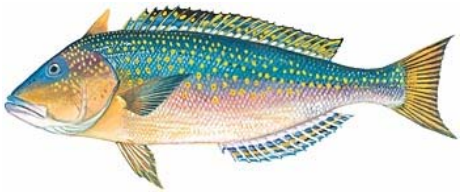
# Seafood Watch
Seafood Report

MONTEREY BAY AQUARIUM®

## Golden tilefish
*Lopholatilus chamaeleonticeps*



## Blueline tilefish
*Caulolatilus microps*



## Southeast Region

Final Report
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## About Seafood Watch® and the Seafood Reports

Monterey Bay Aquarium's Seafood Watch® program evaluates the ecological sustainability of wild-caught and farmed seafood commonly found in the United States marketplace. Seafood Watch® defines sustainable seafood as originating from sources, whether wild-caught or farmed, which can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems. Seafood Watch® makes its science-based recommendations available to the public in the form of regional pocket guides that can be downloaded from the Internet (seafoodwatch.org) or obtained from the Seafood Watch® program by emailing seafoodwatch@mbayaq.org. The program's goals are to raise awareness of important ocean conservation issues and empower seafood consumers and businesses to make choices for healthy oceans.

Each sustainability recommendation on the regional pocket guides is supported by a Seafood Report. Each report synthesizes and analyzes the most current ecological, fisheries and ecosystem science on a species, then evaluates this information against the program's conservation ethic to arrive at a recommendation of "Best Choices", "Good Alternatives" or "Avoid". The detailed evaluation methodology is available upon request. In producing the Seafood Reports, Seafood Watch® seeks out research published in academic, peer-reviewed journals whenever possible. Other sources of information include government technical publications, fishery management plans and supporting documents, and other scientific reviews of ecological sustainability. Seafood Watch® Fisheries Research Analysts also communicate regularly with ecologists, fisheries and aquaculture scientists, and members of industry and conservation organizations when evaluating fisheries and aquaculture practices. Capture fisheries and aquaculture practices are highly dynamic; as the scientific information on each species changes, Seafood Watch's sustainability recommendations and the underlying Seafood Reports will be updated to reflect these changes.

Parties interested in capture fisheries, aquaculture practices and the sustainability of ocean ecosystems are welcome to use Seafood Reports in any way they find useful. For more information about Seafood Watch® and Seafood Reports, please contact the Seafood Watch® program at Monterey Bay Aquarium by calling (831) 647-6873 or emailing seafoodwatch@mbayaq.org.

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## Executive Summary

Golden tilefish (*Lopholatilus chamaeleonticeps*) and blueline tilefish (*Caulolatilus microps*) are long-lived, slow growing deepwater species. These tilefishes are found on the outer continental shelf over rough habitat (blueline tilefish) or steep slopes with clay, mud, and sand substrates (golden tilefish). Both species of tilefish are habitat limited; this combined with their life history characteristics makes them vulnerable to fishing pressure. The history of tilefish exploitation differs in the Mid-Atlantic and the Southeast regions. While a major longline fishery began in Barnegat, New Jersey during the 1970s and subsequently shifted to Montauk, New York in the early 1980s, the fishery in the Southeast did not expand until the 1980s as an alternative for shrimp fishers. In 2002, tilefishes were landed primarily in the Mid-Atlantic/southern New England region (51%), Gulf of Mexico (22%), and South Atlantic (20%); blueline tilefish contributed 39% of the total tilefishes landings in the South Atlantic but only 12% in the Gulf of Mexico. In all three regions, bottom longlines are the primary gear used in the directed fishery. Bottom longlines have minor effects on marine habitat; however bycatch in these tilefish fisheries is a moderate conservation concern. The status of golden tilefish in the Mid-Atlantic is a moderate conservation concern, as this stock is recovering from an overfished condition. In the South Atlantic, golden tilefish are not overfished, but overfishing is occurring and stocks are thus considered a high conservation concern. Blueline tilefish stocks are considered poor due to skewed age and size distributions, decreasing catch per unit effort, and high uncertainty. Golden tilefish are managed by three federal fishery management plans: the Tilefish Fishery Management Plan in the Mid-Atlantic; the Snapper Grouper Fishery Management Plan in the South Atlantic; and the Reef Fish Fishery Management Plan in the Gulf of Mexico. Blueline tilefish are also managed under the South Atlantic and Gulf of Mexico plans. There was no resource management in the Mid-Atlantic/southern New England region prior to 2001, and existing measures in the South Atlantic have not prevented declines in that region. There have been no stock assessments conducted for golden tilefish in the Gulf of Mexico or for blueline tilefish in any region. The critical and poor stock status rankings result in an overall seafood recommendation of "Good Alternative" for golden tilefish from the Mid-Atlantic and "Avoid" for golden and blueline tilefish in the South Atlantic and Gulf of Mexico regions.

**This report was updated on October 22, 2005. See Appendix for a summary of the changes made at this time.**

## Table of Sustainability Ranks

| | Conservation Concern | | | |
|---|---|---|---|---|
| **Sustainability Criteria** | **Low** | **Moderate** | **High** | **Critical** |
| Inherent Vulnerability | | | √ | |
| Status of Stocks | | √ (Golden in the MA) | √ (Blueline, golden in the SA, GOM) | |
| Nature of Bycatch | | √ | | |
| Habitat Effects | √ | | | |
| Management Effectiveness | | √ | | |

SA=South Atlantic, GOM=Gulf of Mexico, MA=Mid-Atlantic

**OVERALL SEAFOOD RECOMMENDATION:**

**Golden tilefish (Mid-Atlantic):**

Best Choice ▮ **Good Alternative** ▮ Avoid ▮

**Golden and blueline tilefish (South Atlantic and Gulf of Mexico):**

Best Choice ▮ Good Alternative ▮ **Avoid** ▮

# Introduction

Golden tilefish (*Lopholatilus chamaeleonticeps*) represent the highest proportion of U.S. landings of all tilefish species (Figure 1) (NMFS 2004). Golden tilefish are found in the western Atlantic from Nova Scotia to southern Florida and the Gulf of Mexico, and also throughout the northern coast of South America (Dooley 1978). Tilefishes are deepwater species that occupy a narrow band of water 9°-14°C along the outer continental shelf. Blueline tilefish (*Caulolatilus microps*), also known as grey tilefish, are another commercially important fish species in the South Atlantic and Gulf of Mexico. Blueline tilefish are found from Virginia to Mexico, and are frequently found in the same habitat as deepwater grouper and snapper (50 – 200 m in depth). From 1985 – 2002, the majority of blueline tilefish landings were from the Carolinas, although blueline tilefish landings were not recorded in Florida until 1992 (NMFS 2004). In 2002, tilefishes were landed in the Mid-Atlantic (52%), Gulf of Mexico (22%), South Atlantic (20%), and New England (6%) (NMFS 2004). Since the 1970s, the Mid-Atlantic fishery has generally landed an overwhelming majority of tilefish in the U.S. (Figure 2). There are also a small number of goldface tilefish (*Caulolatilus chrysops*), and sand tilefish (*Malacanthus plumieri*) landings in the U.S. A commercial fishery has existed for golden tilefish in the Middle Atlantic Bight since 1879, although the fishery declined substantially after mass mortalities in 1882 due to a cooling event (Marsh et al. 1999). Landings were not recorded again until 1915. Both landings and value of the tilefish fisheries exhibited a dramatic increase in the 1970s with the onset of a directed longline fishery for golden tilefish in the Mid-Atlantic/southern New England region (Figure 3) (Grimes et al. 1980). From 1974 – 1978, fishing effort increased while catch per unit effort (CPUE) decreased (Grimes et al. 1980). A similar pattern of decreasing CPUE and increased exploitation of smaller fish was seen from 1981 – 1982 in South Carolina and Georgia waters (Low et al. 1983).

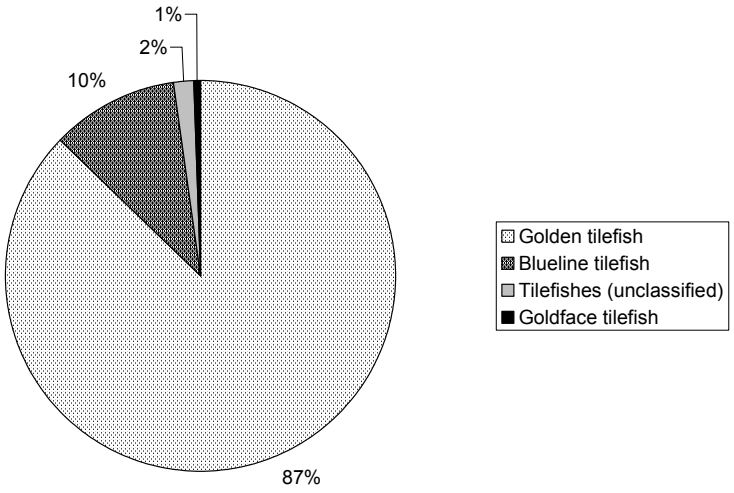



**Figure 1.** All species of U.S. tilefish landings, 2002 (NMFS 2004).

Bottom longlines are the primary gear used in the directed fishery for tilefishes. There are two golden tilefish stocks, one in the Middle Atlantic Bight, and one in the South Atlantic/Gulf of Mexico region (Katz et al. 1983). The Mid-Atlantic Fishery Management Council (MAFMC) manages all golden tilefish in the Atlantic north of the Virginia-North Carolina border under the

Tilefish Fishery Management Plan (FMP). The South Atlantic Fishery Management Council (SAFMC) manages the golden tilefish stock from South Carolina to Florida, as well as blueline tilefish stocks, under the Snapper Grouper FMP. Golden and blueline tilefish in the Gulf of Mexico are under the jurisdiction of the Gulf of Mexico Fishery Management Council (GMFMC), and are included in the Reef Fish FMP.

Estimated recreational fishery catches decreased from 57 mt in 1975 to 3 mt in 1985 (Turner 1986). The most recent Marine Recreational Statistics Survey data suggest that there is no longer a substantial directed recreational fishery for golden tilefish (MAFMC 2000).

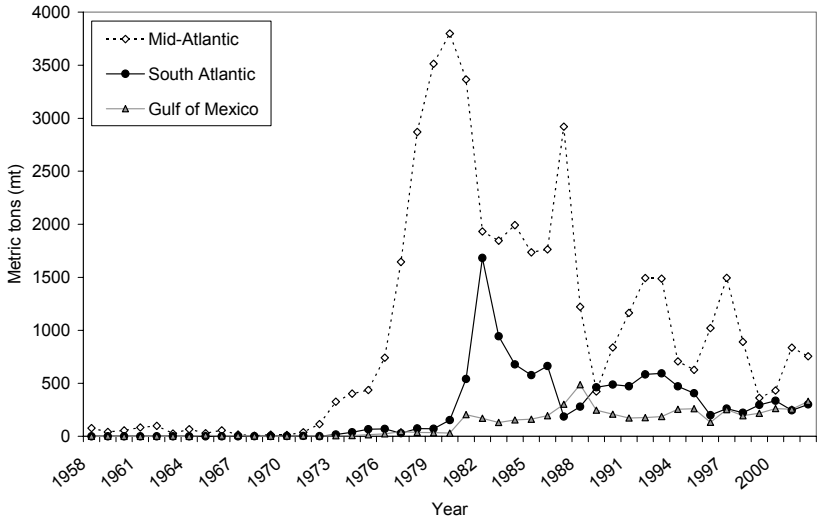



**Figure 2.** Landings of all tilefish species in the U.S., by region, 1958 – 2002 (NMFS 2004).

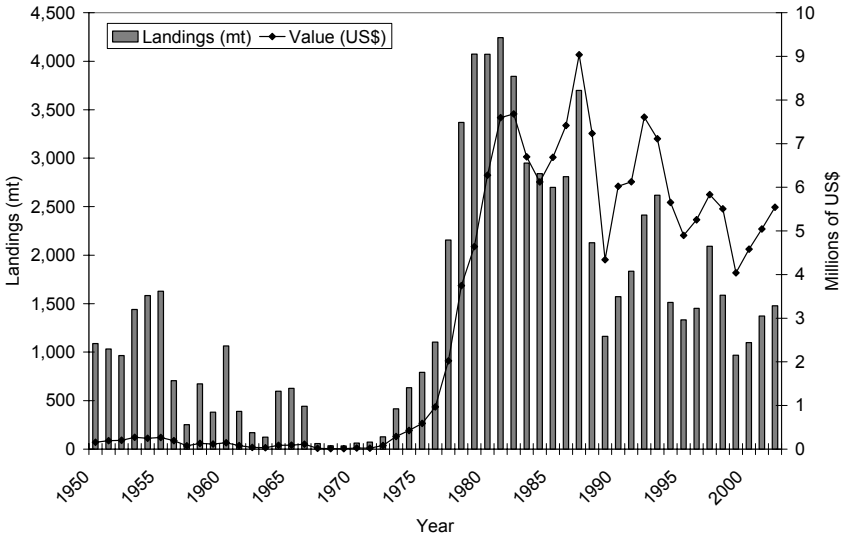



**Figure 3.** The increase and subsequent decline in tilefish landings and value as the result of a directed longline fishery in the 1970s (NMFS 2004).

**Scope of the analysis and the ensuing recommendation:**
This analysis focuses primarily on golden tilefish in the Mid-Atlantic, South Atlantic, and Gulf of Mexico, but includes minor reference to blueline tilefish in the South Atlantic and Gulf of Mexico.

## Availability of Science

There are adequate life history data available for golden tilefish from the Mid-Atlantic and South Atlantic, but very little data pertaining to the Gulf of Mexico golden tilefish stock. Recent, thorough investigations of golden tilefish life history include age data, sex ratio data, trends in mean size and age, reproductive activity over time, and reproductive biology such as fecundity (Palmer et al. 1998; Harris et al. 2001). To date, there are very limited data on blueline tilefish in either the South Atlantic or Gulf of Mexico; a stock assessment has not been conducted and the status of the fishery is unknown. A complete analysis of blueline tilefish will likely be published in 2004 (Harris et al. in press). Management information such as FMPs and FMP amendments are available as grey literature.

## Market Availability

**Common and market names:**
Common names for golden tilefish in the Southeast include colorful tilefish, rainbow tilefish (MAFMC 2000), and golden snapper (SAFMC 1983). Blueline tilefish are commonly known as grey tilefish or paleta (SAFMC 1983).

**Seasonal availability:**
Golden and blueline tilefish are available year-round.

**Product forms:**
Golden and blueline tilefish are available fresh or frozen.

**Import and export sources and statistics:**
In 1975, foreign tilefish landings were estimated at 5 mt (Turner 1986). By the mid 1980s, foreign tilefish landings had declined to zero (MAFMC 2000). There are neither import data nor export data included in the National Marine Fisheries Service (NMFS) foreign trade database for these species.

# Analysis of Seafood Watch® Criteria

## Criterion 1: Inherent Vulnerability to Fishing Pressure

### Growth & Longevity

Tilefishes are slow growing, long-lived species (Table 1). They are sedentary reef fishes, and may be particularly vulnerable to overfishing (Harris and Grossman 1985; Grimes and Turner 1999; Coleman et al. 2000); the minimum population doubling time for both golden and blueline tilefish is 4.5 – 14 years (Froese and Pauly 2004).

#### *Golden tilefish*

Aging research in the Mid-Atlantic suggests that golden tilefish females live longer than males, although males exhibit higher growth rates and reach larger sizes (Turner 1986). Females are estimated to reach 35 years of age and 89 cm fork length (FL), while males are estimated to reach 26 years of age and 96 cm FL (Grimes and Turner 1999). In the South Atlantic, there is no evidence suggesting differences in the longevity of male and female golden tilefish; the oldest fish sampled were a 36 year-old female and a 32 year-old male (Palmer et al. 1998). Both male and female golden tilefish in the Mid-Atlantic are estimated to reach 50% sexual maturity at 48-66 cm FL and approximately 5 – 7 years of age (Grimes et al. 1988). In the South Atlantic, very few immature golden tilefish have been sampled, and size at first, 50%, and 100% maturity have yet to be established (Palmer et al. 1998). Golden tilefish exhibit an unequal sex ratio at size, which is likely due to differential growth between the sexes (Grimes et al. 1988). From 1978 – 1982, male golden tilefish exhibited a decrease in size/age of maturity due to population reduction as a result of fishing pressure (Grimes et al. 1988). Golden and blueline tilefish exhibit sexual dimorphism; the males grow to larger sizes than females. The largest golden tilefish sampled in the South Atlantic was a 112 cm total length (TL) male, caught in 1997, and the largest female golden tilefish was 107 cm TL in 1980 (Palmer et al. 1998).

#### *Blueline tilefish*

Although the mean size of male blueline tilefish (58.3 cm TL) is substantially greater than the mean size of female blueline tilefish (53.7 cm TL), the mean age of males (11.2 yr) is less than the mean age of females (15.2 yr) (Harris et al. in press). The degree of sexual dimorphism declined from 1982 – 1986 to 1996 – 1999, due to the loss of large males in the population, likely attributable to increased fishing effort in the early 1980s (Harris et al. in press). The maximum reported size for blueline tilefish is 90 cm TL, and the maximum reported age is approximately 40 years (SAFMC 2004).

### Fecundity & Reproductive Strategy

#### *Golden tilefish*

Golden tilefish females are fractional spawners, spawning several times from March through November, with a peak from May to September in the Mid-Atlantic (Freeman and Turner 1977; Grimes et al. 1988), and a peak from April to June in the South Atlantic (Palmer et al. 1998). Spawning frequency has been estimated at once every four days, or 34 times per year (Palmer et al. 1998). While spawning behavior is unknown, male and female pairs have been observed sharing a burrow (Grimes et al. 1986). Fecundity for Mid-Atlantic golden tilefish 53 – 91 cm in length ranges from 195,000 to 10 million eggs, with a mean of approximately 2.3 million

(Grimes et al. 1988). Although tilefishes are highly fecund, Harris et al. (2001) observed in the South Atlantic that some younger, smaller females that were sexually mature did not spawn, and the size and age of the reproductively active females has declined over time. In the Mid-Atlantic, research has shown that sexually mature males that were not large enough to hold a territory to attract females did not spawn (Grimes et al. 1988). Although very little is known about the reproductive strategy of golden tilefish in the South Atlantic Bight, there is no evidence to suggest that it is different than in the Middle Atlantic Bight.

***Blueline tilefish***

Blueline tilefish also spawn several times per season from February to October, with a peak in May (Ross and Merriner 1983; Harris et al. in press). Fecundity for blueline tilefish off of the Carolinas has been estimated at 0.2 million eggs for fish 41 cm TL and 4.1 million eggs for fish 74 cm TL (Ross and Merriner 1983). More recent studies in the South Atlantic have found that annual fecundity is indeterminate (i.e., counts of eggs do not indicate annual fecundity), but estimates of potential annual fecundity ranged from 2.2 – 13.0 million eggs for fish between 36.7 – 62.9 cm TL (Harris et al. in press). Harris et al. (in press) also suggest that the reproductive output of the current population is much lower than in the 1970s and 1980s, based on the loss of larger and older blueline tilefish from the population and the relationship between female size and egg production.

**Habitat Utilization**

Golden tilefish have been shown to aggregate in their preferred habitat (Freeman and Turner 1977); temperature and sediment type are two factors limiting golden tilefish distribution (Able et al. 1993). Golden tilefish are found along the outer continental shelf, in depths of 75 – 460 m (Dooley 1978), but are most commonly found from depths of 100 – 240 m in association with the 15°C isotherm (Freeman and Turner 1977; Dooley 1978). Blueline tilefish are found in depths of 48 – 236 m (Dooley 1978) and temperatures ranging from 15° to 23°C (Parker and Mays 1998). Along with several grouper species, they are a dominant species found on the continental shelf at depths greater than 100 m (Chester et al. 1984). Fishes found on the continental shelf and upper slope commonly use microhabitat features such as biogenic depressions and burrows (Auster et al. 1995). Golden tilefish burrow in clay substrate (Grimes et al. 1986; Able et al. 1993). Tilefishes are shelter seeking, and may be habitat limited (Able et al. 1982; Grossman et al. 1985; Grimes et al. 1986; Harris et al. 2001); vertical burrows are the predominant type of shelter used (Grimes et al. 1986; Able et al. 1993). Golden tilefish burrows appear to be centers of species abundance, and may have an impact on local continental shelf communities (Able et al. 1982). Burrows constructed by golden and blueline tilefish may result in changes to substrate composition and stability (Able et al. 1987). Through their burrowing activities, tilefishes are ecosystem engineers and their removal can have an impact on local biodiversity and water-sediment processes (Coleman and Williams 2002).

**Table 1**. Life history characteristics of golden and blueline tilefish.

| Species | Intrinsic Rate of Increase (r) | Growth Rate/Max Size | Age at Maturity | Maximum Age | Fecundity | Species Range | Sources |
|---|---|---|---|---|---|---|---|
| Golden tilefish | Unknown | vBgf[1]: $L_\infty$ = 92.3 cm, k = 0.17; 10 cm/yr until age 4 when growth slows | 5-7 yrs | 36 yrs (females) and 32 yrs (males) | Mean of 2.3 mil eggs | Nova Scotia to South America (excluding the Caribbean) | Turner 1986; Grimes et al. 1988; Palmer et al. 1998; Grimes and Turner 1999 |
| Blueline tilefish | Unknown | vBgf: $L_\infty$ = 81.4 cm, k = 0.14 | 5-7 yrs | 43 yrs | 0.2 mil eggs (41 cm TL) – 4.1 mil eggs (74 cm TL) | Virginia to eastern Gulf of Mexico | Ross and Merriner 1983; SAFMC 1983; SAFMC 2004; Harris et al. in press |

## INHERENT VULNERABILITY RANK

Golden and blueline tilefish are long-lived, slow growing species, and do not reach 50% sexual maturity until age 5 – 7. Female golden tilefish have a maximum age of 36 years, while blueline tilefish have a maximum age of 43 years. In addition, golden and blueline tilefish inhabit a limited species range, and are found in a relatively narrow band of warm water along the continental slope. The burrowing activity of these fish requires clay substrate, and is an additional factor in limiting their distribution. This narrow geographic range may facilitate ease of capture in commercial fisheries. Golden tilefish are also vulnerable to physical environmental change, as evidenced by the mass tilefish mortality in 1882. This suite of factors makes golden and blueline tilefish inherently vulnerable to fishing pressure.

Resilient Neutral **Vulnerable**

[1] vBgf = a commonly used growth function in fisheries science to determine length as a function of age. $L_\infty$ is maximum length, and k is body growth coefficient. The maximum length and body growth coefficient shown here are from the Mid-Atlantic. In the South Atlantic from 1980-87, $L_\infty$ = 99.1 cm, k = 0.14; from 1996-99, $L_\infty$ = 83.9 cm, k = 0.15 (Palmer et al. 1998).

## Criterion 2: Status of Wild Stocks

### Golden tilefish – Mid-Atlantic Region

Stock status varies with location (Table 2). Golden tilefish in the Mid-Atlantic is not overfished and overfishing is not occurring (NMFS 2005). A stock is overfished when the total stock biomass falls below a minimum biomass threshold of ½ $B_{MSY}$ (4200 mt) (NMFS 2003a). $B_{MSY}$ is the biomass capable of supporting maximum sustainable yield. Total biomass in 2004 is 72% of $B_{MSY}$, although estimates in recent years are highly variable (NEFSC 2005). In 2004 fishing mortality was 87% of $F_{MSY}$ (NEFSC 2005). Since 1999, F has been below $F_{MSY}$, and biomass has been increasing (Figure 4) (NEFSC 2005).

Although the long term abundance trend exhibits a declining trend, the short-term trend is increasing (NEFSC 2005). CPUE trends also indicate an increasing trend (Figure 5) (NEFSC 2005). The current size distribution of the landings is highly skewed towards smaller fish in comparison to existing data from 1898 (Figures 6 and 7) (Nitschke et al. 1998). The proportion of landed fish greater than 70 cm length declined from 71% in 1974 to 16% – 21% in 1980, most likely due to increased fishing effort (Turner et al. 1983). Landings from 1996 – 1997 indicate that only 3% of the golden tilefish landed were greater than 70 cm length (Nitschke et al. 1998).

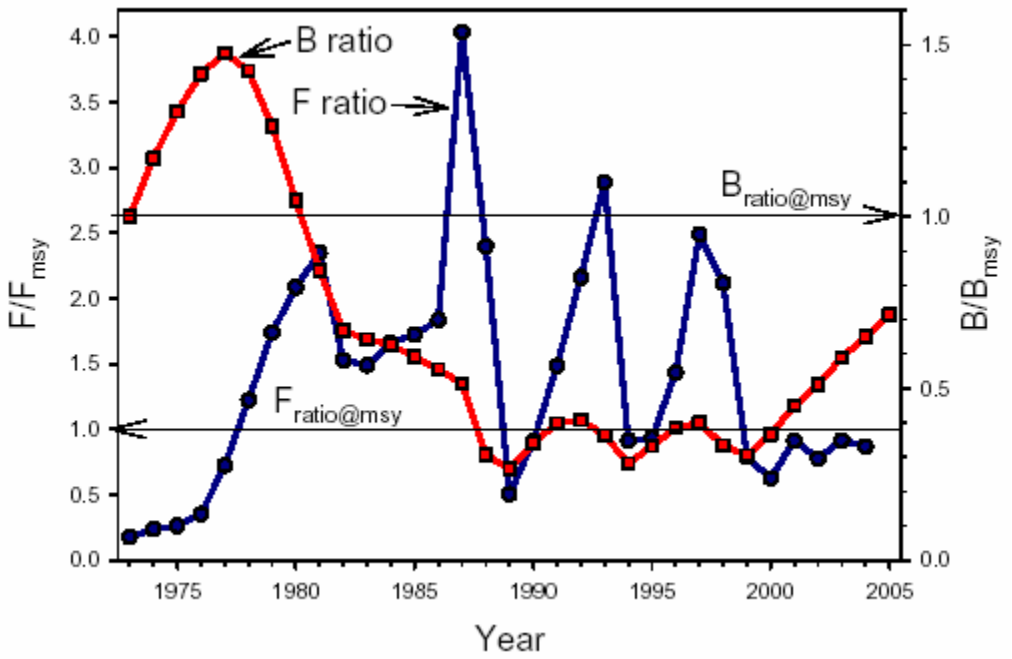



**Figure 4.** Trends in $F/F_{MSY}$ and $B/B_{MSY}$ for golden tilefish in the Mid-Atlantic (Figure from NEFSC 2005).

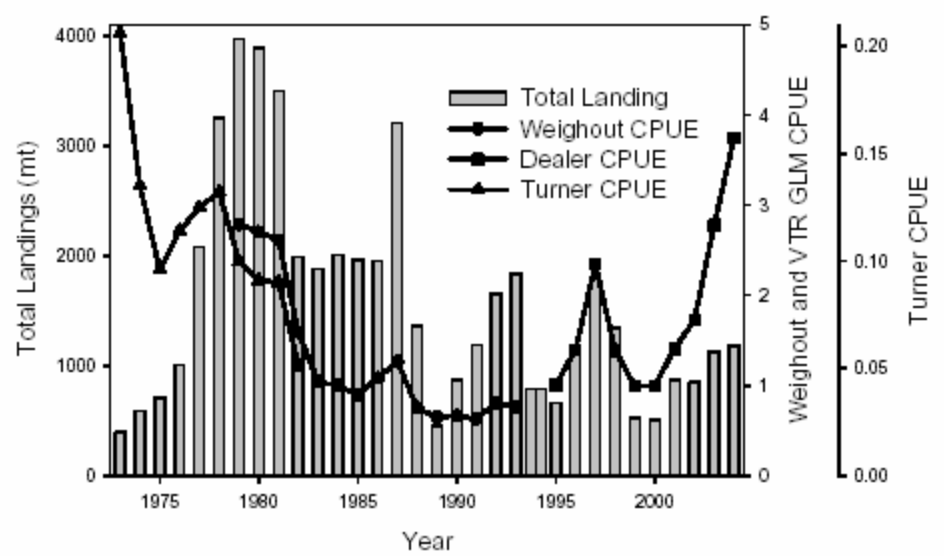



**Figure 5.** Increase in CPUE trend observed in the past five years (Figure from NEFSC 2005).

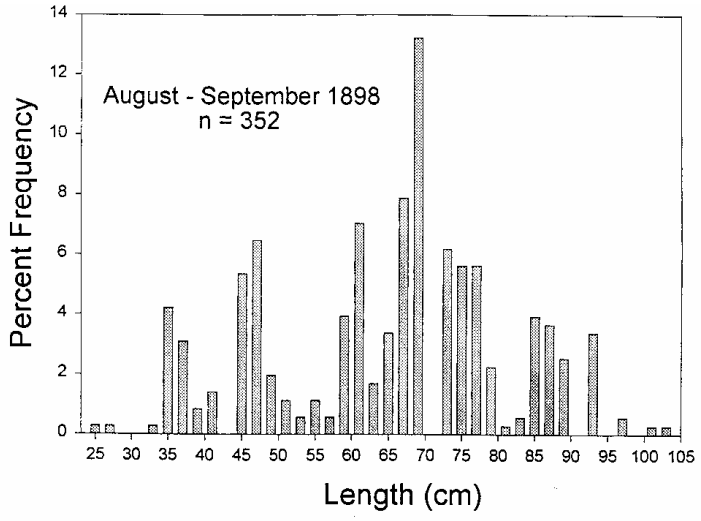



**Figure 6.** Golden tilefish size frequency from 1898 longline survey (Figure from Nitschke et al. 1998).

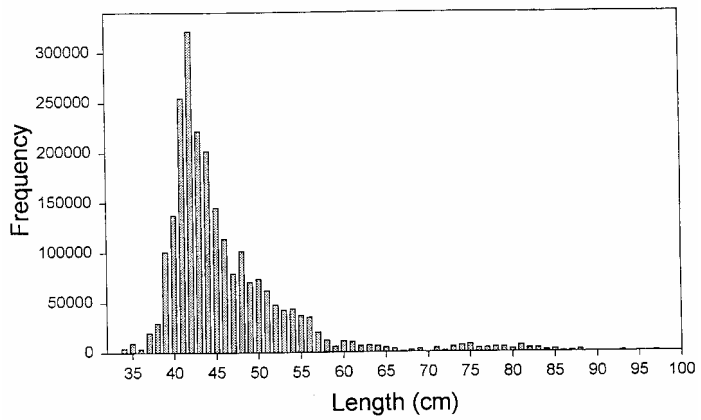



**Figure 7.** Golden tilefish size frequency from 1996 – 1997 longline survey (Figure from Nitschke et al. 1998).

**Golden tilefish – South Atlantic Region**

Golden tilefish in the South Atlantic are not overfished, but overfishing is occurring (NMFS 2005). The overfished definition for golden tilefish in the South Atlantic is a stock size less than MSST, and overfishing is defined as an F that exceeds $F_{MSY}$ (NMFS 2005). A statistical catch-at-age model was used to assess golden tilefish in the South Atlantic in 2004. The median value of $SSB_{2002}/SSB_{MSY}$ is 0.95, and the median value of $F_{2002}/F_{MSY}$ is 1.53 (SEDAR 2004). Fishing mortality on this stock has been variable (Figure 8), while trends in spawning stock biomass have exhibited a long term declining trend and short term stable trend (Figure 9) (SEDAR 2004). South Atlantic CPUE estimates based on commercial data indicate that 1987 stock biomass was 22% –45% (200 – 600 mt) of virgin biomass and 51% – 105% of the recommended level (400 – 800 mt) (Hightower and Grossman 1988). Fishery independent monitoring of golden tilefish in the South Atlantic Bight was conducted from 1984 – 1986, and reinstated in 1996; no trends have been evident in the relatively short data series available (Harris and Machowski 2003). From 1983 to 1986, fishery independent CPUE decreased from 6.2 fish/100 hooks to 2.4 fish/100 hooks (Barans and Stender 1993). In the South Atlantic, size frequency data indicate a shift towards smaller fish from the 1983 – 1984 period compared to the 1985 – 1987 period (Barans and Stender 1993), and from the 1980 – 1986 period compared to the 1996 – 1998 period (Harris et al. 2001). In addition, there was a significant decrease in the mean length of both sexes between these two time periods (Harris et al. 2001). The age at onset of sexual dimorphism decreased from 10 years during 1980 – 1987 to 7 years during 1996 – 1998 (Harris et al. 2001). From the mid-1980s to 1999, both landings and commercial weights exhibited a decreasing trend (Figure 10) (Potts and Brennan 2001). The commercial mean weight of golden tilefish in the South Atlantic Bight decreased from 11.5 kg in 1984 to approximately 5.0 kg in 1995 (Parker and Mays 1998). The change in sex ratio observed from 1996 to 1998 after high fishing mortality rates appears to be due to the commercial fishery removal of the larger, predominately male fish (Harris et al. in press). According to Harris et al. (2001), "Tilefish off the southeastern coast of the United States show many symptoms of severe overfishing, including reduced landings, decreased size at age, and decreasing size and age of reproductively active fish". There is a moderate level of uncertainty associated with the status of the stock in the South Atlantic.

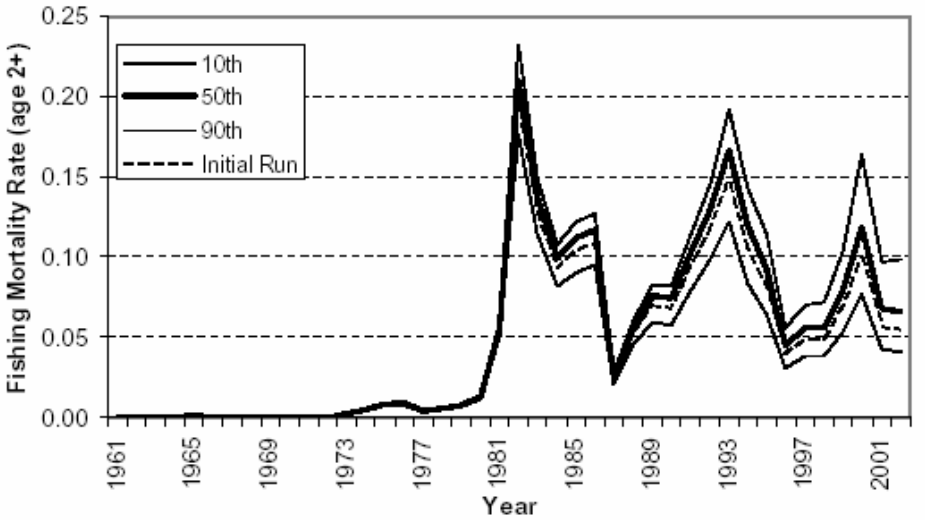



**Figure 8.** Fishing mortality rate on golden tilefish (age 2+) in the South Atlantic (Figure from SEDAR 2004).

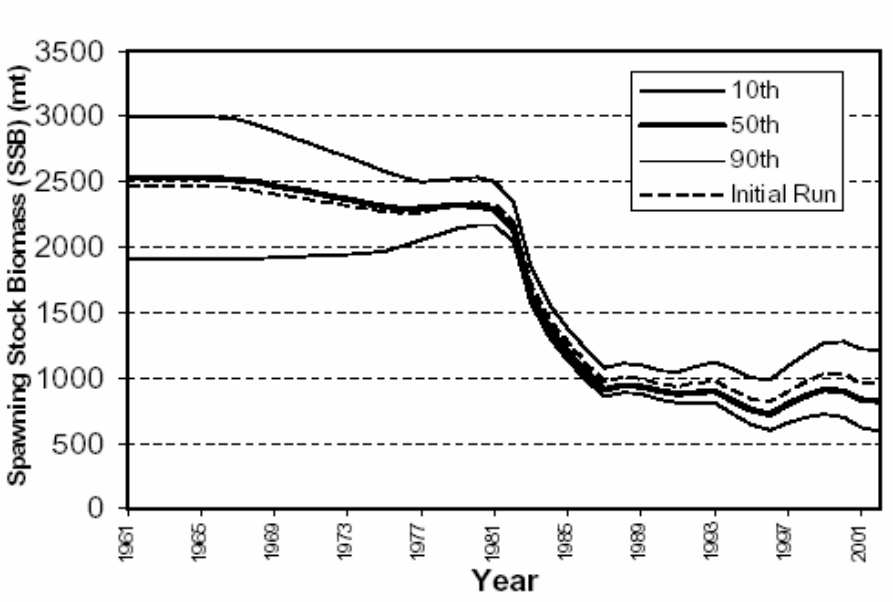



**Figure 9.** Trend in spawning stock biomass of golden tilefish in the South Atlantic (Figure from SEDAR 2004).

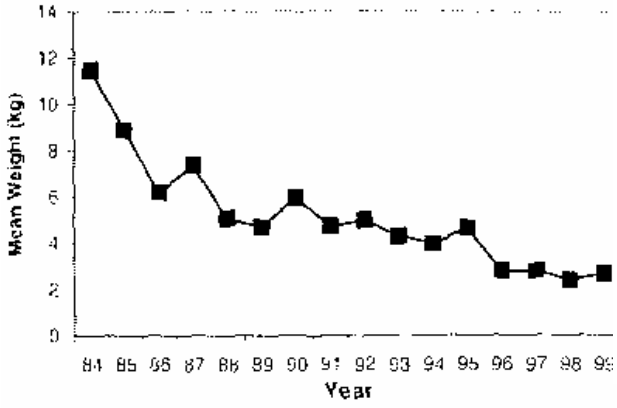



**Figure 10.** Decrease in commercial mean weights of golden tilefish landed in the South Atlantic, 1984 – 1999 (Figure from Potts and Brennan 2001).

**Golden tilefish – Gulf of Mexico**

There has been no stock assessment conducted for golden tilefish in the Gulf of Mexico, and fishery dependent CPUE data are not collected. A commercial fishery for tilefishes developed as an alternative to shrimp trawling; prior to 1981 there was not a substantial fishery for tilefishes in the Gulf of Mexico (Low et al. 1983). Matlock et al. (1991) found that from 62% to 100% of tilefish were taken out of an area by an effort of approximately 6000 hook-hours (1.5 – 2 day effort), and recommended that additional research be conducted to routinely monitor fish populations in the Gulf to determine the amount of fishing they can support. The status of the golden tilefish fishery in the Gulf of Mexico is unknown, and there are no data related to the occurrence of overfishing and the current population structure. Golden tilefish inhabit a narrow geographic range in the Gulf of Mexico, along the outer edge of the continental shelf (Matlock et

al. 1991), making them vulnerable to fishing pressure (Harris and Grossman 1985). There is a high level of uncertainty in the stock status of golden tilefish in the Gulf of Mexico.

**Blueline tilefish**

There has been no stock assessment conducted for blueline tilefish in either the South Atlantic or Gulf of Mexico, and the status of this species is unknown. The trend in the catch of blueline tilefish is similar to that of golden tilefish, with a sharp increase in the early to mid-1980s, followed by a dramatic decline; total catch of blueline tilefish in 1986 was approximately 200 times lower than in 1983 (Parker and Mays 1998). Fishery independent data from the South Atlantic indicate an increasing trend from 1983 – 1986 (Figure 11), and a decreasing trend from 1996 – 2002 (Figure 12) (Harris and Machowski 2003). The commercial mean weight of blueline tilefish decreased from approximately 4.0 kg in the mid-1980s to 2.4 kg in 1995 (Parker and Mays 1998). Fishery independent monitoring conducted from 1982 – 1987 and 1996 – 1999 in the South Atlantic indicated significant declines in the mean lengths of male and female blueline tilefish between these two time periods (Harris et al. in press). The mean lengths for blueline tilefish decreased from 59.1 cm TL during 1982 – 1987 to 52.4 cm TL during 1996 – 1999 (Harris et al. in press). The mean ages for both male and female blueline tilefish also showed significant declines, declining from 16.9 yr to 10 yr from 1982 – 1986 to 1996 – 1999 (Harris et al. in press). Elevated levels of fishing mortality from 1980 – 1983 may explain the predominance of female blueline tilefish in the 1980s; the overall sex ratio for blueline tilefish shifted from 1 male:2.12 females (1982 – 1987) to 1 male:0.85 female (1996 – 1999) (Harris et al. in press). However, blueline tilefish may be more resilient to high levels of fishing mortality than golden tilefish, as the blueline tilefish fishery does not harvest immature fish, and a high number of egg batches are released during the spawning season (Harris et al. in press). In the summer of 2004, the SAFMC will receive stock assessments for the major deepwater species; these data will be used to establish maximum sustainable yield (MSY) and optimum yield (OY), and determine the status of the fisheries (SAFMC 2004).

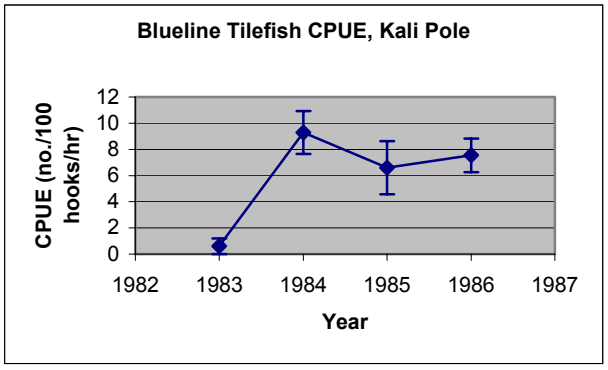



**Figure 11.** Blueline tilefish CPUE data, 1983 – 1986 from kali pole data (Figure from Harris & Machowski 2003).

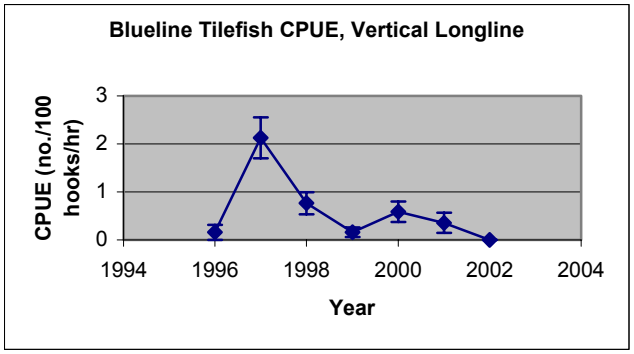



**Figure 12.** Blueline tilefish CPUE data, 1996 – 2002 from vertical longline data (Figure from Harris & Machowski 2003).

**Table 2**. Stock status of golden and blueline tilefish.

| Species (Region) | Classification Status | $B/B_{MSY}$ | Occurrence of Overfishing | $F/F_{MSY}$ | Abundance Trends/ CPUE | Age/Size/Sex Distribution | Degree of Uncertainty in Stock Status | Sources |
|---|---|---|---|---|---|---|---|---|
| Golden tilefish (MA) | Not overfished | 0.72 | No | 0.87 | Increasing short-term trend in abundance | Skewed | Moderate | Steimle et al. 1999; MAFMC 2000; NEFSC 2005 |
| Golden tilefish (SA) | Not overfished | $SSB_{2002}/SSB_{MSY}$ = 0.95 (median) | Yes | $F_{2002}/F_{MSY}$ = 1.53 (median) | Unknown/ Declining | Skewed | Moderate | Hightower & Grossman 1988; Barans & Stender 1983; NMFS 2005; SEDAR 2004 |
| Golden tilefish (GOM) | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | High | NMFS 2003a |
| Blueline tilefish (SA) | Unknown | Unknown | Unknown | Unknown | Fishery independent CPUE trend declining | Skewed | High | NMFS 2003a; Harris et al. in press |
| Blueline tilefish (GOM) | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | High | NMFS 2003a |

## STATUS OF THE STOCKS RANK

Golden tilefish is not overfished and overfishing is not occurring in the Mid-Atlantic, and current biomass estimates are approximately 70% of $B_{MSY}$. In the South Atlantic, golden tilefish is not overfished but overfishing is occurring. These parameters are unknown for the Gulf of Mexico. Overall, CPUE exhibits a downward trend, and there are no data concerning population

abundance based on fishery independent monitoring. The size distribution of golden tilefish in the Mid-Atlantic and South Atlantic is skewed. The stock status of golden tilefish is a moderate conservation concern in the Mid-Atlantic. Although the stock status of blueline tilefish is unknown, the age, size, and sex distribution of the South Atlantic stock is skewed relative to natural condition, the long-term CPUE trend is decreasing, and there is high uncertainty. The stock status of blueline tilefish is considered poor.

| Healthy | **Moderate/Rebuilding** | **Poor** | Critical |
|---|---|---|---|
| | Golden tilefish (MA) | Golden tilefish (SA, GOM)<br>Blueline tilefish | |

## Criterion 3: Nature of Bycatch

In 2002, 79% (1155 mt) of all tilefish landed in the U.S. were harvested with bottom longlines (Figure 13) (NMFS 2004). Tilefish landed in the South Atlantic in 2002 were harvested primarily with bottom longlines (79%) and handlines (17%) (NMFS 2004). In the Gulf of Mexico, 53% of tilefish landed were harvested using longlines (this excludes Texas landings, where landings were reported as all gears combined) (NMFS 2004). Bottom longlines and handlines are hook and line gear, and have similar bycatch characteristics (Table 3). Longlines use baited hooks on leaders of a single main line to catch fish at various depths depending on the targeted species; in bottom longlining the line is anchored at the bottom to target reef-associated species (Barnette 2001) such as golden tilefish. Although not analyzed in this report, 6% (84 mt) of tilefish landings in the Mid-Atlantic in 2002 were incidental take in the otter trawl fisheries for flounder, hake, squid, mackerel, and butterfish (MAFMC 2000; NMFS 2004).

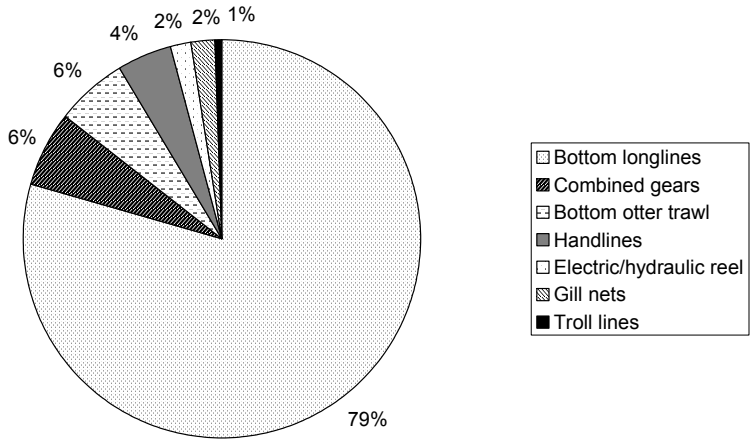



**Figure 13.** Gear used to harvest all species of tilefish in the U.S., 2002 (NMFS 2004).

Data from 1995 – 1997 indicate that bycatch in the golden tilefish fishery in the Mid-Atlantic was minimal during that time period, with species such as eel, hake, kingfish and sharks composing less than 3% (by number) of the catch (Nitschke et al. 1998). In the Gulf of Mexico bottom longline and South Atlantic snapper grouper longline fisheries there is a "high potential"

for fish bycatch, a "moderate potential" for sea turtle bycatch, and a "low potential" for marine mammal bycatch (NMFS 2003c). Beginning in 2001, the Southeast Fisheries Science Center (SEFSC) collected data using a supplemental discard form in the Gulf of Mexico reef fish, South Atlantic snapper grouper, king and Spanish mackerel and shark fisheries (Poffenberger 2004). Bottom longline data were collected from 51 vessels in the Gulf of Mexico and 16 vessels in the South Atlantic from August 1, 2001 to July 31, 2003 (Poffenberger 2004). In the South Atlantic, 449 animals were discarded in the bottom longline fishery; the species with the highest quantity of discards were spiny dogfish sharks (195 during 2 trips), unclassified red porgies (57 during 7 trips), and lesser amberjacks (48 during 3 trips) (Poffenberger 2004). In the Gulf of Mexico, 33,519 animals were discarded in the bottom longline fishery; the species with the highest quantity of discards were red grouper (23,305 during 121 trips), unclassified sharks (3,009 during 78 trips), and red snapper (1,612 during 58 trips) (Poffenberger 2004). The percentage of discards relative to landings of golden and blueline tilefish is unknown. A leatherback sea turtle was discarded during one trip in the South Atlantic, while one loggerhead, one green turtle, and three unclassified sea turtles were discarded during five trips in the Gulf of Mexico (Poffenberger 2004).

Approximately 5000 animals representing 89 taxa were caught during 242 observed bottom longline sets for red grouper and 75 sets for yellowedge grouper and blueline tilefish in the Gulf of Mexico in 1994 and 1995 (NMFS undated$_a$). Approximately 28% of this bycatch was released alive, and 56% of the fishes were retained (NMFS undated$_a$); however, as blueline tilefish inhabit deeper waters, it is probable that none of the fishes caught and released from blueline tilefish sets would survive the change in pressure while being brought to the surface (Grimes et al. 1983). Bycatch mortality in this fishery may be reduced through time/area closures; spawning season closures have been suggested for golden and blueline tilefish (NMFS undated$_a$). Research conducted in 1982 found that a bottom longline set off of Charleston, South Carolina at 183 – 199 m depth caught a variety of species (Russell et al. 1988). The catch comprised blackbelly rosefish (77%), blueline tilefish (9%), snowy grouper (7%), southern hake (3%), and golden tilefish (2%), with the remaining 2% attributed to yellowedge grouper, chain catshark, longspine and highfin scorpionfish, and Carolina hake (Russell et al. 1988).

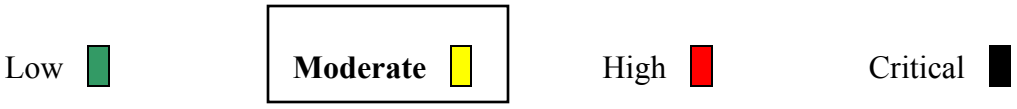
Data are not available for endangered species interactions and takes associated with the golden tilefish bottom longline fishery in the Mid-Atlantic (MAFMC 2000). A direct measure to address bycatch in the Mid-Atlantic golden tilefish fishery is the restriction to use only longline gear in the directed fishery; indirect measures include limited entry and a commercial quota with fishery closure once it is attained (NMFS 2003d). The small mesh otter trawl fishery targeting squid, mackerel, and butterfish, which also catches golden tilefish as bycatch, has been identified as an initial monitoring priority in the Mid-Atlantic due to a lack of observer coverage (NMFS 2003d).

**Table 3**. Bycatch characteristics of the golden and blueline tilefish fisheries.

| Gear | Composition of Bycatch | Percent Bycatch Relative to Landings | Population Consequences of Bycatch | Trend in Quality & Quantity of Bycatch | Ecosystem Effects | Sources |
|---|---|---|---|---|---|---|
| Bottom longlines in the Mid-Atlantic (Directed fishery) | Low diversity of organisms | < 3% | Low impact | Unknown | No evidence to date | Nitschke et al. 1998 |
| Bottom longlines & handlines in the South Atlantic and Gulf of Mexico (Multi-species fishery) | High diversity of organisms | Unknown | Unknown | Unknown | No evidence to date | Poffenberger 2004 |

**NATURE OF BYCATCH RANK**

Data provide evidence that there is a high diversity of organisms discarded in bottom longline fisheries in the South Atlantic and Gulf of Mexico. Golden and blueline tilefish are caught as part of a multi-species fishery, so bycatch can be inferred from general bottom longline data. In the Mid-Atlantic, however, the golden tilefish fishery is a directed fishery with little bycatch. As approximately 60% of golden tilefish landings are from the Mid-Atlantic, and approximately 40% are from the South Atlantic and Gulf of Mexico, bycatch is a moderate conservation concern in the golden and blueline tilefish fisheries.




## Criterion 4: Effect of Fishing Practices on Habitats and Ecosystems

Golden tilefish are found on clay, mud, and sand bottoms and blueline tilefish are found on mixed hard/soft bottom, often associated with rocky outcrops and overhanging ledges. The habitat effects of bottom longlines and handlines on this type of habitat are similar (Table 4). Longlines have only minor impacts on soft substrates, but may become entangled in the vertical relief provided by hardbottom habitats (Barnette 2001). Direct observations made with a submersible vessel indicate, however, that there is no evidence that longlines shifted more than 1 – 2 m after they are set (Grimes et al. 1982). Fish have also been observed to move the ground line several feet along the bottom and up into the water column during escape runs, disturbing objects in their path. In the Southeast, bottom longlines (targeting species other than sharks) are prohibited in waters less than 92 m in depth to limit habitat damage (NEFSC 2002). Possible handline impacts include entanglement and damage caused by weights on the line (Barnette 2001).

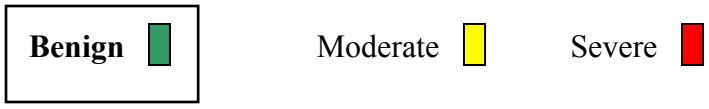
The removal of golden and blueline tilefish golden tilefish may have an impact on local continental shelf communities, as tilefish burrows appear to be centers of species abundance (Able et al. 1982). Burrows constructed by golden and blueline tilefish may result in changes to substrate composition and stability (Able et al. 1987). Through their burrowing activities, tilefishes are ecosystem engineers and their removal can have an impact on local biodiversity and water-sediment processes (Coleman and Williams 2002).

**Table 4.** Habitat effects of bottom longlines and handlines.

| Gear | Effect of Fishing Gear on Habitats | Habitat Resilience to Disturbance | Geographic Extent of Fishery Effects | Evidence of Food Web Disruption | Evidence of Ecosystem Changes | Sources |
|---|---|---|---|---|---|---|
| Bottom longlines & handlines | Low | Moderate | Limited | No evidence to date | No evidence to date | Grimes et al. 1982; Barnette 2001 |

**EFFECT OF FISHING PRACTICES RANK**

Bottom longlines have a limited geographic extent of cumulative impacts, and cause minimal damage to the clay, mud, and sand bottom habitat where golden tilefish most often occur. Bottom longlines and handlines may become entangled in the rough habitat that of blueline tilefish. The removal of tilefishes may cause ecosystem state changes, as tilefish are ecosystem engineers and their burrows appear to be centers of species abundance. Bottom longlines and handlines are ranked as benign fishing methods.




## Criterion 5: Effectiveness of the Management Regime

Golden and blueline tilefish are managed under three separate Fishery Management Plans (FMPs): the Tilefish FMP in the Mid-Atlantic; the Snapper Grouper FMP in the South Atlantic; and the Reef Fish FMP in the Gulf of Mexico. Management measures vary by location (Table 5).

### Mid-Atlantic

The Tilefish FMP was first drafted in the early 1980s by Mid-Atlantic Fishery Management Council (MAFMC) staff, and an industry advisor panel was created at that time (MAFMC 2000). During the 1980s, progress was made to develop an Individual Transferable Quota (ITQ) approach based on historical landings until industry realized that landings had to be significantly reduced to reach MSY (MAFMC 2000). At this point industry withdrew from the process and the MAFMC focused their efforts elsewhere (MAFMC 2000). The MAFMC began drafting an FMP again in the early 1990s and faced similar problems with industry (MAFMC 2000). In 1996 Congress passed the amended Magnuson-Stevens Act (which requires rebuilding of all overfished resources), and work began on the Tilefish FMP in 1999 (MAFMC 2000). The most

recent stock assessment was conducted in 2004. Previous stock assessments were conducted in 1999, 1985, 1992, and 1993 (NOAA 2004a). There is regular collection of fishery dependent data, but not fishery independent data. The goal of the FMP is to rebuild the stock in 10 years, with 50% probability of achieving the rebuilt $B_{MSY}$ stock level (MAFMC 2000). Current management measures include a limited entry program, commercial quota, permitting and reporting requirements, and the prohibition of gear other than bottom longlines in the directed fishery (MAFMC 2000). There is no bycatch reduction plan implemented in this fishery, and no mitigative measures have been implemented to address habitat effects of fishing, as bottom longlines are a relatively benign fishing method. A court order in Hadaja v. Evans (May 15, 2003) set aside the regulations pertaining to the permit requirements for commercial golden tilefish vessels; this decision has resulted in an open access fishery that is not subject to any federal vessel permit requirements or incidental take limit (NMFS undated$_b$). The basis for the legal action was that the limited access program in the FMP was not based on scientific evidence, but on a compromise between two industry groups (NMFS undated$_b$). On April 26, 2004, permit requirements for the tilefish fishery were reinstated (NOAA 2004b).

**South Atlantic**

Golden and blueline tilefish in the South Atlantic are managed under the 1983 Snapper Grouper FMP. In 1991, it was recommended that all fishing for golden tilefish stop because of the overfished condition of the stocks (SAFMC 1991). In 1993, Amendment 6/EA was prepared to rebuild golden tilefish through implementation of catch quotas, commercial trip limits, recreational bag limits, and the creation of the *Oculina* Experimental Closed Area (SAFMC 2003). The *Oculina* bank is a strip of coral reefs off central-eastern Florida (SAFMC 2003). A recent analysis conducted in 2001 estimated that the current static SPR values for tilefish in the South Atlantic are 27% (age-4) and 20% (age-8) (Potts and Brennan 2001), which is below the 30% overfishing threshold. There is no bycatch reduction plan, however the *Oculina* Experimental Closed Area was established to protect the reefs from damaging fishing practices for tilefish and other fisheries. A program similar to logbook reporting has been in place since 1992 for species included in the Snapper Grouper FMP; in 2001 the Southeast Fisheries Science Center (SEFSC) implemented a supplemental discard reporting form in addition to the mandatory reporting regulations under the FMP (Poffenberger 2004). The South Atlantic Fishery Management Council (SAFMC) is currently developing Amendment 14 to the Snapper Grouper FMP, which would implement marine protected areas (MPAs) to protect overfished deepwater species managed in the FMP; blueline tilefish is one species targeted for protection within the proposed MPAs (SAFMC 2004). There is no assessment of blueline tilefish, and the status of this resource is unknown. In June 2005, the SAFMC decided to move forward with a regulatory amendment to address overfishing of several stocks, including golden tilefish; this may include a 35% reduction in the golden tilefish quota (SAFMC 2005a).

**Gulf of Mexico**

Golden and blueline tilefish are managed by the Gulf of Mexico Fishery Management Council (GMFMC) within the reef fish management unit; a reef fish vessel permit is thus required for commercial harvest of these species (Reef Fish Amendment 1, 1990). The objective of Secretarial Amendment 1 to the Reef Fish FMP is to reduce the harvest of red grouper by 9.4% each year for the first three years of the 10-year rebuilding plan, and it is probable that effort will be shifted to species such as tilefishes and deep-water grouper (NMFS 2003b). Hence, there is a

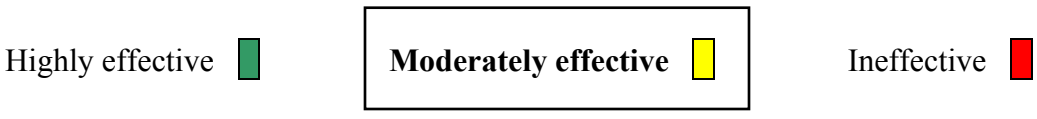
proposed precautionary tilefish quota in the Reef Fish Secretarial Amendment 1. The proposed quota is 200 mt (gutted weight), which was the average annual harvest from 1996 – 2000; during this baseline period landings exceeded the proposed quota 40% of the time (NMFS 2003b). Although golden and blueline tilefish are included in the 1984 Reef Fish FMP, there has been no stock assessment conducted for either species in the Gulf of Mexico, and no other management measures have been implemented for these species. Logbook reporting has been required since 1990 for all species included in the Reef Fish FMP.

**Table 5.** Commercial harvest management measures.

| Management Jurisdictions & Agencies | Total Allowable Landings | Size Limit | Gear Restrictions | Trip Limit | Area Closures | Sources |
|---|---|---|---|---|---|---|
| MAFMC | 905 mt | None | None | 0.1 mt for open access incidental catch permit | None | MAFMC 2000 |
| SAFMC/golden tilefish | 454 mt | None | Allowable gear includes hook-and-line, spearfishing gear w/o rebreathers, powerheads, and longline in depths > 91 m and north of St. Lucie Inlet FL | 2.3 mt when season open, 0.1 mt when closed | Potentially inhabits the *Oculina* Experimental Closed Area | SAFMC 2004; SAFMC 2005b |
| SAFMC/blueline tilefish | None set | None | See "SAFMC/golden tilefish" above | None | See "SAFMC/golden tilefish" above | SAFMC 2004 |
| GMFMC | None | None | None | None | None | N/A |

## EFFECTIVENESS OF MANAGEMENT RANK

A stock assessment for golden tilefish has recently been conducted in the Mid-Atlantic, and stock assessments are planned for 2004 in the Mid-Atlantic and South Atlantic. There have been no stock assessments conducted for golden or blueline tilefish in the Gulf of Mexico. Fishery dependent data are collected, although not regularly, in the Mid-Atlantic. There is neither a bycatch reduction plan nor mitigative measures to address habitat damage due to fishing practices, other than the *Oculina* Experimental Closed Area in the South Atlantic. Logbook reporting is required in all three regions. Management measures were implemented in the Mid-Atlantic only after significant declines in tilefish populations, and management in the South Atlantic has not prevented such declines. Although tilefishes are included in the Gulf of Mexico Reef Fish FMP, there are no specific regulations governing this tilefish species. Overall, management for golden and blueline tilefish is characterized as moderately effective.



## Overall Evaluation and Seafood Recommendation

Golden and blueline tilefish are long-lived, slow growing fishes; these life history characteristics, combined with the habitat limitations of golden and blueline tilefish, make them inherently vulnerable to fishing pressure. Golden tilefish in the Mid-Atlantic are not overfished and overfishing is not occurring, while golden tilefish in the South Atlantic are not overfished but overfishing is occurring. The stock status of golden tilefish in the Mid-Atlantic is a moderate conservation concern. Stock status for the South Atlantic and Gulf of Mexico remains a high conservation concern. The stock status of blueline tilefish is considered poor due to high uncertainty in the stock status, declining CPUE trends, and skewed age and size distributions. There is a moderate level of bycatch in the golden and blueline tilefish fisheries, as approximately 40% of the landings are from handlines and bottom longlines in the South Atlantic and Gulf of Mexico. Although the fishing effects of these gear types are benign, golden and blueline tilefish are ecosystem engineers, and their removal may have ecosystem effects. Management measures implemented in the South Atlantic have not prevented declines in tilefish populations in that region, and management in the Mid-Atlantic was not implemented until 2001. Overall, management of golden and blueline tilefish is characterized as moderately effective. The goal of this Seafood Report is to make a general recommendation based on the preceding criteria; this leads to an overall seafood recommendation of "Good Alternative" for golden tilefish from the Mid-Atlantic, and a recommendation of "Avoid" for golden and blueline tilefish from the South Atlantic and Gulf of Mexico.

## Table of Sustainability Ranks

| | **Conservation Concern** | | | |
|---|---|---|---|---|
| **Sustainability Criteria** | Low | Moderate | High | Critical |
| Inherent Vulnerability | | | √ | |
| Status of Stocks | | √ (Golden in the MA) | √ (Blueline, golden in the SA, GOM) | |
| Nature of Bycatch | | √ | | |
| Habitat Effects | √ | | | |
| Management Effectiveness | | √ | | |

**OVERALL SEAFOOD RECOMMENDATION:**

**Golden tilefish (Mid-Atlantic):**

Best Choice | **Good Alternative** | Avoid

**Golden and blueline tilefish (South Atlantic and Gulf of Mexico):**

Best Choice | Good Alternative | **Avoid**

## Supplemental Information

Although potential health effects are not a factor in the overall seafood recommendation, the consumption of tilefish may be a health concern for certain individuals. A 2001 U.S. Food and Drug Administration (FDA) consumer advisory recommends that pregnant women and women of child-bearing age limit their consumption of tilefish due to the presence of methylmercury (USFDA 2001). The FDA recommends that individuals do not consume fish with mercury levels higher than 1 ppm. A 1976 FDA study found that the mean mercury level of 60 tilefish in the Gulf of Mexico was 1.45 ppm (range from 0.65 – 3.73 ppm) (USFDA 2001). From 2002 to 2003, the FDA tested 17 golden tilefish from Atlantic waters; the mean mercury level was 0.15 ppm (range from 0.06 – 0.53 ppm) (CFSAN 2004). Only one tilefish was sampled from the Gulf of Mexico from 2002 to 2003, with a mercury level of 1.12 ppm (CFSAN 2004).

## Acknowledgements

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## Appendix

Prior to the release of the 2004 status of U.S. fisheries report (NMFS 2005), golden tilefish in the Mid-Atlantic and South Atlantic were listed as overfished with overfishing occurring (MAFMC 2000; NMFS 2003a). In the Mid-Atlantic, the definition of overfishing was when the catch associated with a threshold fishing mortality rate (F) of $F_{MSY}$ is exceeded (NMFS 2003a). The fishing mortality rate (F) in the Mid-Atlantic in 1998 was approximately double the established $F_{MSY}$ (0.22) for the golden tilefish stock in that region (Nitschke et al. 1998), and exploitation had shifted to smaller fish (MAFMC 2000). The population abundance based on the 1999 stock assessment was roughly 35% of $B_{MSY}$; $B_{MSY}$ was estimated at 8400 mt, and in 1998 the stock biomass was 2900 mt (Nitschke et al. 1998).

For the South Atlantic, the overfished definition for golden tilefish was an SPR less than 30% (NMFS 2003a), with estimates of static Spawning Potential Ratio (SPR) below 30% (27% for age-4 and 20% for age-8) (Potts and Brennan 2001). Overfishing was defined as F higher than F corresponding to 30% static SPR (NMFS 2003a). The F to obtain 30% SPR was 0.23, and F was estimated at 0.29 (Potts and Brennan 2001). Golden tilefish in the South Atlantic region was listed as overfished and undergoing overfishing.

This resulted in a critical stock status for golden tilefish in the South Atlantic and Mid-Atlantic, according to Seafood Watch® criteria, and thus an overall recommendation of "Avoid" for this species. According to NMFS (2005), golden tilefish in the South Atlantic region is no longer overfished, although overfishing is still occurring. Golden tilefish in the Mid-Atlantic is not overfished and overfishing is not occurring. Stock status therefore remains a high conservation concern for the South Atlantic stock and a moderate conservation concern for the Mid-Atlantic stock. As of October 22, 2005 golden tilefish in the Mid-Atlantic is recommended as a Good Alternative, and golden tilefish from the South Atlantic and Gulf of Mexico are recommended as an Avoid. Additional regulations implemented in 2005 include a 454 mt quota for golden tilefish in the South Atlantic; in 2004 there was no quota for this species.