxxxxx	0.591555422	B	0.29702627	1.99	0.0466
permit	xxxxxx	-1.539896622	B	0.53932474	-2.86	0.0043
permit	xxxxxx	0.830542564	B	0.27988964	2.97	0.0030
permit	xxxxxx	1.115564763	B	0.27197006	4.10	<.0001
permit	xxxxxx	0.000000000	B	.	.	.