Summary of available data for data-limited species in the Gulf of Mexico Reef Fish Fishery Management Plan that have never been assessed

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1. BACKGROUND AND NEED

Recent legislation in the United States mandating scientifically-derived annual catch limits (ACLs) is particularly challenging to meet in regions such as the Southeast US (Berkson and Thorson 2015, Newman et al. 2015), where species biodiversity exceeds that of other marine ecosystems (e.g., Northeast US; Fautin et al. 2010). The ability to determine ACLs differs among regions and species primarily due to the quantity and quality of available data. Conventional fisheries stock assessments cannot be conducted when basic information is lacking such as relative abundance, composition data, and/or biological characteristics (e.g., growth). Nationally, nearly 60% of stocks are considered data-poor (Newman et al. 2015), meaning there is insufficient data to conduct a statistical assessment that yields meaningful information on reference points (e.g., target catch or biomass levels) or stock status relative to meaningful reference points (e.g., overfished or overfishing). The Gulf of Mexico Fishery Management Council manages 35 fish stocks (excluding species not in the management unit), 74% of which are managed as data-poor (Newman et al. 2015). Stock assessments in the region are developed through the Southeast Data Assessment and Review process (SEDAR; www.sedarweb.org).

SEDAR 49, the most recent stock evaluation of data-poor species in the Gulf of Mexico, employed the Data-Limited Methods Toolkit (DLMtool; Carruthers et al. 2014, Carruthers et al. 2015) as the primary modeling platform. This software program allows evaluation of the performance of multiple data-limited assessment methods in a simulation environment using management strategy evaluation (MSE). MSE allows for the comparison of the relative effectiveness for achieving management objectives of different combinations of data collection schemes, methods of analysis and subsequent processes leading to management actions (Punt et al. 2014).

Currently, over 84 methods are available within DLMtool. The data inputs range from a simple time series of total removals (i.e., catch) to indices of abundance or length compositions utilized

in more data-moderate methods such as indicator-based methods (e.g., Geromont and Butterworth 2014) or mean length-based mortality methods (e.g., Gedamke and Hoenig 2006). Based on the data available for a given species, only certain method types are feasible (Figure 1). For example, if available data include a time series of total removals and an index of relative abundance, both catch-based and index-based methods are feasible methods for developing catch recommendations. In addition to the existing methods within DLMtool, a mean length estimator approach assuming nonequilibrium conditions was utilized to estimate total mortality when length-frequency data were available.

1.1 SPECIES NOT YET ASSESSED

This report provides an overview of the data available for species in the management unit in the Gulf of Mexico Reef Fish Fishery Management Plan (FMP) that have never been assessed (Table 1). Specifically, this report is focused on those species which have not undergone stock assessment (Table 2). Species which were removed from the Reef Fish FMP in 2012 through the Generic ACL/AM amendment due to low landings data were excluded from this data review (Table 3; see GMFMC 2011 for details). Of 11 species in the Reef Fish FMP in the Gulf of Mexico that have never been assessed, ten of the species fall within Tier 3A of the Gulf Acceptable Biological Catch Control Rule. Only one species, Warsaw Grouper, falls within Tier 3B (Table 4; see GMFMC 2011).

2 LIFE HISTORY

Life-history parameters (e.g., mortality, growth, and maturity) represent key data inputs for a variety of data-limited methods such as the mean length-based mortality estimator (Gedamke and Hoenig 2006). A literature review was conducted to compile all available life history information for the 11 species that have never been assessed. Additional details on specifics of the literature review are provided in Adams et al. (2016). It is important to highlight that the life history information documented herein has not been scrutinized by the life history subject matter experts. However, the information presented in this report can be used to evaluate reliability and identify best estimates for these species, as done during SEDAR 49 (SEDAR 2016d).

Life history information was available for the majority of the species (Table 5). No life history information was obtained for either Banded Rudderfish or Goldface Tilefish. Although life history parameter estimates were provided for both species in Farmer et al. (2016), the data sources specified therein (i.e., www.fishbase.org) could not be used to verify the original source of the parameters. Available life history information is provided for von Bertalanffy growth parameters and maximum age (Table 6), maturity parameters (Table 7), length-weight relationship parameters (Table 8), length-length relationship parameters (Table 9), mortality estimates (Table 10), and steepness parameters (Table 11). An estimate of steepness was solely available for Blueline Tilefish from a previous assessment conducted on the South Atlantic stock (SEDAR 2013b). Due to the paucity of information on steepness, steepness estimates for similar species were included within the literature review as proxies.

3 COMMERCIAL FISHERY STATISTICS

Commercial fishery statistics were available from the landings and discards data reported in the Southeast Fisheries Science Center's Accumulated Landings System (ALS). Additional data related to commercial discards were available from the Shark Bottom Logline Observer Program, Directed Reef Fish Observer Program, and the commercial Shrimp Trawl Fishery Observer Program.

3.1 COMMERCIAL LANDINGS

Annual commercial landings estimates for the years 1986 to 2015 were available from the ALS logbook data. Although sporadic landings data are available back to 1962 for some of the species, these landings were considered highly uncertain.

Of the 11 species, five were consistently available on the commercial logbook reporting forms beginning in 1990 (Table 12). Six of the species were not available on the forms in all years, including Banded Rudderfish (absent from 1990-91 and 1993), Blackfin Snapper and Blueline Tilefish (both absent from 1990-1993), Warsaw Grouper (absent in 1994 and 2000-09), Cubera Snapper (present only in 1994), and Goldface Tilefish (absent all years).

Annual commercial landings estimates were available for all 11 species for the majority of years between 1986 and 2015 (Table 13). Total landings were highest for Scamp (8.90 million pounds total) and Gray Snapper (7.36 million pounds total) and lowest for Cubera Snapper (34,657 pounds total). Median landings ranged from nearly 300,000 pounds per year for Scamp to 1,400 pounds per year for Cubera Snapper (Figure 2). Median landings for most of the species well below 50,000 pounds per year.

Commercial landings for most species were predominantly from one gear. The majority of Blueline Tilefish (89%), Goldface Tilefish (61%), and Yellowfin Grouper (56%) were landed by the longline fleet (Figure 2). The majority of Banded Rudderfish (94%), Gray Snapper (73%), and Scamp (54%) were landed by the handline fleet (Figure 2). For the remaining species, the percentage of landings was relatively similar between both longline and handline gear (range of 0.3% to 11% difference), with the exception of Warsaw Grouper where the landings from the "Other" fishery (37%) were similar to the landings using handline gear (39%).

3.2 COMMERCIAL DISCARDS AND BYCATCH

Self-reported discards from commercial logbooks were available from 2002-2014. Table 14 provides a summary of the percentage of trips with discards and the total volume of fish discarded. At the SEDAR 49 Data Workshop, a threshold of 2.5 percent of sets reporting discards was selected as a cut-off by the Total Removals Working Group as a criterion for justifying inclusion or exclusion of discards. Given this criteria, calculating discards could be recommended for the following species-gear combinations:

- Scamp commercial diving (mean of 2.8% over 10 years);
- Scamp handline fleet (mean of 4.3% over 13 years);
- Gray Snapper commercial diving (mean of 7.8% over 8 years); and
- Blueline Tilefish commercial longline (mean of 3.4 over 8 years)

These recommendations could change after further considering expert opinion related to discard mortality as occurred for Almaco Jack during SEDAR 49 (i.e., the percent of sets with discards exceeded 2.5% but the Total Removals Working Group decided that the mortality associated with discards was sufficiently low that it would lead to negligible total dead discards).

Observer reported discards were available from the bottom longline observer program and the reef fish observer program since 2006 and from the shrimp observer program since 1997 (Table 15). Species occurring as discards in more than 2.5% of sets were similar to those presented in the commercial logbooks and included Scamp (commercial bandit, handline, and longline fleets), Gray Snapper (commercial bandit, handline, and longline fleets), and Blueline Tilefish (commercial longline fleet) (Table 16).

Shrimp bycatch estimates for the species that have not yet been assessed could be estimated using the approach developed by Nichols (Nichols 2004a, b) and used in SEDAR 7 Gulf of Mexico Red Snapper assessment (SEDAR 2005a). A detailed description of methods and data sources is available in Isely (2016). However, initial evaluation of the shrimp observer data indicated that none of the 11 species were represented in the bycatch in sufficient numbers (>2,000 individuals in > 400 tows) to warrant formal estimation of bycatch in the shrimp fishery (Table 17).

4 RECREATIONAL FISHERY STATISTICS

Recreational fisheries statistics were available from the following sampling programs: 1) Marine Recreational Fisheries Statistics Survey (MRFSS) and the Marine Recreational Information Program (MRIP); 2) Southeast Region Headboat Survey (SRHS); 3) Texas Parks and Wildlife Department (TPWD); and the 4) Louisiana Creel Survey.

4.1 RECREATIONAL LANDINGS

MRFSS/MRIP provides a long time series of estimated catch-per-unit effort, total effort, landings, and discards for six two-month periods (waves) each year and covers coastal Gulf of Mexico states from Florida to Louisiana. The state of Texas was included in the survey from 1981-1985, although not all modes and waves were covered. MRFSS/MRIP provides estimates for three recreational fishing modes: shore-based fishing (SH), private and rental boat fishing (PR), and for-hire charter and guide fishing (CH). When the survey first began in Wave 2 (Mar/Apr), 1981, headboats were included in the for-hire mode, but were excluded after 1985 in the South Atlantic and Gulf of Mexico to avoid overlap with the Southeast Region Headboat Survey (SRHS).

The SRHS estimates annual landings and effort for headboats. The program started in the South Atlantic in 1972 and in the Gulf of Mexico in 1986. Mississippi headboats were added to the survey

in 2010. The South Atlantic and Gulf of Mexico Headboat Surveys generally include 70-80 vessels participating in each region annually.

The TPWD Sport-boat Angling Survey was implemented in May 1983 and samples fishing trips made by sport-boat anglers fishing in Texas marine waters. All sampling takes place at recreational boat access sites. The survey is designed to estimate landings and effort by high-use (May 15-November 20) and low-use seasons (November 21-May 14). TPWD surveys private and charterboat fishing trips.

The Louisiana Department of Wildlife and Fisheries (LDWF) began conducting the Louisiana Creel (LA Creel) survey program for monitoring marine recreational fishery catch and effort on January 1, 2014. LDWF samples private and charter modes of fishing.

4.1.1 SOUTHEAST REGIONAL HEADBOAT SURVEY (SRHS)

Landings from recreational headboats were available for most species for the majority of years between 1986 and 2015 (Table 18). However, the majority of species that have not yet been assessed were infrequently encountered by headboats, with total landings below 25,000 pounds for the entire time series (Table 18). Landings were highest for Gray Snapper (2.17 million pounds total) and lowest for Goldface Tilefish (177 pounds total). Average pounds ranged from 72,500 pounds per year for Gray Snapper to 18 pounds per year for Goldface Tilefish.

4.1.2 MARINE RECREATIONAL FISHERY STATISTICS SURVEY (MRFSS)

Recreational landings from MRFSS were available between 1981 and 2015 for all species except Goldface Tilefish (Table 19). Landings were highest for Gray Snapper (53.73 million pounds total) and lowest for Blackfin Snapper (1,725 pounds total).

Combined recreational landings (MRFSS + SRHS) ranged from nearly 1.40 million pounds per year for Gray Snapper to 2 pounds per year for Queen Snapper (Figure 4). Median landings for the majority of species were below 10,000 pounds per year.

Recreational landings for many of the species were predominantly from the private fishing mode (Figure 5). Exceptions were noted for Banded Rudderfish and Blackfin Snapper which were predominantly caught by the charterboat and headboat fishing modes, respectively. The percentage of landings for Scamp was relatively similar between the charterboat and private fishing modes.

4.2 RECREATIONAL DISCARDS

Recreational discards (in number) were available from MRFSS for all species except Goldface Tilefish for at least part of the time series between 1986 and 2015 (Table 20). Discards were highest

for Gray Snapper, with more than 100,000,000 fish discarded in total. Both Scamp and Banded Rudderfish were discarded on the order of ~500,000 fish overall.

5 COMPARISON OF COMMERCIAL VERSUS RECREATIONAL LANDINGS

The majority of species were more prevalent in commercial landings than recreational landings (Figure 6). Recreational landings exceeded commercial landings for Cubera Snapper, Gray Snapper, Silk Snapper, and Banded Rudderfish. Landings for Warsaw Grouper were similar in magnitude between commercial and recreational fisheries.

6 MEASURES OF TRENDS IN POPULATION ABUNDANCE

Multiple data sources were explored to determine the feasibility of developing a candidate index of abundance for each species. Fishery-independent sources which were evaluated included:

1. *SEAMAP Summer Groundfish Survey*
2. *SEAMAP Ichthyoplankton Survey*
3. *NMFS Small Pelagics Survey*
4. *NMFS Bottom Longline Survey*
5. *NMFS Reef Fish Video Survey*
6. *NMFS Panama City Laboratory Trap and Camera Survey*

Fishery-dependent data sources included:

1. *Commercial Logbook*
2. *Marine Recreational Fishery Statistics Survey*
3. *Texas Parks and Wildlife Department Sport-boat Angling Survey*
4. *Southeast Regional Headboat Survey*

6.1 FISHERY-INDEPENDENT SURVEYS

The SEAMAP Reef Fish and Panama City Video Surveys frequently encountered Scamp (Table 21) and Gray Snapper (Table 22), with mean percent occurrence ranging from 10% to 42% of survey sites. Survey catches of the remaining species were consistently low across data sources, with mean percent occurrences lower than 1% of survey sites for all surveys (Tables 23-31). Given the low occurrence of these species, the development of an index of abundance from a fishery-independent source seems unfeasible. For SEDAR 49, an index of abundance was attempted for Yellowmouth Grouper, a species which displayed a mean annual percent occurrence of 5% (Campbell et al. 2016). Ultimately, this index was not selected for consideration in the assessment due to concerns over data limitations such as the low percent occurrence and small sample size.

6.2 FISHERY-DEPENDENT SURVEYS

Overall, feasibility of developing indices of abundance from fishery-dependent sources was also limited, with annual indices of abundance potentially feasible for Scamp, Warsaw Grouper, Gray Snapper, Silk Snapper, and Blueline Tilefish using the Commercial logbook data (Table 32). All species that have not yet been assessed were relatively rare in the MRFSS, TPWD, and the SRHS surveys (Tables 33-34). Although indices using commercial sources appear feasible based on sample sizes, these data have not been scrutinized by subject matter experts for potential biases due to changes in fishing behavior or regulations. During SEDAR 49, indices of abundance derived from the commercial longline data for both Snowy Grouper and Speckled Hind were not recommended for consideration due to a shift in fisher distribution into deeper waters following the implementation of IFQs for snappers, grouper, and tilefish. An accompanying shift in selectivity towards larger individuals inhabiting deeper waters was suspected to impact the reliability of the trend in the resource.

7 LENGTH COMPOSITION

The SEFSC Trip Intercept Program (TIP) collects biological data including length measurements. The TIP data include length samples for all 11 species between 1984 and 2015 (Tables 35-36). Scamp and Gray Snapper had the largest number of length observations with annual means of 1,335 for the Commercial Longline and 1,113 for the Commercial Handline, respectively (Table 35). Species and gear combinations with mean annual observations greater than 100 included:

- Blueline Tilefish Commercial Longline;
- Queen Snapper Commercial Handline,
- Silk Snapper Commercial Handline; and
- Banded Rudderfish Commercial Handline.

Fewer annual observations were reported for both Blackfin Snapper (mean of 92 observations per year) and Warsaw Grouper (mean of 65 observations per year) for Commercial Handline. Low overall sample sizes (<25 mean observations per year) will likely limit the utility of length observations for Yellowfin Grouper, Cubera Snapper, and Goldface Tilefish (Table 35).

8 AGE COMPOSITION

Otoliths have been collected for all 11 species although the quantity varied substantially between species (Table 37). The largest collection of otoliths was evident for Scamp and Gray Snapper, with fewer than 5,000 otoliths collected overall for the remaining species. It is important to note that the availability of age data for assessment would require substantial resources and time to process samples and validate annual band increments to ensure accurate age assignments. Aging efforts are currently underway for the assessment of Gulf of Mexico Gray Snapper in 2017 (SEDAR 51) and a planned assessment for Gulf of Mexico Scamp in 2018.

9 OVERVIEW OF POTENTIAL MODELING APPROACHES

Available method types in the DLMtool range from simple catch-only models to length-based mortality estimator approaches which require length composition and life history parameters (Figure 1). At a minimum, catch-only methods similar to the status quo method currently implemented by the Gulf of Mexico Fishery Management Council can be employed for all 11 species (Table 38). Given current data limitations, catch-based methods appear to be the only feasible method type for Yellowfin Grouper, Cubera Snapper, Goldface Tilefish, and Banded Rudderfish due to their rare occurrence in surveys sampling both abundance and composition. However, it is possible that an index of abundance could be developed for Banded Rudderfish from the Panama City Video Survey, which just missed the cut-off criteria for index development.

Available data suggest that either an index of abundance and/or an index of mean length could be developed for many of the species that have not yet been assessed, which would enable the implementation of simple index-based or length-based methods described in Geromont and Butterworth (2014). However, it is important to note that the quality of both the index and length data must be vetted by subject matter experts to ensure these data are justifiable for consideration. Some of the candidate indices and length data may be deemed inappropriate for use due to significant changes in the fishery, as observed during SEDAR 49 for the commercial longline index developed for both deep-water grouper species.

The availability of both life history data and length composition may enable the mean length-based mortality estimator approach of Gedamke and Hoenig (2006) for the majority of the species that have not yet been assessed (Table 39). A method which links the estimate of F derived using the length-based mortality estimator to a recent catch history to produce an estimate of the overfishing limit has been developed by M. Bryan and colleagues at the Southeast Fisheries Science Center.

Although various methods may appear feasible based on data availability, their utility may change once the data quality is assessed by subject matter experts. More complex methods such as depletion-based (e.g., Depletion-Corrected Average Catch; MacCall 2009) methods remain unfeasible due to the lack of estimates of stock depletion. Given the widespread usage of such methods (e.g., Carruthers et al. 2014), it would be beneficial to investigate whether estimates of stock depletion could be developed from other sources (e.g., expert opinion).

10 SYNTHESIS OF AVAILABLE DATA BY SPECIES

10.1 Scamp

Of the managed species in the Gulf of Mexico Reef Fish FMP which have not yet undergone stock assessment, Scamp represent a more data-moderate species as evident by the availability and quantity of data including life history, removals, relative abundance, and size composition (Figure 7). Based on criteria used during SEDAR 49, estimating discards may be necessary to capture additional sources of removals. It appears possible to develop indices using both fishery-independent and -dependent data sources due to frequent encounters of Scamp. An average of 1,000 or more length observations per year exist for both the commercial handline and longline fisheries. Many method types in the DLMtool appear feasible for Scamp, although feasibility of

these methods may change after further evaluating available data and method assumptions. An age-structured benchmark assessment for Scamp is scheduled for 2018.

10.2 Warsaw Grouper

Warsaw Grouper are infrequently encountered in many of the data sources analyzed (Figure 8). Although an index of abundance may be developed from the commercial logbook data, it remains to be seen whether derived indices using either longline or handline gear will suffer from the same concerns as those for Snowy Grouper and Speckled Hind during SEDAR 49. Annual length composition is available for Warsaw Grouper, however, the data need to be analyzed to determine if sample sizes are appropriate for utilizing the mean length estimator or other length-based indicator methods.

10.3 Yellowfin Grouper

Very little data are available for Yellowfin Grouper from the data source analyzed (Figure 9). As a result, the lack of auxiliary data such as an index of abundance or size composition data will limit feasible methods to catch-only methods.

10.4 Blackfin Snapper

Similarly, very little data are available for Blackfin Snapper from the data sources analyzed (Figure 10). Although annual length composition is available for Blackfin Snapper, the data need to be analyzed to determine if the sample sizes are appropriate for utilizing the mean length estimator or other length-based indicator methods in addition to catch-only methods.

10.5 Cubera Snapper

Data are also very sparse for Cubera Snapper from all data sources analyzed (Figure 11). Without auxiliary data such as an index of abundance or size composition data, feasible methods are limited to catch-only methods.

10.6 Gray Snapper

Similar to Scamp, Gray Snapper are data-moderate due to the availability and quantity of data including life history, removals, relative abundance, and size composition (Figure 12). Based on criteria used during SEDAR 49, the estimation of discards may be required to capture additional sources of removals. Index development appears likely using both fishery-independent and -dependent data sources due to frequent encounters of Gray Snapper. An average of more than 1,000 length observations per year exists for the commercial handline fishery. Many method types

are feasible in the DLMtool for Gray Snapper, although feasibility of these methods may change after further evaluating available data and method assumptions. An age-structured benchmark assessment for Gulf of Mexico Gray Snapper is on the schedule for 2017 under SEDAR51.

10.7 Queen Snapper

Very little data are available for Queen Snapper from the data sources analyzed (Figure 13). Index-based assessment methods are not feasible since no index of abundance appears possible due to a low percent of occurrences. However, because of the available length composition and life history information, other methods may be feasible such as the mean length estimator and other length-based indicator methods in addition to catch-only methods.

10.8 Silk Snapper

Data for Silk Snapper are infrequent in the data sources analyzed (Figure 14). Although developing an index of abundance from the commercial logbook data may be possible, changes in effort and targeting may lead to similar issues brought up for the Snowy Grouper and Speckled Hind indices which were not recommended for use during SEDAR 49. An average of more than 150 length observations per year for the commercial handline fishery means that the mean length estimator and/or other length-based indicator methods may be feasible.

10.9 Blueline Tilefish

Similar to Scamp and Gray Snapper, Blueline Tilefish are data-moderate due to the large quantity of data including life history, removals, relative abundance, and size composition (Figure 15). Based on criteria used during SEDAR 49, the estimation of discards may be required to capture additional sources of removals. Many method types are feasible in the DLMtool for Blueline Tilefish, although feasibility of these methods may change after further evaluating available data and method assumptions. Based on recent evidence of connectivity between the Gulf of Mexico and the Atlantic Coast, a joint stock assessment may be considered during SEDAR 50.

10.10 Goldface Tilefish

Goldface Tilefish is one of the most data-limited species of the managed species in the Gulf of Mexico Reef Fish FMP that have not been assessed (Figure 16). The absence of auxiliary data such as an index of abundance or size composition data will limit feasible methods to catch-only methods.

10.11 Banded Rudderfish

Banded Rudderfish is also one of the more data-limited species (Figure 17). However, if an index of abundance can be developed from the Panama City Video survey for the recent years, which fell just below the criteria, index-based methods could be feasible, in addition to the catch-based methods which are similar to the status quo. No life history information is available.

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13 TABLES

Table 1. Assessment history (most recent) for managed species in the Reef Fish Fishery Management Plan of the Gulf of Mexico. – indicates no stock assessment for species. *Yellowmouth Grouper was considered for stock assessment but was excluded from analyses due to severe data limitations relating to species misidentification.

Family	Common name	Scientific name	Assessed
Balistidae	Gray Triggerfish	*Balistes capriscus*	SEDAR (2015c)
Carangidae	Greater Amberjack	*Seriola dumerili*	SEDAR (2014d)
	Lesser Amberjack	*Seriola fasciata*	SEDAR (2016c)
	Almaco Jack	*Seriola rivoliana*	SEDAR (2016c)
	Banded Rudderfish	*Seriola zonata*	-
Labridae	Hogfish	*Lachnolaimus maximus*	Cooper et al. (2014)
Malacanthidae	Goldface Tilefish	*Caulolatilus chrysops*	-
	Blueline Tilefish	*Caulolatilus microps*	-
	Golden Tilefish	*Lopholatilus chamaeleonticeps*	SEDAR (2011b)
Serranidae	Speckled Hind	*Epinephelus drummondhayi*	SEDAR (2016c)
	Yellowedge Grouper	*Hyporthodus flavolimbatus*	SEDAR (2011c)
	Atlantic Goliath Grouper	*Epinephelus itajara*	SEDAR (2016b)
	Red Grouper	*Epinephelus morio*	SEDAR (2015b)
	Warsaw Grouper	*Hyporthodus nigritus*	-
	Snowy Grouper	*Hyporthodus niveatus*	SEDAR (2016c)
	Black Grouper	*Mycteroperca bonaci*	SEDAR (2010a)
	Yellowmouth Grouper	*Mycteroperca interstitialis*	SEDAR (2016c)*
	Gag	*Mycteroperca microlepis*	SEDAR (2014c)
	Scamp	*Mycteroperca phenax*	-
	Yellowfin Grouper	*Mycteroperca venenosa*	-
Lutjanidae	Queen Snapper	*Etelis oculatus*	-
	Mutton Snapper	*Lutjanus analis*	O'Hop et al. (2015)
	Blackfin Snapper	*Lutjanus buccanella*	-
	Northern Red Snapper	*Lutjanus campechanus*	SEDAR (2014b)
	Cubera Snapper	*Lutjanus cyanopterus*	-
	Grey Snapper	*Lutjanus griseus*	-
	Lane Snapper	*Lutjanus synagris*	SEDAR (2016c)
	Silk Snapper	*Lutjanus vivanus*	-
	Yellowtail Snapper	*Ocyurus chrysurus*	O'Hop et al. (2012)
	Wenchman	*Pristipomoides aquilonaris*	SEDAR (2016c)
	Vermilion Snapper	*Rhomboplites aurorubens*	SEDAR (2016a)

Table 2. Managed species in the Reef Fish Fishery Management Plan that have not yet been assessed. For information on the ITIS code, see http://www.itis.gov/.

Species	Scientific Name	ITIS code	ITIS_COMMON_NAME
Scamp	*Mycteroperca phenax*	167763	SCAMP
Warsaw Grouper	*Hyporthodus nigritus*	167704	GROUPER, WARSAW
Yellowfin Grouper	*Mycteroperca venenosa*	167764	GROUPER, YELLOWFIN
Blackfin Snapper	*Lutjanus buccanella*	168852	SNAPPER, BLACKFIN
Cubera Snapper	*Lutjanus cyanopterus*	168847	SNAPPER, CUBERA
Gray Snapper	*Lutjanus griseus*	168848	SNAPPER, GRAY
Queen Snapper	*Etelis oculatus*	168902	SNAPPER, QUEEN
Silk Snapper	*Lutjanus vivanus*	168861	SNAPPER, SILK
Blueline Tilefish	*Caulolatilus microps*	168543	TILEFISH, BLUELINE
Goldface Tilefish	*Caulolatilus chrysops*	168544	TILEFISH, GOLDFACE
Banded Rudderfish	*Seriola zonata*	168693	RUDDERFISH, BANDED

Table 3. Species removed from the Reef fish Fishery Management Plan in 2012 due to "small" or "nil" catches as documented in the Generic ACL/AM amendment (GMFMC 2011).

Species	Scientific Name	ITIS code	ITIS_COMMON_NAME
Nassau grouper	*Epinephelus striatus*	167706	GROUPER, NASSAU
Misty grouper	*Epinephelus mystacinus*	167703	GROUPER, MISTY
Rock hind	*Epinephelus adscensionis*	167696	HIND, ROCK
Red hind	*Epinephelus guttatus*	167700	HIND, RED
Dwarf sand perch	*Diplectrum bivittatum*	167796	PERCH, DWARF SAND
Sand perch	*Diplectrum formosum*	167793	PERCH, SAND
Schoolmaster	*Lutjanus apodus*	168850	SCHOOLMASTER
Dog snapper	*Lutjanus jocu*	168857	SNAPPER, DOG
Mahogany snapper	*Lutjanus mahogoni*	168858	SNAPPER, MAHOGANY
Anchor tilefish	*Caulolatilus intermedius*	168542	TILEFISH, ANCHOR
Blackline tilefish	*Caulolatilus cyanops*	168541	TILEFISH, BLACKLINE

Table 4. Description of how the overfishing limit (OFL) and acceptable biological catch (ABC) are set for the managed species that have not yet been assessed. Units include gutted weight (gw) and whole weight (ww) in pounds. SD = standard deviation. Additional details are available in GMFMC (2011).

Species	Tier	Reference Years	OFL		ABC	Units
			Method	Value	Method	
Scamp	3A	1995-2008	Mean + 2SD	443,982	Mean + 1 SD	gw
Warsaw Grouper	3B	1992-2008	Mean	138,313	Mean	gw
Yellowfin Grouper	3A	1995-2008	Mean + 2SD	17,018	Mean + 1 SD	gw
Blackfin Snapper	3A	1999-2008	Mean + 2SD	8,143	Mean + 1 SD	ww
Cubera Snapper	3A	1999-2008	Mean + 2SD	7,005	Mean + 1 SD	ww
Gray Snapper	3A	1999-2008	Mean + 2SD	2,877,034	Mean + 1 SD	ww
Queen Snapper	3A	1999-2008	Mean + 2SD	23,810	Mean + 1 SD	ww
Silk Snapper	3A	1999-2008	Mean + 2SD	112,646	Mean + 1 SD	ww
Blueline Tilefish	3A	1992-2008	Mean + 2SD	175,377	Mean + 1 SD	gw
Goldface Tilefish	3A	1992-2008	Mean + 2SD	62,364	Mean + 1 SD	gw
Banded Rudderfish	3A	2000-2008	Mean + 2SD	198,304	Mean + 1 SD	ww

Table 5. Summary of the availability (identified by an X) of life history information for the managed species that have not yet been assessed. – indicates no data available.

Species	Growth	Maturity	Length-Weight	Length-Length	Natural Mortality	Steepness
Scamp	X	X	X	X	X	–
Warsaw Grouper	X	X	X	–	X	–
Yellowfin Grouper	X	X	X	–	X	–
Blackfin Snapper	X	–	X	–	X	–
Cubera Snapper	X	X	X	X	X	–
Gray Snapper	X	X	X	X	X	–
Queen Snapper	X	–	X	X	–	–
Silk Snapper	X	–	X	–	X	–
Blueline Tilefish	X	X	X	X	X	X
Goldface Tilefish	–	–	–	–	–	–
Banded Rudderfish	–	–	–	–	–	–

Table 6. von Bertalanffy growth parameters compiled through a literature review. L_∞ is the asymptotic size parameter, k is the rate at which the growth curve approaches L_∞, t_0 is the theoretical size of the fish at age 0, t is the maximum age, sex represents male (M), female (F), or both sexes (A), and n is the sample size. Standard errors are given in parentheses where available. Possible length types in millimeters (mm) include total length (TL), fork length (FL), or unknown (UNK). -- indicates no information available.

Species	Location	$L\infty$	k	t_0	Length range	t	Sex	n	Reference
Grouper									
Warsaw	--	2394	0.054	-3.62	-- mm --	41	A	--	Ault et al. (1998)
	Southeast US	2394	0.050	-3.61	-- mm TL	41	A	--	Manooch III and Mason (1987)
Scamp	--	1000	0.126	-1.36	-- mm --	21	A	--	Ault et al. (1998)
	Southeast US	846	0.170	1.86	-- mm TL	30	A	2,573	Harris et al. (2002)
	Southeast US	897	0.130	2.57	-- mm TL	30	A	2,573	Harris et al. (2002)
	Southeast US	864	0.120	-3.15	-- mm TL	--	A	--	Harris et al. (2002)
	Southeast US	1114	0.050	-7.52	-- mm TL	--	A	--	Harris et al. (2002)
	Northern GOM	772	0.090	-4.40	109-890 mm FL	31	A	5,383	Lombardi-Carlson et al. (2012)
	South Atlantic	985	0.092	-2.45	-- mm FL	21	A	--	Matheson III et al. (1986)
Yellowfin	--	860	0.170	0.00	-- mm --	15	A	--	Ault et al. (1998)
	Puerto Rico	895	0.086	0.00	-- mm --	25	A	--	Ault et al. (2008)
	Bahamas	977	0.140	-1.50	-- mm TL	13	A	70	Cushion (2010)
	St. John	895	0.086 (0.04)	--	-- mm TL	--	A	--	Munro and Williams (1985)
	Jamaica	860	0.090	--	-- mm TL	--	A	--	Munro (1983)
	St. John	895	0.086 (0.04)	--	-- 850 mm TL	--	A	--	Randall (1962)
	Caribbean	--	--	--	-- 1000 mm TL	--	A	--	SEDAR (2007)
	Jamaica	860	0.10-0.17	--	-- mm TL	--	A	--	Thompson and Munro (1978)
	Southern GOM (Campeche)	--	--	--	390-920 mm TL	--	A	--	Tuz-Sulub et al. (2006)
Snapper									
Queen	Caribbean	906	--	--	-- 900 mm FL	--	A	--	Gobert et al. (2005)
	St. Lucia	1020	0.400	-0.29	-- mm TL	--	A	--	Murray and Moore (1992)
	--	--	1.087	--	-- UNK --	--	A	--	Murray and Neilson (2012)
	--	--	0.621	--	-- UNK --	--	A	--	Murray and Neilson (2012)
	St. Lucia	1032	0.610	--	310-920 mm TL	2.5	A	--	Murray et al. (1992)
Blackfin	--	730	0.084	-2.90	-- mm --	9	A	--	Ault et al. (1998)
	Puerto Rico	730	0.084	-2.90	-- mm --	9	A	--	Ault et al. (2008)
	Cuba, SE	635	0.100	-2.05	-- mm FL	--	A	--	Pozo and Espinosa (1982)

Species	Location	$L\infty$	k	$t0$	L range	t	Sex	n	Reference
Blackfin	Cuba, NW	602	0.100	-3.16	-- mm FL	--	A	--	Espinosa and Pozo (1982)
(continued)	Jamaica	460	0.350	--	-- mm FL	--	A	--	Munro (1983)
	Jamaica	540	0.700	--	-- mm FL	--	A	--	Munro (1983)
	Caribbean (Costa Rica)	620	0.350	-0.04	-- mm --	--	A	--	Tabash and Sierra (1996)
Cubera	--	1200	0.160	-0.30	-- mm --	20	A	--	Ault et al. (1998)
	Cuba	1033	0.125	-0.98	-- 1004 mm UNK	24	A	--	Martinez-Andrade (2003)
	Synthesis	1289	0.137	-0.71	-- 1171 mm UNK	22.7	A	--	Martinez-Andrade (2003)
Gray	--	722	0.136	-0.86	-- mm --	10	A	--	Ault et al. (1998)
	Puerto Rico	722	0.136	-0.86	-- mm --	28	A	--	Ault et al. (2008)
	Florida, North	717	0.170	-0.03	181-760 mm TL	24	A	519	Burton (2001)
	Florida, South	625	0.130	-1.33	167-618 mm TL	15	A	724	Burton (2001)
	Florida	--	--	--	167-760 mm TL	24	A	1,243	Burton (2001)
	Florida	768	0.150	-0.78	167-760 mm TL	24	F	--	Burton (2001)
	Florida	697	0.180	0.49	167-760 mm TL	24	M	--	Burton (2001)
	Cuba, SW	548	0.230	-1.06	-- mm FL	--	A	--	Claro (1983)
	Cuba, SE	513	0.240	-0.62	-- mm FL	--	A	--	Claro et al. (2001)
	Florida	1200	0.050	-0.29	-- mm FL	--	A	--	Claro et al. (2001)
	Florida	788	0.160	0.17	-- mm TL	--	A	--	Claro et al. (2001)
	Northern GOM (LA)	656	0.220	0.00	222-756 mm TL	28	A	718	Fischer et al. (2005)
	Northern GOM (LA)	657	0.210	0.00	254-756 mm TL	28	F	--	Fischer et al. (2005)
	Northern GOM (LA)	655	0.230	0.00	222-732 mm TL	28	M	--	Fischer et al. (2005)
	Southeast US/GOM	792	0.078	-3.90	136-764 mm TL	25	A	432	Johnson et al. (1994)
	Southeast US	890	0.100	-0.31	-- mm TL	--	A	--	Manooch III and Matheson III (1981)
	Florida (Florida Bay)	716	0.140	-0.96	-- 692 mm UNK	21	A	0	Martinez-Andrade (2003)
	Synthesis	670	0.168	-0.70	-- 651 mm UNK	17.4	A	--	Martinez-Andrade (2003)
	Jamaica	464	0.610	--	-- mm TL	--	A	--	Munro (1999)
Silk	--	781	0.092	-2.31	-- mm --	9	A	--	Ault et al. (1998)
	Puerto Rico	781	0.092	-2.31	-- mm --	9	A	--	Ault et al. (2008)
	Cuba, SE	757	0.100	-2.08	-- mm FL	--	A	688	Pozo and Espinosa (1982)
	Cuba	812	0.100	--	-- mm TL	--	A	--	Pozo and Espinosa (1982)
	Cuba, NE	729	0.090	-2.64	-- mm FL	--	A	--	Pozo et al. (1983)
	Caribbean (Costa Rica)	620	0.320	-0.04	-- mm --	--	A	--	Tabash and Sierra (1996)
Tilefish									
Blueline	Mid-Atlantic	750	0.110	-5.45	396-784 mm TL	43	M	104	Harris et al. (2004); SEDAR (2004)

Species	Location	$L\infty$	k	$t0$	L range	t	Sex	n	Reference
Blueline (continued)	Mid-Atlantic	649	0.090	-7.58	333-711 mm TL	40	F	172	Harris et al. (2004); SEDAR (2004)
	Mid-Atlantic	716	0.070	-12.54	385-734 mm TL	40	M	201	Harris et al. (2004); SEDAR (2004)
	Mid-Atlantic	626	0.120	-5.57	336-702 mm TL	43	F	219	Harris et al. (2004); SEDAR (2004)
	Mid-Atlantic	651	0.080	-11.77	333-734 mm TL	40	A	400	Harris et al. (2004); SEDAR (2004)
	Mid-Atlantic	643	0.150	-3.88	336-784 mm TL	43	A	406	Harris et al. (2004); SEDAR (2004)
	Mid-Atlantic	814	0.137	1.03	270-780 mm TL	15	A	201	Ross and Huntsman (1982); SEDAR (2004)
	South Atlantic	839	0.110	-2.31	200-900 mm FL	40	A	1,737	Schmidtke and Jones (2016)
	South Atlantic	936	0.090	-1.76	200-900 mm FL	40	A	1,737	Schmidtke and Jones (2016)
	South Atlantic	711	0.260	-0.85	300-800 mm FL	38	A	2,627	Schmidtke and Jones (2016)
	South Atlantic	739	0.190	-1.85	300-800 mm FL	38	A	2,627	Schmidtke and Jones (2016)
	Mid & Southeast US	621.3 (4.29)	0.282 (0.12)	-1.2473 (0.18)	250-900 mm FL	40	A	--	SEDAR (2013b)
	Mid & Southeast US	600.3 (2.54)	0.330 (0.01)	-0.50	250-900 mm FL	43	A	--	SEDAR (2013b)
	Mid & Southeast US	609.3 (3.40)	0.281 (0.02)	-1.112 (0.15)	250-900 mm FL	43	A	--	SEDAR (2013b)
	Mid & Southeast US	615.7 (10.30)	0.111 (0.01)	-5.08 (0.01)	250-800 mm FL	43	F	--	SEDAR (2013b)
	Mid & Southeast US	554.9 (4.35)	0.258 (0.01)	-0.50	250-900 mm FL	43	F	--	SEDAR (2013b)

Table 7. Maturity parameters compiled through a literature review. Parameters obtained through statistical model estimation are represented by t_{50}, L_{50}, and L_{95}, which represent the age at 50% maturity, the length at 50% maturity, and the length at 95% maturity, respectively. Approximation of size at maturity is given by L_m and approximation of size at full maturity is given by L_{100}. Sample size for the entire study is given by *n*, sex represents male (M), female (F), both sexes (A), or transitional (T), and sample size for each individual sex is given by *m*. Possible length types in millimeters (mm) include total length (TL), fork length (FL), standard length (SL) or unknown (UNK). -- indicates no information available.

Species	Sampling location	t_{50}	L_{50}	L_{95}	L_m	L_{100}	Length range	*t* range	*n*	Sex	*m*	Reference
Grouper												
Warsaw	Southeast US	9	--	--	--	--	--	--	--	F	--	Manooch III and Mason (1987)
Scamp	Southeast US	1.72	374	--	--	--	-- mm TL	--	--	F	--	Harris et al. (2002)
	Southeast US	1.28	353	--	--	--	-- mm TL	--	--	F	--	Harris et al. (2002)
	Northern GOM	2	332				109-878 mm FL	1-19	2,481	F	1,427	Lombardi-Carlson et al. (2012)
	South Atlantic	--	--	--	--	--	--	--	--	--	--	Matheson III et al. (1986)
	Eastern GOM	--	--	--	--	350	250-700 mm SL	--	2,646	F		Bullock and Smith (1991)
Yellowfin	Puerto Rico	--	--	--	529	--	-- mm --	--	--	F	--	Ault et al. (2008)
	Bahamas	4.66	561	--	--	--	300-871 mm TL	8--	323	F	--	Cushion (2010)
	Bahamas	--	--	--	--	--	716-871 mm TL	--9	323	T	--	Cushion (2010)
	Bahamas	--	--	--	--	--	716940 mm TL	--	323	M	--	Cushion (2010)
	Cuba	--	--	--	--	--	250-850 mm TL	--	135	F	--	García-Cagide and García (1996)
	Cuba	--	--	--	--	--	-- mm TL	--	135	M	--	García-Cagide and García (1996)
	Jamaica	--	--	--	510	--	-- mm TL	--	--	F	--	García-Cagide et al. (1994)
	Florida Keys	--	--	--	540	--	-- mm SL	--	--	M	--	Taylor and McMichael (1983)
	Southern GOM (Campeche)	--	--	--	--	--	430-853 mm TL	--	363	F	273	Tuz-Sulub et al. (2006)
	Southern GOM (Campeche)	--	--	--	--	--	390-920 mm TL	--	363	M	90	Tuz-Sulub et al. (2006)
Snapper												
Queen	Caribbean	--	--	--	--	--	-- mm	--	309	F	191	Gobert et al. (2005)
	Caribbean	--	--	--	--	--	-- mm	--	309	M	118	Gobert et al. (2005)
Cubera	Belize	--	--	--	--	--	-- UNK	--	--	A	--	Heyman et al. (2005)
	Synthesis	--	--	--	654	--	-- mm UNK	--	--	A	--	Martinez-Andrade (2003)
	Cuba	--	--	--	536	--	-- mm UNK	--	--	A	--	Martinez-Andrade (2003)
Gray	Puerto Rico	--	--	--	230	--	-- mm UNK	--	--	F	--	Ault et al. (2008)

Species	Sampling location	t_{50}	L_{50}	L_{95}	L_m	L_{100}	Length range	t range	n	Sex	m	Reference
Gray	Florida (Key West)	--	--	--	100	240	-- mm SL	--	80	F	--	Domeier et al. (1996)
(continued)	Florida (Key West)	--	--	--	300	240	-- mm SL	--	80	F	--	Domeier et al. (1996)
	Florida (Key West)	--	--	--	100	240	-- mm SL	--	80	M	--	Domeier et al. (1996)
	Florida (Key West)	--	--	--	300	240	-- mm SL	--	80	M	--	Domeier et al. (1996)
	--	--	--	--	195	--	-- mm SL	--	--	--	--	Faunce and Serafy (2007)
	Puerto Rico	--	--	--	304	--	-- mm UNK	--	--	F	--	Ault et al. (2008)
	Eastern Venezuela	--	540	--	--	--	260-750 mm TL	--	592	F	292	Gomez et al. (1996)
	Eastern Venezuela	--	565	--	--	--	265-760 mm TL	--	592	M	300	Gomez et al. (1996)
Tilefish												
Blueline	Mid-Atlantic	--	--	--	500-525	600	156-800 mm TL	3-15	371	M	195	Ross and Merriner (1983); SEDAR (2004)
	Mid-Atlantic	--	--	--	426-450	500-526	200-775 mm TL	3-15	371	F	176	Ross and Merriner (1983); SEDAR (2004)
	Mid-Atlantic	--	--	--	--	400+	330-780 mm TL	--	1,451	M	480	Harris et al. (2004); SEDAR (2004)
	Mid-Atlantic	--	--	--	326-350	351-375	330-780 mm TL	--	1,451	F	616	Harris et al. (2004); SEDAR (2004)
	Mid-Atlantic	3	--	--	340	360	330-710 mm TL	2--	--	F	702	SEDAR (2013b)
	Mid-Atlantic	< 3	--	--	380	380	380-780 mm TL	3--	--	M	517	SEDAR (2013b)
	Mid & South Atlantic	1.71	305	--	--	--	300-800 mm FL	2-43	2,386	F	1,281	Kolmos et al. (2016)

Table 8. Length (L)-weight (W) parameters compiled through a literature review. Equation form and associated parameters (*a*, *b*) are given, with standard errors in parentheses where available, *n* is the sample size, and sex represents male (M), female (F), or both sexes (A). Possible length types in millimeters (mm) include total length (TL), fork length (FL), standard length (SL) or unknown (UNK). -- indicates no information available.

Species	Sampling location	Equation form	*a*	*b*	Length range	*n*	Sex	Reference
Grouper								
Warsaw	--	W = a * L ^ b	2.09E-05	2.98	-- mm UNK	--	--	Ault et al. (1998)
	Southeast US	W = a * TL ^ b	2.09E-05	2.98	-- mm TL	124	A	Manooch III and Mason (1987)
Scamp	--	W = a * L ^ b	2.02E-05	2.99	-- mm --	--	--	Ault et al. (1998)
	Eastern GOM	W = a * SL ^ b	1.10E-07	2.74	75-650 mm SL	1,216	A	Bullock and Smith (1991)
	Eastern GOM	W = a * FL ^ b	9.00E-09	3.07	-- mm FL	1,092	A	Bullock and Smith (1991)
	South Atlantic Bight	W= a * FL ^ b	2.46E-08	2.91	-- mm FL	693	A	Matheson III et al. (1986)
Yellowfin	--	W = a * L ^ b	2.82E-05	2.98	-- mm UNK	--	--	Ault et al. (1998)
	Cuba, SW	W = a * TL ^ b	1.32E-02	3.04	25-92 cm TL	54	--	Claro and Garcia-Arteaga (1994)
								Claro and Garcia-Arteaga (1994)
	Cuba, NE	W = a * TL ^ b	6.20E-03	3.25	29-57 cm TL	8	--	Claro and Garcia-Arteaga (2001)
	Bahamas	logW = a + b * logTL	-3.17	2.75	-- mm TL	170	A	Cushion (2010)
	Cuba, SW	W = a * TL ^ b	2.82E-05	2.98	310-690 mm TL	36	--	Claro et al. (2001)
Snapper								
Queen	Caribbean	W=a * FL ^ b	0.02748	2.83	-- cm FL	499	A	Gobert et al. (2005)
	Caribbean	W=a * TL ^ b	0.03006	2.81	-- cm FL	487	A	Gobert et al. (2005)
	St. Lucia	lnW = a + b * ln(TL)	-9.925	2.72	-- mm TL	62	A	Murray and Moore (1992)
	St. Lucia	lnW = a + b * ln(FL)	-9.67	2.77	-- mm FL	62	A	Murray and Moore (1992)
Blackfin	--	W = a * L ^ b	7.40E-06	2.97	-- mm UNK	--	--	Ault et al. (1998)
	Cuba, SE	W=a * L^ b	1.75E-05	3.02	19-74 cm FL	--	A	Espinosa and Pozo (1982)
	Caribbean (Costa Rica)	W=a * L^ b	1.42E-05	2.89	-- cm UNK	200	A	Tabash and Sierra (1996)
Cubera	--	W = a * L ^ b	1.32E-05	3.06	-- mm UNK	--	--	Ault et al. (1998)
	Cuba, SW	W = a * FL ^ b	9.26E-01	2.88	33-109 cm FL	107	A	Claro and Garcia-Arteaga (1994)
	Cuba, NE	W = a * FL ^ b	9.80E-03	3.12	25-99 cm FL	28	A	Claro and Garcia-Arteaga (2001)
Gray	--	W = a * L ^ b	3.05E-05	2.88	-- mm UNK	--	--	Ault et al. (1998)
	Cuba, SE	W = a * FL ^ b	1.03E-04	2.68	15-50 cm FL	769	F	Báez-Hidalgo and Álvarez-Lajonchere (1980)
	Cuba, SE	W = a * FL ^ b	1.70E-05	3.00	15-43 cm FL	519	M	Báez-Hidalgo and Álvarez-Lajonchere (1980)
	Florida	W = a * TL ^ b	7.22E-09	3.11	167-760 mm TL	10,705	A	Burton (2001)
	Florida	W = a * TL ^ b	7.13E-09	3.11	-- mm TL	10,705	M	Burton (2001)
	Florida	W = a * TL ^ b	6.95E-09	3.10	-- mm TL	10,705	F	Burton (2001)

Species	Sampling location	Equation form	*a*	*b*	Length range	*n*	Sex	Reference
Gray	Florida, North	W = a * TL ^ b	8.40E-09	3.08	181-760 mm TL	10,705	A	Burton (2001)
(continued)	Florida, South	W = a * TL ^ b	5.40E-09	3.15	167-618 mm TL	10,705	A	Burton (2001)
	Cuba, NE	W = a * FL ^ b	1.66E-02	2.96	11-40 cm FL	25	A	Claro and Garcia-Arteaga (2001)
	Cuba, SW	W = a * FL ^ b	2.07E-02	2.91	6-52 cm TL	956	A	Claro (1983)
	Florida (Key West)	W= a * SL ^ b	0.0281	3.00	-- cm SL	1,026	A	Domeier et al. (1996)
	Northern GOM (LA)	W = a * TL ^ b	2.04E-05	2.93	222-732 mm TL	441	M	Fischer et al. (2005)
	Northern GOM (LA)	W = a * TL ^ b	5.50E-05	2.77	254-756 mm TL	387	F	Fischer et al. (2005)
	Northern GOM (LA)	W = a * TL ^ b	3.31E-05	2.85	222-756 mm TL	933	A	Fischer et al. (2005)
	Cuba, SW	W = a * FL ^ b	1.82E-02	2.94	15-56 cm FL	1,499	A	Claro et al. (2001)
Silk	--	W = a * L ^ b	1.00E-05	3.10	-- mm UNK	--	--	Ault et al. (1998)
	Central Brazil	W=a * (TL) ^ b	0.0169	2.95	41.5-768 cm TL	65	A	Frota et al. (2004)
	Central Brazil	W=a * (SL) ^ b	0.0232	3.05	32-56 cm SL	34	A	Frota et al. (2004)
	Eastern Venezuela	W=a * (TL) ^ b	1.00E-05	3.02	260-760 mm TL	592	A	Gomez et al. (1996)
	SE Cuba	W=a * (FL) ^ b	1.66E-05	3.03	19-56 mm FL	--	A	Pozo and Espinosa (1982)
	US Virgin Islands, Anegada, Virgin Gorda	logW = a + b*logFL	-3.47058	2.41	33-67 cm FL	35	A	Sylvester and Dammann (1973)
	Caribbean (Costa Rica)	W=a * L ^ b	9.00E-05	2.91	180-50 mm UNK	200	A	Tabash and Sierra (1996)
Tilefish								
Blueline	Mid-Atlantic	logW = a + b * logTL	-12.286	3.14	-- mm TL	601	A	Ross and Huntsman (1982)
	Mid-Atlantic	logW = a + b * logTL	-11.495	3.02	-- mm TL	120	F	Ross and Huntsman (1982)
	Mid-Atlantic	logW = a + b * logTL	-10.498	3.30	-- mm TL	113	M	Ross and Huntsman (1982)
	Mid-Atlantic	W = a * TL ^ b	1.66E-05 (2.48E-06)	2.94 (0.02)	333-784 mm TL	1,306	A	SEDAR (2004)
	Mid-Atlantic	W = a * TL ^ b	2.43E-05 (6.56E-06)	2.88 (0.04)	385-784 mm TL	448	M	SEDAR (2004)
	Mid-Atlantic	W = a * TL ^ b	1.08E-05 (3.03E-06)	3.01 (0.04)	333-711 mm TL	662	F	SEDAR (2004)
	Mid-Atlantic	W = a * FL ^ b	1.24E-05 (2.14E-06)	3.01 (0.03)	312-725 mm FL	732	A	SEDAR (2004)
	Mid-Atlantic	W = a * FL ^ b	5.52E-06 (1.38E-06)	3.14 (0.04)	364-725 mm FL	345	M	SEDAR (2004)
	Mid-Atlantic	W = a * FL ^ b	4.75E-06 (1.33E-06)	3.17 (0.04)	312-661 mm FL	304	F	SEDAR (2004)
	Mid-Atlantic	W = a * SL ^ b	5.47E-05 (8.38E-06)	2.84 (0.03)	262-640 mm SL	1,156	A	SEDAR (2004)
	Mid-Atlantic	W = a * SL ^ b	6.11E-05 (1.50E-05)	2.82 (0.04)	308-640 mm SL	449	M	SEDAR (2004)

Species	Sampling location	Equation form	*a*	*b*	Length range	*n*	Sex	Reference
Blueline (continued)	Mid-Atlantic	W = a * SL ^ b	2.87E-06 (9.10E-07)	3.32 (0.05)	262-586 mm SL	582	F	SEDAR (2004)
	Mid & South Atlantic	logW = a + b * logFL	-18.85 (0.10)	3.11 (0.02)	220-833 mm FL	1,113	A	SEDAR (2013b)
	Mid & South Atlantic	logW = a + b * logTL	-18.76 (0.10)	3.07 (0.02)	267-884 mm TL	1,708	A	SEDAR (2013b)
	Mid & South Atlantic	logW = a + b * logSL	-17.11 (0.12)	2.90 (0.02)	262-650 mm SL	1,302	A	SEDAR (2013b)

Table 9. Length-length parameters compiled through a literature review. Parameters are as defined in the Table 7 caption.

Species	Sampling location	Equation form	a	b	Length range	Sex	*n*	Reference
Grouper								
Scamp	South Atlantic Bight	FL = a + b * TL	23.63	0.870	-- mm UNK	A	33	Matheson III et al. (1986)
Snapper								
Queen	Caribbean	TL = a + b * FL	2.75	1.164	-- cm UNK	A	842	Gobert et al. (2005)
	Caribbean	FL = a + b * TL	-1.00	0.837	-- cm UNK	A	842	Gobert et al. (2005)
	St. Lucia	FL = a + b * TL	-9.86	1.159	-- mm UNK	A	394	Murray and Moore (1992)
Cubera	Synthesis	TL = a + b * FL	0.00	1.023	-- mm UNK	A	--	Martinez-Andrade (2003)
	Synthesis	TL = a + b * SL	0.00	1.178	-- mm UNK	A	--	Martinez-Andrade (2003)
Gray	Northern GOM (LA)	TL = a + b * FL	8.35	1.048	222-756 mm TL	A	275	Fischer et al. (2005)
Tilefish								
Blueline	Mid-Atlantic	SL = a + b * TL	-19.21	0.864	-- mm UNK	A	--	Ross and Huntsman (1982)
	Mid-Atlantic	TL = a + b * FL	-2.28 (1.10)	1.068 (0.002)	312-725 mm FL	A	820	SEDAR (2004)
	Mid-Atlantic	TL = a + b * FL	-2.61 (1.67)	1.067 (0.003)	364-725 mm FL	M	375	SEDAR (2004)
	Mid-Atlantic	TL = a + b * FL	-2.82 (1.79)	1.069 (0.004)	312-661 mm FL	F	334	SEDAR (2004)
	Mid-Atlantic	TL = a + b * SL	22.19 (210)	1.178 (0.050)	262-640 mm SL	A	1,239	SEDAR (2004)
	Mid-Atlantic	TL = a + b * SL	23.97 (3.29)	1.177 (0.007)	308-640 mm SL	M	480	SEDAR (2004)
	Mid-Atlantic	TL = a + b * SL	24.38 (3.58)	1.168 (0.008)	262-586 mm SL	F	580	SEDAR (2004)
	Mid-Atlantic	FL = a + b * TL	4.09 (1.12)	0.933 (0.002)	333-775 mm TL	A	821	SEDAR (2004)
	Mid-Atlantic	FL = a + b * TL	4.15 (1.55)	0.934 (0.003)	385-775 mm TL	M	375	SEDAR (2004)
	Mid-Atlantic	FL = a + b * TL	5.76 (2.35)	0.929 (0.005)	333-711 mm TL	F	337	SEDAR (2004)
	Mid-Atlantic	FL = a + b * SL	28.09 (2.12)	1.092 (0.005)	262-633 mm SL	A	810	SEDAR (2004)
	Mid-Atlantic	FL = a + b * SL	30.02 (3.30)	1.090 (0.007)	308-633 mm SL	M	375	SEDAR (2004)
	Mid-Atlantic	FL = a + b * SL	30.14 (3.72)	1.083 (0.009)	262-586 mm SL	F	305	SEDAR (2004)
	Mid-Atlantic	SL = a + b * TL	-11.15 (1.76)	0.836 (0.003)	333-778 mm TL	A	1,258	SEDAR (2004)
	Mid-Atlantic	SL = a + b * TL	-12.36 (2.86)	0.836 (0.005)	385-784 mm TL	M	481	SEDAR (2004)
	Mid-Atlantic	SL = a + b * TL	-10.94 (2.75)	0.837 (0.005)	333-711 mm TL	F	611	SEDAR (2004)
	Mid-Atlantic	SL = a + b * FL	-17.58 (2.10)	0.900 (0.004)	312-725 mm FL	A	818	SEDAR (2004)
	Mid-Atlantic	SL = a + b * FL	-19.77 (3.14)	0.902 (0.006)	364-725 mm TL	M	376	SEDAR (2004)
	Mid-Atlantic	SL = a + b * FL	--	--	-- mm FL	F		SEDAR (2004)
	Southeast US	FL = a + b * TL	1.32 (0.88)	0.940 (0.002)	267-884 mm TL	A	1,335	SEDAR (2013b)
	Southeast US	FL = a + b * SL	28.28 (1.69)	1.090 (0.004)	262-672 mm SL	A	1,074	SEDAR (2013b)
	Southeast US	TL = a + b * FL	0.66 (0.93)	1.060 (0.002)	220-833 mm FL	A	1,335	SEDAR (2013b)
	Southeast US	TL = a + b * SL	25.22 (1.91)	1.170 (0.004)	262-672 mm SL	A	1,523	SEDAR (2013b)
	Southeast US	TL = a + b * FL	--	--	200-900 mm FL	A	2,277	Schmidtke and Jones (2016)

Table 10. Total (*Z*), natural (*M*), and fishing (*F*) mortality estimates compiled through a literature review. Estimation method is given, as well as age (*t*) ranges where available, sex represents both male and female (A), and *n* is the sample size.

Species	Sampling location	*Z*	*M*	*F*	Mortality estimation method	*t*	Sex	*n*	Reference
Grouper									
Warsaw	--	--	0.08	--	--	--	A	--	Ault et al. (1998)
Scamp	--	--	0.14	--	--	--	A	--	Ault et al. (1998)
Yellowfin	--	--	0.18	--	--	--	A	--	Ault et al. (1998)
	Puerto Rico	0.22	0.12	0.10	--	--	A	--	Ault et al. (2008)
	Jamaica	--	0.42	--	Beverton and Holt (1956)	--	A	--	Munro and Williams (1985)
	Jamaica	--	0.23-0.61	--	Beverton and Holt (1956)	--	A	--	Thompson and Munro (1978)
Snapper									
Queen	St. Lucia	1.87	--	--	length converted catch curve, ELEFAN	--	A	--	Murray and Moore (1992)
Blackfin	--	--	0.23	--	--	--	A	--	Ault et al. (1998)
	Caribbean (Costa Rica)	1.19	0.73	0.46	Electronic LEngth Frequency ANalysis (ELEFAN) IV	--	A	--	Tabash and Sierra (1996)
Cubera	--	--	0.15	--	--	--	A	--	Ault et al. (1998)
	Synthesis	--	0.31	--	averaging existing parameters	--	A	--	Martinez-Andrade (2003)
	Cuba	--	0.46	--	--	--	A	--	Martinez-Andrade (2003)
Gray	--	--	0.30	--	--	--	A	--	Ault et al. (1998)
	Puerto Rico	0.54	0.11	0.43	--	--	A	--	Ault et al. (2008)
	Florida, North	--	0.18	--	Hoenig (1983)	--	A	--	Burton (2001)
	Florida, South	--	0.29	--	Hoenig (1983)	--	A	--	Burton (2001)
	Florida, North	--	0.33	--	Hoenig (1983) (corrected for sample size)	--	A	--	Burton (2001)
	Florida, South	--	0.35	--	Hoenig (1983) (corrected for sample size)	--	A	--	Burton (2001)
	Florida, North	--	0.43	--	Pauly (1980)	--	A	--	Burton (2001)
	Florida, South	--	0.38	--	Pauly (1980)	--	A	--	Burton (2001)
	Florida, North	--	0.37	--	Ralston (1987) (linear regression)	--	A	--	Burton (2001)
	Florida, South	--	0.29	--	Ralston (1987) (linear regression)	--	A	--	Burton (2001)
	Florida, North	0.35	--	--	catch curves	--	A	--	Burton (2001)
	Florida, South	0.94	--	--	catch curves	--	A	--	Burton (2001)
	Northern GOM (LA)	0.18	--	--	catch curve	28	A	--	Fischer et al. (2005)
	Northern GOM (LA)	--	0.15	--	Hoenig (1983)	--	A	--	Fischer et al. (2005)
	Northern GOM (LA)	--	0.30	--	Hoenig (1983) (corrected for sample size)	--	A	--	Fischer et al. (2005)
	Northern GOM (LA)	--	0.40	--	Ralston (1987) (linear regression)	--	A	--	Fischer et al. (2005)
	Northern GOM (LA)	--	0.51	--	Pauly (1980)	--	A	--	Fischer et al. (2005)

Species	Sampling location	*Z*	*M*	*F*	Mortality estimation method	*t*	Sex	*n*	Reference
Silk (continued)	--	--	0.23	--	--	--	A	--	Ault et al. (1998)
	Puerto Rico	0.59	0.33	0.26	--	--	A	--	Ault et al. (2008)
	Caribbean (Costa Rica)	1.26	0.86	0.30	Electronic LEngth Frequency ANalysis (ELEFAN) IV	--	A	--	Tabash and Sierra (1996)
Tilefish									
Blueline	Mid-Atlantic	0.22	0.30		catch curve; M - using Hoenig (1983) for fish regression	15	A	283	Ross and Huntsman (1982)
	Mid-Atlantic		0.11		Hoenig (1983) for fish regression	42	A	406	SEDAR (2004); data from Harris et al. (2004)
	Mid-Atlantic		0.11		Hoenig (1983) for fish regression	40	A	400	SEDAR (2004); data from Harris et al. (2004)
	Mid-Atlantic		0.11		Hoenig (1983) for fish regression	42	A	923	SEDAR (2004); data from Harris et al. (2004)

Table 11. Summary of steepness (*h*) and recruitment variability (SigmaR) used in previous assessments for groupers, snappers, tilefish, and amberjacks. Regions include South Atlantic (SA), Gulf of Mexico (GOM), the southeast U.S. (SE US), and the U.S. Caribbean (Cari). Type identifies whether steepness was calculated (Calc), estimated (Est), or fixed (Fix). -- indicates no data available. Note that all steepness formulations correspond to a Beverton-Holt stock-recruitment curve (Beverton and Holt 1957).

Species	Region	Type	*h*	Other runs	*h* range	sigmaR	Notes	Reference
Grouper								
Goliath (*Epinephelus itajara*)	SA/GOM	Calc	0.85	--	0.70-0.99	--		SEDAR (2011d)
Red (*Epinephelus morio*)	GOM	Est	0.80	0.65, 0.98	0.40-0.99	0.97 (0.12 SD)	Prior value of 0.83 from Shertzer and Conn (2012)	SEDAR (2015a)
	SA	Est	0.91	--	0.76-0.97	0.41	Prior value of 0.72 from SEFSC (2009)	SEDAR (2010b)
Snowy (*Hyporthodus niveatus*)	SA	Fix	0.84	0.70, 0.74, 0.94	0.32-0.99	0.55	Fixed at 0.84 from Shertzer and Conn (2012)	SEDAR (2013c)
Yellowedge (*Hyporthodus flavolimbatus*)	GOM	Est	0.95	0.60, 0.65, 0.70	0.30 - 0.99	0.2	Prior value of 0.7 from Shertzer and Conn (2012)	SEDAR (2011c)
Black (*Mycteroperca bonaci*)	SA/GOM	Est	0.84	0.6, 0.65, 0.7, 0.75, 0.8, 0.85, 0.9, 0.95	0.60-0.85	--		SEDAR (2010a)
Gag (*Mycteroperca microlepis*)	GOM	Est	0.99	0.7, 0.95, 0.85	0.50-0.99	0.6	Prior value of 0.7 from Shertzer and Conn (2012)	SEDAR (2014c)
	SA	Fix	0.84	0.74, 0.94	0.30-0.99	0.6	Fixed at 0.84 from Shertzer and Conn (2012)	SEDAR (2014a)
Snapper								
Mutton (*Lutjanus analis*)	SA/GOM	Est	0.81	--	0.40-0.99	--		O'Hop et al. (2015)
	SA/GOM	Fix	0.75	0.65, 0.8	0.65-0.96	0.5		SEDAR (2008b)
Red	GOM	Fix	0.99	--	0.30-0.99	0.3		SEDAR (2014b)
(*Lutjanus campechanus*)	GOM	Fix	0.99	0.8	0.30-0.99	0.3		SEDAR (2013a)
	SA	Fix	0.85	0.97, 0.95, ~1	0.60-0.99	0.6?	Fixed at 0.85 from SEFSC (2010)	SEDAR (2010c)
Yellowtail	SA/GOM	Est	0.70	--	0.50-0.99	--		O'Hop et al. (2012)
(*Ocyurus chrysurus*)	CARI	–	–	--	0.79-0.91	--		SEDAR (2005b)
	SE US	Est	0.80	0.7, 0.8, 0.9	0.21 - 0.99	0.19	Prior value of 0.8 assigned based on Rose et al. (2001)	Muller et al. (2003)

Species	Region	Type	*h*	Other runs	*h* range	sigmaR	Notes	Reference
Vermilion (*Rhomboplites aurorubens*)	SA	Est	0.71	0.56	0.52-0.90	0.75		SEDAR (2008c)
	GOM	Calc	1.00	--	--	0.4		SEDAR (2011a)
	SA	Fix	0.56	0.47, 0.53, 0.67, 0.73	0.45-0.95	0.75		SEDAR (2012)
Tilefish								
Blueline (*Caulolatilus microps*)	SA	Fix	0.8	0.70, 0.95	0.32-0.99	0.367	Fixed at value based on Myers et al. (2002), Shertzer and Conn (2012), and SEDAR (2011e)	SEDAR (2013b)
Golden (*Lopholatilus chamaeleonticeps*)	SA	Fix	0.8	0.74, 0.94	0.3-1.0	0.4 (0.2-0.76)	Fixed at 0.84 from Shertzer and Conn (2012)	SEDAR (2011e)
	GOM	Est	0.9	0.75, 0.95	0.6-0.99	0.15 (0.01-0.3)		SEDAR (2011b)
Amberjack								
Greater (*Seriola dumerili*)	GOM	Est	0.84	0.8	0.50-0.99	0.6		SEDAR (2014d)
	SA	Est	0.74	--	0.55-0.95	--		SEDAR (2008a)

Table 12. The availability (presence indicated by X) on the commercial logbook reporting forms for the managed species that have not yet been assessed.

Year	Scamp	Warsaw Grouper	Yellowfin Grouper	Blackfin Snapper	Cubera Snapper	Gray Snapper (Mangrove)	Queen Snapper	Silk Snapper	Blueline Tilefish	Goldface Tilefish	Banded Rudderfish
1990	X	X	X			X	X	X			
1991	X	X	X			X	X	X			
1992	X	X	X			X	X	X			X
1993	X	X	X			X	X	X			
1994	X		X	X	X	X	X	X	X		X
1995	X	X	X	X		X	X	X	X		X
1996	X	X	X	X		X	X	X	X		X
1997	X	X	X	X		X	X	X	X		X
1998	X	X	X	X		X	X	X	X		X
1999	X	X	X	X		X	X	X	X		X
2000	X		X	X		X	X	X	X		X
2001	X		X	X		X	X	X	X		X
2002	X		X	X		X	X	X	X		X
2003	X		X	X		X	X	X	X		X
2004	X		X	X		X	X	X	X		X
2005	X		X	X		X	X	X	X		X
2006	X		X	X		X	X	X	X		X
2007	X		X	X		X	X	X	X		X
2008	X		X	X		X	X	X	X		X
2009	X		X	X		X	X	X	X		X
2010	X	X	X	X		X	X	X	X		X
2011	X	X	X	X		X	X	X	X		X
2012	X	X	X	X		X	X	X	X		X
2013	X	X	X	X		X	X	X	X		X
2014	X	X	X	X		X	X	X	X		X

Table 13. Summary of commercial landings (in pounds) between 1986 and 2015 for the managed species that have not yet been assessed. Note that *Lutjanus griseus* has been reported as both Mangrove Snapper and Gray Snapper in the Annual Landings System (same species reporting under different NMFS Codes), and are reported as Gray Snapper within this report. Nyear refers to the number of years where the species was landed. Total refers to the total landings summed across years.

Species	Nyear	Annual Commercial Landings			
		Min	Mean	Max	Total
Scamp	30	169,543	296,615	383,233	8,898,451
Warsaw Grouper	30	59,305	140,869	272,509	4,226,073
Yellowfin Grouper	30	690	28,231	423,212	846,932
Blackfin Snapper	29	10	3,551	10,244	102,977
Cubera Snapper	25	350	1,386	4,468	34,657
Gray Snapper	30	112,307	245,452	528,289	7,363,556
Queen Snapper	30	2,234	20,210	65,287	606,294
Silk Snapper	30	20,236	65,042	317,750	1,951,253
Blueline Tilefish	28	31	84,761	180,393	2,373,320
Goldface Tilefish	23	2	20,467	90,423	470,738
Banded Rudderfish	25	1,352	11,682	24,828	292,050

Table 14. Summary of percent positive trips (PP) and discards (pounds, whole weight) from the Commercial Logbook dataset between 2003 and 2014. Nyear refers to the number of years where the species was reported as present. Total refers to the total number discarded summed across years. Mean values above 2.5% positive trips (bolded) may warrant calculation of discards based on the criteria discussed at SEDAR 49. – indicates no data available.

Species	Source	Nyear	Mean PP	Catch			
				Min	Max	Mean	Total
Scamp	Diving	10	**2.8**	1	20	8	76
	Handline	13	**4.3**	192	4,540	760	9,886
	Longline	12	2.2	1	202	32	382
	Trap	3	7.5	2	136	47	141
Warsaw Grouper	Handline	12	1.1	1	1,262	178	2,130
	Longline	2	5.5	1	184	93	185
Yellowfin Grouper	Handline	1	0.4	102	102	102	102
	Longline	3	0.4	4	9	6	19
Blackfin Snapper	Handline	3	0.1	4	11	7	22
Cubera Snapper	Handline	1	0.1	5	5	5	5
Gray Snapper	Diving	8	**7.8**	3	163	59	469
	Handline	13	1.3	10	5,916	589	7,652
	Longline	2	0.6	4	6	5	10
	Trap	2	7.1	3	300	152	303
	Troll	1	4.7	27	27	27	27
Queen Snapper	Handline	1	0.1	1	1	1	1
Silk Snapper	Handline	3	0.2	8	50	26	77
	Trap	1	5.0	400	400	400	400
Goldface Tilefish	–	–	–	–	–	–	–
Blueline Tilefish	Handline	5	0.2	6	200	66	323
	Longline	8	**3.4**	593	4,517	1,436	11,488
Banded Rudderfish	Handline	8	0.1	4	64	36	289
	Longline	1	0.5	12	12	12	12

Table 15. Summary of observer coverage for the Gulf of Mexico bandit reel, handline, and longline reef fish fisheries from 2006–2016 and the shrimp fishery from 1997–2016.

Year	Bandit			Handline			Longline			Shrimp	
	N sets sampled	Soak time (hrs)	N hooks set	N sets sampled	Soak time (hrs)	N hooks set	N sets sampled	Soak time (hrs)	N hooks set	N tows sampled	Tow time (hrs)
1997	-	-	-	-	-	-	-	-	-	50	261
1998	-	-	-	-	-	-	-	-	-	25	337
1999	-	-	-	-	-	-	-	-	-	1,193	5,981
2000	-	-	-	-	-	-	-	-	-	1,284	7,304
2001	-	-	-	-	-	-	-	-	-	1,505	8,263
2002	-	-	-	-	-	-	-	-	-	5,324	27,308
2003	-	-	-	-	-	-	-	-	-	2,567	13,525
2004	-	-	-	-	-	-	-	-	-	2,371	13,049
2005	-	-	-	-	-	-	-	-	-	2,066	10,743
2006	1,083	791	30,992	49	39	493	201	946	204,000	1,795	8,161
2007	2,422	1,803	72,552	505	430	3,540	192	1,064	235,000	2,080	10,798
2008	1,350	1,028	37,210	298	158	9,613	109	429	94,206	3,328	17,083
2009	1,362	774	35,157	278	348	1,938	686	3,636	654,539	3,314	18,223
2010	2,177	1,103	35,635	181	211	5,214	1,448	5,777	922,512	2,533	12,754
2011	3,335	1,963	119,019	738	440	9,349	2,332	8,640	1,561,199	3,504	17,868
2012	9,703	5,167	309,356	1,282	949	19,426	524	1,790	361,396	3,790	17,218
2013	3,687	1,693	100,017	1,013	610	15,867	2,136	8,037	1,494,335	4,899	20,881
2014	3,405	1,774	84,535	913	432	8,377	858	3,419	616,582	4,506	21,467
2015	6,668	3,347	192,706	1,485	703	7,694	719	2,927	518,194	3,689	17,762
2016	1,012	561	20,814	130	97	1,521	273	1,194	211,712	280	2,006

Table 16. Summary of occurrence (i.e., percent positive sets) in observer datasets for the Gulf of Mexico bandit reel, handline, and longline reef fish fisheries from 2006–2016 and the shrimp fishery from 1997–2016. Nyear refers to the number of years where each species was recorded. Total sets refers to the number of sets where the species occurred. Total Catch refers to the total number caught across years. *Potential* species-gear combinations for discard estimation are highlighted in bold (mean occurrence in sets > 2.5% as per SEDAR 49), although additional data filtering may alter the numbers. Note that little to no data were available for any species from the Shark Bottom Longline Observer Program.

Species	Gear	Nyear	Sets				Mean	Catch			
			Min	Max	Mean	Total	PP	Min	Max	Mean	Total
Scamp	Bandit	11	66	833	237	2,609	**7.3**	102	1,458	410	4,514
	Handline	11	2	84	21	231	**3.8**	2	187	41	456
	Longline	11	14	679	227	2,492	**23.2**	51	2,712	782	8,598
	Shrimp	2	0	1	0	2	0.0	0	1	0	2
Warsaw	Bandit	11	2	30	11	121	0.4	2	32	15	163
Grouper	Handline	6	0	2	1	9	0.2	0	2	1	9
	Longline	10	0	32	12	137	2.2	0	45	16	178
	Shrimp	2	0	1	0	2	0.0	0	1	0	2
Yellowfin	Bandit	2	0	2	0	3	0.0	0	2	0	4
Grouper	Handline	1	0	2	0	2	0.0	0	2	0	2
	Longline	1	0	3	0	3	0.0	0	3	0	3
Blackfin	Bandit	6	0	24	6	68	0.2	0	87	21	226
Snapper	Handline	2	0	3	0	4	0.0	0	4	1	7
	Longline	4	0	32	7	75	0.5	0	705	97	1,070
Cubera	Bandit	3	0	1	0	3	0.0	0	1	0	3
Snapper	Longline	6	0	3	1	10	0.1	0	3	1	11
	Shrimp	3	0	2	0	5	0.0	0	9	1	14
Gray	Bandit	11	29	271	99	1,090	**3.2**	41	497	163	1,798
Snapper	Handline	11	8	117	42	459	**8.4**	17	566	168	1,851
	Longline	11	5	200	68	747	**9.3**	6	261	98	1,075
	Shrimp	6	0	7	1	14	0.0	0	16	1	25
Queen	Bandit	7	0	17	5	57	0.2	0	198	26	284
Snapper	Handline	1	0	1	0	1	0.0	0	1	0	1
	Longline	8	0	20	7	80	0.6	0	94	25	279
	Shrimp	1	0	1	0	1	0.0	0	1	0	1
Silk	Bandit	7	0	34	8	89	0.2	0	297	53	586
Snapper	Handline	1	0	1	0	1	0.0	0	7	1	7
	Longline	9	0	31	8	93	0.8	0	215	32	354
Blueline	Bandit	9	0	60	12	130	0.4	0	111	21	236
Tilefish	Handline	1	0	15	1	15	0.1	0	19	2	19
	Longline	9	0	225	78	858	**9.2**	0	2,810	1,073	11,805
	Shrimp	1	0	4	0	4	0.0	0	10	1	10
Goldface	Bandit	8	0	19	5	60	0.1	0	21	6	66
Tilefish	Handline	2	0	6	1	7	0.1	0	6	1	7
	Longline	6	0	6	1	15	0.1	0	12	2	24
Banded	Bandit	11	3	215	51	558	1.4	6	447	159	1,753
Rudderfish	Handline	8	0	20	6	64	0.9	0	290	36	399
	Longline	8	0	60	19	209	2.0	0	125	38	423
	Shrimp	1	0	9	0	9	0.0	0	14	1	14

Table 17. Bycatch in the offshore shrimp fishery as total number landed (Catch) and total number of positive tows (Positive Tows). Note that no species meet the criteria for inclusion (i.e., > 400 positive tows and > 2,000 total catch).

Common Name	Scientific Name	Positive Tows	Catch
Scamp	*Mycteroperca phenax*	18	28
Warsaw Grouper	*Hyporthodus nigritus*	0	0
Yellowfin Grouper	*Mycteroperca venenosa*	1	1
Blackfin Snapper	*Lutjanus buccanella*	0	0
Cubera Snapper	*Lutjanus cyanopterus*	0	0
Gray Snapper	*Lutjanus griseus*	59	203
Queen Snapper	*Etelis oculatus*	3	18
Silk Snapper	*Lutjanus vivanus*	1	1
Blueline Tilefish	*Caulolatilus microps*	52	464
Goldface Tilefish	*Caulolatilus chrysops*	9	29
Banded Rudderfish	*Seriola zonata*	17	31

Table 18. Summary of trips and catch (in pounds) for the Southeast Regional Headboat Survey dataset between 1986 and 2015. Nyear refers to the number of years where the species was reported as present. Total refers to the total catch summed across years. Additional data filtering may alter the numbers.

Species	Nyear	Trips			Catch			
		Min	Max	Mean	Min	Max	Mean	Total
Scamp	30	319	1,024	632	2,533	23,041	9,083	272,493
Warsaw Grouper	30	45	454	188	1,204	41,084	7,239	217,181
Yellowfin Grouper	23	1	15	4	3	414	113	2,596
Blackfin Snapper	30	3	24	9	18	1,349	310	9,288
Cubera Snapper	29	1	18	9	4	5,157	722	20,951
Gray Snapper	30	718	2,333	1,386	26,554	151,730	72,489	2,174,661
Queen Snapper	9	1	13	4	1	1,379	286	2,577
Silk Snapper	30	1	26	10	2	1,527	208	6,231
Blueline Tilefish	28	1	77	17	4	12,120	887	24,836
Goldface Tilefish	10	1	5	3	1	52	18	177
Banded Rudderfish	29	2	705	262	47	50,344	16,176	469,099

Table 19. Summary of recreational landings (in pounds) between 1981 and 2015 for the managed species that have not yet been assessed from the Marine Recreational Fisheries Statistics Survey. Nyear refers to the number of years where the species was landed. Total refers to the total landings summed across years. Additional data filtering may alter the numbers.

Species	Annual Recreational Landings				
	Nyears	Min	Mean	Max	Total
Scamp	35	5,638	66,578	165,921	2,330,246
Warsaw Grouper	34	1,219	106,809	980,525	3,631,512
Yellowfin Grouper	15	151	8,118	33,594	121,776
Blackfin Snapper	10	11	173	732	1,725
Cubera Snapper	28	189	68,963	504,569	1,930,960
Gray Snapper	35	627,288	1,535,067	5,847,951	53,727,336
Queen Snapper	14	41	8,341	64,503	116,768
Silk Snapper	27	76	179,783	3,900,752	4,854,144
Blueline Tilefish	19	113	10,208	42,514	193,944
Goldface Tilefish	-	-	-	-	-
Banded Rudderfish	26	369	79,113	505,363	2,056,938

Table 20. Summary of recreational discards (in number) between 1981 and 2015 from the Marine Recreational Fisheries Statistics Survey. Nyear refers to the number of years where the species was reported as present. Total refers to the total discards summed across years. Additional data filtering may alter the numbers.

Species	Annual Recreational Discards				
	Nyears	Min	Mean	Max	Total
Scamp	34	629	19,373	77,747	658,695
Warsaw Grouper	14	24	2,336	7,928	32,703
Yellowfin Grouper	10	17	2,998	20,764	29,985
Blackfin Snapper	2	125	1,074	2,024	2,149
Cubera Snapper	13	28	12,671	101,824	164,717
Gray Snapper	35	170,983	2,876,395	7,570,175	100,673,809
Queen Snapper	5	38	2,767	8,229	13,835
Silk Snapper	10	33	6,440	43,116	64,396
Blueline Tilefish	10	7	806	3,556	8,063
Goldface Tilefish	-	-	-	-	-
Banded Rudderfish	22	397	26,363	147,672	579,994

Table 21. Occurrence (i.e., percent positive) of Scamp in fishery-independent surveys conducted in the Gulf of Mexico. Data sources which may produce an index of abundance are highlighted in bold. For the SEAMAP Plankton survey, * indicates that larvae cannot be identified to species level and/or are not caught in any numbers. – indicates no data available. Additional data filtering may alter the numbers.

Year	Mississippi Laboratory					Panama City
	SEAMAP Groundfish	NMFS Bottom Longline	**Reef Fish Video**	NMFS Small Pelagics	SEAMAP Plankton	**Video**
1986	–	–	**–**	–	*	**–**
1987	0.0	–	**–**	–	*	**–**
1988	0.0	–	**–**	–	–	**–**
1989	0.0	–	**–**	–	–	**–**
1990	0.2	–	**–**	–	*	**–**
1991	0.2	–	**–**	–	*	**–**
1992	0.0	–	**36.2**	–	–	**–**
1993	0.0	–	**23.3**	–	*	**–**
1994	0.2	–	**18.3**	–	*	**–**
1995	0.0	0.0	**19.4**	–	*	**–**
1996	0.0	0.0	**20.0**	–	*	**–**
1997	0.0	0.0	**21.3**	–	*	**–**
1998	0.0	–	**–**	–	–	**–**
1999	0.0	0.0	**–**	–	*	**–**
2000	0.0	0.0	**–**	–	*	**–**
2001	0.0	0.0	**30.1**	–	*	**–**
2002	0.2	0.5	**45.1**	0.0	–	**–**
2003	0.2	1.1	**56.2**	0.0	*	**–**
2004	0.2	2.0	**34.7**	0.0	–	**–**
2005	0.4	2.1	**34.5**	–	–	**–**
2006	0.4	0.0	**21.8**	0.0	*	**36.6**
2007	0.0	0.6	**33.1**	0.0	*	**43.1**
2008	0.7	0.9	**30.5**	0.6	–	**48.2**
2009	1.1	0.0	**26.1**	0.0	*	**46.5**
2010	0.6	0.0	**32.2**	0.0	*	**37.8**
2011	0.5	0.0	**31.5**	0.8	*	**23.1**
2012	2.8	2.1	**22.8**	0.0	*	**14.7**
2013	1.9	0.0	**30.9**	0.0	–	**24.5**
2014	1.0	0.0	**32.7**	–	–	**25.6**
2015	–	–	**–**	–	–	**24.8**
Mean	0.4	0.5	**30.0**	0.1	–	**33.3**

Table 22. Occurrence (i.e., percent positive) of Gray Snapper in fishery-independent surveys conducted in the Gulf of Mexico. Data sources which may produce an index of abundance are highlighted in bold. – indicates no data available. Additional data filtering may alter the numbers.

	Mississippi Laboratory					Panama City
Year	SEAMAP Groundfish	NMFS Bottom Longline	**Reef Fish Video**	NMFS Small Pelagics	SEAMAP Plankton	**Video**
1986	–	–	**–**	–	2.9	**–**
1987	0.0	–	**–**	–	5.3	**–**
1988	0.0	–	**–**	–	–	**–**
1989	0.0	–	**–**	–	–	**–**
1990	0.2	–	**–**	–	1.4	**–**
1991	0.0	–	**–**	–	6.8	**–**
1992	0.2	–	**16.2**	–	–	**–**
1993	0.2	–	**12.6**	–	1.0	**–**
1994	0.0	–	**15.0**	–	0.0	**–**
1995	0.2	0.0	**18.4**	–	0.9	**–**
1996	0.0	0.0	**11.0**	–	1.7	**–**
1997	0.0	0.0	**14.0**	–	3.5	**–**
1998	0.0	–	**–**	–	–	**–**
1999	0.4	0.0	**–**	–	0.0	**–**
2000	0.6	0.0	**–**	–	1.8	**–**
2001	0.0	0.4	**7.2**	–	4.6	**–**
2002	0.2	0.0	**11.6**	0.0	–	**–**
2003	0.0	0.4	**6.6**	0.0	9.5	**–**
2004	0.2	0.8	**9.6**	0.0	–	**–**
2005	0.9	0.0	**5.0**	–	–	**–**
2006	0.0	0.0	**6.8**	0.0	5.4	**43.7**
2007	0.2	0.0	**4.3**	2.1	10.9	**51.0**
2008	0.6	0.0	**7.1**	1.8	–	**41.2**
2009	5.7	0.5	**8.8**	1.6	5.0	**50.5**
2010	7.6	0.0	**7.6**	2.2	0.9	**49.0**
2011	5.1	0.0	**8.2**	4.6	3.6	**34.0**
2012	7.5	0.7	**6.5**	0.9	11.5	**41.3**
2013	7.0	0.0	**7.2**	2.6	–	**27.7**
2014	11.6	0.0	**5.4**	–	–	**40.2**
2015	–	–	**–**	–	–	**41.4**
Mean	1.7	0.1	**9.5**	1.4	4.0	**42.0**

Table 23. Occurrence (i.e., percent positive) of Warsaw Grouper in fishery-independent surveys conducted in the Gulf of Mexico. Development of an index for any data source seems unlikely given the low occurrence. For the SEAMAP Plankton survey, * indicates that larvae cannot be identified to species level and/or are not caught in any numbers. – indicates no data available.

	Mississippi Laboratory				
Year	SEAMAP Groundfish	NMFS Bottom Longline	Reef Fish Video	NMFS Small Pelagics	SEAMAP Plankton
1986	–	–	–	–	*
1987	0	–	–	–	*
1988	0	–	–	–	–
1989	0	–	–	–	–
1990	0	–	–	–	*
1991	0.2	–	–	–	*
1992	0	–	0	–	–
1993	0	–	0	–	*
1994	0	–	0.8	–	*
1995	0	0	0	–	*
1996	0	0	0	–	*
1997	0	0	0.3	–	*
1998	0	–	–	–	–
1999	0	0	–	–	*
2000	0	0	–	–	*
2001	0	1.1	1.3	–	*
2002	0	1.4	0.4	0	–
2003	0	0	1.5	0	*
2004	0	1.6	0.8	1	–
2005	0	4.2	1	–	–
2006	0	0	0.6	0	*
2007	0	0.6	0	0	*
2008	0	2.8	0.5	0	–
2009	0.2	1.1	0.8	0	*
2010	0.1	1.3	1.2	0	*
2011	0	1.6	0.9	0.8	*
2012	0	0.7	0.8	0.9	*
2013	0	0	1.4	0	–
2014	0	0	0.5	–	–
Mean	0.0	0.9	0.6	0.2	–

Table 24. Occurrence (i.e., percent positive) of Yellowfin Grouper in fishery-independent surveys conducted in the Gulf of Mexico. Development of an index for any data source seems unlikely given the low occurrence. For the SEAMAP Plankton survey, * indicates that larvae cannot be identified to species level and/or are not caught in any numbers. – indicates no data available.

	Mississippi Laboratory				
Year	SEAMAP Groundfish	NMFS Bottom Longline	Reef Fish Video	NMFS Small Pelagics	SEAMAP Plankton
1986	–	–	–	–	*
1987	0	–	–	–	*
1988	0	–	–	–	–
1989	0	–	–	–	–
1990	0	–	–	–	*
1991	0	–	–	–	*
1992	0	–	0.8	–	–
1993	0	–	0.6	–	*
1994	0	–	0.8	–	*
1995	0	0	0	–	*
1996	0	0	0.7	–	*
1997	0	0	1.7	–	*
1998	0	–	–	–	–
1999	0	0	–	–	*
2000	0	0	–	–	*
2001	0	0	0.7	–	*
2002	0	0	1.1	0	–
2003	0	0	0	0	*
2004	0	0	0.4	0	–
2005	0	0	1	–	–
2006	0	0	0.2	0	*
2007	0	0	0.2	0	*
2008	0	0	0.8	0	–
2009	0.1	0	0	0	*
2010	0	0	0.6	0	*
2011	0	0	0.2	0	*
2012	0	0	0.3	0	*
2013	0	0	0.8	0	–
2014	0	0	0.5	–	–
Mean	0.0	0.0	0.6	0.0	–

Table 25. Occurrence (i.e., percent positive) of Blackfin Snapper in fishery-independent surveys conducted in the Gulf of Mexico. Development of an index for any data source seems unlikely given the low occurrence. For the SEAMAP Plankton survey, * indicates that larvae cannot be identified to species level and/or are not caught in any numbers. – indicates no data available.

Year	Mississippi Laboratory				
	SEAMAP Groundfish	NMFS Bottom Longline	Reef Fish Video	NMFS Small Pelagics	SEAMAP Plankton
1986	–	–	–	–	*
1987	0	–	–	–	*
1988	0	–	–	–	–
1989	0	–	–	–	–
1990	0	–	–	–	*
1991	0	–	–	–	*
1992	0	–	0.8	–	–
1993	0	–	0	–	*
1994	0	–	1.7	–	*
1995	0	0	0	–	*
1996	0	0	0	–	*
1997	0	0	0	–	*
1998	0	–	–	–	–
1999	0	0	–	–	*
2000	0	0	–	–	*
2001	0	0	0	–	*
2002	0	0	0	0	–
2003	0	0	0	0	*
2004	0	0	0.4	0	–
2005	0	0	0.2	–	–
2006	0	0	0	0	*
2007	0	0	0.8	0	*
2008	0	0	0.5	0	–
2009	0	0	1.5	0	*
2010	0	0	0.3	0	*
2011	0	0	1.2	0	*
2012	0	0	2	0	*
2013	0	0	1.1	0	–
2014	0	0	0.9	–	–
Mean	0.0	0.0	0.6	0.0	–

Table 26. Occurrence (i.e., percent positive) of Cubera Snapper in fishery-independent surveys conducted in the Gulf of Mexico. Development of an index for any data source seems unlikely given the low occurrence. For the SEAMAP Plankton survey, * indicates that larvae cannot be identified to species level and/or are not caught in any numbers. – indicates no data available.

	Mississippi Laboratory				
Year	SEAMAP Groundfish	NMFS Bottom Longline	Reef Fish Video	NMFS Small Pelagics	SEAMAP Plankton
1986	–	–	–	–	*
1987	0	–	–	–	*
1988	0	–	–	–	–
1989	0	–	–	–	–
1990	0	–	–	–	*
1991	0	–	–	–	*
1992	0	–	0	–	–
1993	0	–	0	–	*
1994	0	–	0	–	*
1995	0	0	0	–	*
1996	0	0	0	–	*
1997	0	0	0	–	*
1998	0	–	–	–	–
1999	0	0	–	–	*
2000	0	0	–	–	*
2001	0	0	0	–	*
2002	0	0	0	0	–
2003	0	0	0	0	*
2004	0	0	0	0	–
2005	0	0	0	–	–
2006	0	0	0	0	*
2007	0	0	0	0	*
2008	0	0	0	0	–
2009	0	0	0	0	*
2010	0	0	0	0	*
2011	0	0	0	0	*
2012	0	0	0.5	0	*
2013	0	0	0	0	–
2014	0	0	0	–	–
Mean	0.0	0.0	0.0	0.0	–

Table 27. Occurrence (i.e., percent positive) of Queen Snapper in fishery-independent surveys conducted in the Gulf of Mexico. Development of an index for any data source seems unlikely given the low occurrence. For the SEAMAP Plankton survey, * indicates that larvae cannot be identified to species level and/or are not caught in any numbers. – indicates no data available.

	Mississippi Laboratory				
Year	SEAMAP Groundfish	NMFS Bottom Longline	Reef Fish Video	NMFS Small Pelagics	SEAMAP Plankton
1986	–	–	–	–	*
1987	0	–	–	–	*
1988	0	–	–	–	–
1989	0	–	–	–	–
1990	0	–	–	–	*
1991	0	–	–	–	*
1992	0	–	0	–	–
1993	0	–	0	–	*
1994	0.2	–	0	–	*
1995	0	0	2	–	*
1996	0	0	0	–	*
1997	0	0	0.3	–	*
1998	0	–	–	–	–
1999	0	0	–	–	*
2000	0	0	–	–	*
2001	0	0	0	–	*
2002	0	0	0.7	0	–
2003	0	0.4	0	0	*
2004	0.2	0	0	0	–
2005	0	1.1	0	–	–
2006	0	0	0	0	*
2007	0	0	0.2	0	*
2008	0	0	0	0	–
2009	0.1	0	0.2	0	*
2010	0	0	0	0	*
2011	0	0	0	0	*
2012	0	0	0.2	0	*
2013	0	0	0.3	0	–
2014	0	0	0	–	–
Mean	0.0	0.1	0.2	0.0	–

Table 28. Occurrence (i.e., percent positive) of Silk Snapper in fishery-independent surveys conducted in the Gulf of Mexico. Development of an index for any data source seems unlikely given the low occurrence. For the SEAMAP Plankton survey, * indicates that larvae cannot be identified to species level and/or are not caught in any numbers. – indicates no data available.

Year	Mississippi Laboratory				
	SEAMAP Groundfish	NMFS Bottom Longline	Reef Fish Video	NMFS Small Pelagics	SEAMAP Plankton
1986	–	–	–	–	*
1987	0.6	–	–	–	*
1988	0	–	–	–	–
1989	0	–	–	–	–
1990	0	–	–	–	*
1991	0	–	–	–	*
1992	0	–	0	–	–
1993	0	–	0	–	*
1994	0	–	0	–	*
1995	0	0	0	–	*
1996	0	0	0	–	*
1997	0	0	0.7	–	*
1998	0	–	–	–	–
1999	0	0	–	–	*
2000	0	0	–	–	*
2001	0	0	0	–	*
2002	0	0	0.4	0	–
2003	0	0	0	0	*
2004	0	0	0	0	–
2005	0	0	0.4	–	–
2006	0	0	0	0	*
2007	0	0	0.3	0	*
2008	0	0	0	0	–
2009	0	0	0	0	*
2010	0	0	0.3	0	*
2011	0.2	0	0.9	0	*
2012	0	0	0.6	0	*
2013	0.4	0	0.3	0	–
2014	0.3	0	0.2	–	–
Mean	0.1	0.0	0.2	0.0	–

Table 29. Occurrence (i.e., percent positive) of Blueline Tilefish in fishery-independent surveys conducted in the Gulf of Mexico. Development of an index for any data source seems unlikely given the low occurrence. For the SEAMAP Plankton survey, * indicates that larvae cannot be identified to species level and/or are not caught in any numbers. – indicates no data available.

	Mississippi Laboratory				
Year	SEAMAP Groundfish	NMFS Bottom Longline	Reef Fish Video	NMFS Small Pelagics	SEAMAP Plankton
1986	–	–	–	–	*
1987	1.2	–	–	–	*
1988	0.6	–	–	–	–
1989	0.6	–	–	–	–
1990	0.4	–	–	–	*
1991	0	–	–	–	*
1992	0	–	0	–	–
1993	0	–	0	–	*
1994	0	–	0	–	*
1995	0	0	0	–	*
1996	0	0	0.3	–	*
1997	0	0	0	–	*
1998	0	–	–	–	–
1999	1.8	0	–	–	*
2000	0	0	–	–	*
2001	0.5	0.4	0.7	–	*
2002	0	0	0	0	–
2003	0	5.7	2.9	0	*
2004	0	2	0.4	0	–
2005	0	2.1	0.4	–	–
2006	0	0.7	0.4	0	*
2007	0	0.6	0.3	0	*
2008	0	1.9	0	0	–
2009	0	1.1	0.4	0.8	*
2010	0	0.7	0	0	*
2011	0	0.8	0	0	*
2012	0.2	1.4	0.2	0	*
2013	0	1.8	0	0	–
2014	0	0	0.5	–	–
Mean	0.2	1.0	0.3	0.1	–

Table 30. Occurrence (i.e., percent positive) of Goldface Tilefish in fishery-independent surveys conducted in the Gulf of Mexico. Development of an index for any data source seems unlikely given the low occurrence. For the SEAMAP Plankton survey, * indicates that larvae cannot be identified to species level and/or are not caught in any numbers. – indicates no data available.

Year	Mississippi Laboratory				
	SEAMAP Groundfish	NMFS Bottom Longline	Reef Fish Video	NMFS Small Pelagics	SEAMAP Plankton
1986	–	–	–	–	*
1987	0	–	–	–	*
1988	0	–	–	–	–
1989	0	–	–	–	–
1990	0	–	–	–	*
1991	0	–	–	–	*
1992	0	–	6.2	–	–
1993	0	–	0	–	*
1994	0	–	2.5	–	*
1995	0	0	7.1	–	*
1996	0	0	3.1	–	*
1997	0	0	2.8	–	*
1998	0	–	–	–	–
1999	0	0	–	–	*
2000	0	0	–	–	*
2001	0	0	1.3	–	*
2002	0	0	4.7	0.8	–
2003	0	0	0	3.4	*
2004	0	0	1.3	0	–
2005	0.2	0	3.7	–	–
2006	0	0	1.9	0	*
2007	0.4	0	4.1	1.4	*
2008	0	0	3.3	1.8	–
2009	0.3	0	3.4	0.8	*
2010	0	0	4.7	0	*
2011	0.4	0	4.5	0	*
2012	0	0	2.6	0.9	*
2013	0.2	0	2.2	0	–
2014	0.1	0	4.1	–	–
Mean	0.1	0.0	3.2	0.8	–

Table 31. Occurrence (i.e., percent positive) of Banded Rudderfish in fishery-independent surveys conducted in the Gulf of Mexico. Development of an index for any data source seems unlikely given the low occurrence, although the Panama City Video is just below the 5% threshold. For the SEAMAP Plankton survey, * indicates that larvae cannot be identified to species level and/or are not caught in any numbers. – indicates no data available.

Year	Mississippi Laboratory					Panama City
	SEAMAP Groundfish	NMFS Bottom Longline	Reef Fish Video	NMFS Small Pelagics	SEAMAP Plankton	Video
1986	–	–	–	–	*	–
1987	0.0	–	–	–	*	–
1988	0.0	–	–	–	–	–
1989	0.0	–	–	–	–	–
1990	0.2	–	–	–	*	–
1991	0.0	–	–	–	*	–
1992	0.0	–	0.0	–	–	–
1993	0.2	–	1.3	–	*	–
1994	0.2	–	0.0	–	*	–
1995	0.0	0.0	0.0	–	*	–
1996	0.0	0.0	0.0	–	*	–
1997	0.0	0.0	0.3	–	*	–
1998	0.2	–	–	–	–	–
1999	1.0	0.0	–	–	*	–
2000	0.2	0.0	–	–	*	–
2001	0.0	0.0	0.0	–	*	–
2002	0.0	0.0	0.7	1.5	–	–
2003	0.2	0.0	0.0	0.0	*	–
2004	0.9	0.0	0.4	0.0	–	–
2005	0.0	0.0	0.4	–	–	–
2006	0.0	0.0	1.1	0.0	*	0.0
2007	0.2	0.0	2.0	1.4	*	0.0
2008	0.0	0.0	0.5	0.6	–	3.5
2009	0.7	0.0	0.4	0.0	*	3.0
2010	0.6	0.0	1.5	0.0	*	4.9
2011	1.1	0.0	0.2	0.0	*	3.8
2012	0.5	0.0	0.5	0.0	*	5.3
2013	2.5	0.0	0.8	0.9	–	5.3
2014	0.3	0.0	0.0	–	–	15.2
2015	–	–	–	–	–	3.8
Mean	0.3	0.0	0.5	0.4	–	4.6

Table 32. Summary of percent positive trips (PP) and catch (pounds, whole weight) for commercial gear types in the Commercial Logbook dataset between 1993 and 2014. Nyear refers to the number of years where the species was reported as present. Total Catch refers to the total number caught summed across years. *Potential* indices of abundance are highlighted in bold (mean PP > 5% and time series > 20 yr), although additional data filtering may alter the numbers.

Species	Gear	Nyear	Mean PP	Catch			
				Min	Max	Mean	Total
Scamp	Buoy Gear	3	12.9	5	460	200	599
	Diving	22	**12.1**	387	10,404	2,164	47,607
	Gillnet	1	1.2	12,713	12,713	12,713	12,713
	Handline	22	**23.3**	68,137	249,445	161,102	3,544,244
	Longline	22	**42.3**	29,601	183,794	110,964	2,441,215
	Other	14	8.5	9	3,041	529	7,403
	Trap	14	5.3	18	4,665	2,575	36,056
	Troll	13	0.5	4	1,440	236	3,063
Warsaw Grouper	Buoy Gear	1	2.7	54	54	54	54
	Diving	10	0.5	6	739	209	2,094
	Handline	22	**5.7**	18,813	157,381	78,045	1,716,996
	Longline	22	**9.3**	18,307	90,157	40,817	897,965
	Other	5	1.5	55	3,188	814	4,070
	Trap	4	0.2	55	297	169	676
	Troll	7	0.4	19	909	299	2,093
Yellowfin Grouper	Buoy Gear	1	12.5	230	230	230	230
	Diving	20	1.0	18	340	147	2,932
	Handline	22	0.4	228	11,928	4,023	88,514
	Longline	22	1.6	853	139,332	35,483	780,621
	Other	3	1.0	2	13	8	24
	Trap	8	0.3	1	278	84	675
	Troll	2	0.2	55	114	85	170
Blackfin Snapper	Buoy Gear	1	2.7	6	6	6	6
	Diving	2	0.2	7	60	33	67
	Gillnet	1	0.4	6	6	6	6
	Handline	22	1.1	1,016	17,328	5,794	127,466
	Longline	22	3.2	842	31,201	5,222	114,875
	Other	2	1.6	1	26	13	27
	Trap	9	0.4	3	2,018	384	3,459
	Troll	11	0.2	1	134	34	379
Cubera Snapper	Diving	16	0.8	7	529	174	2,781
	Handline	18	0.0	6	744	326	5,872
	Longline	21	0.4	37	1,126	365	7,671
	Trap	5	0.2	24	145	61	303

Species	Gear	Nyear	Mean PP	Catch Min	Catch Max	Catch Mean	Catch Total
Gray Snapper	Buoy Gear	2	22.8	7	16	11	22
	Diving	22	**59.9**	6,304	33,544	17,260	379,724
	Gillnet	2	0.8	6	7	6	12
	Handline	22	**26.7**	63,691	234,778	154,931	3,408,486
	Longline	22	**22.4**	2,876	17,455	8,676	190,872
	Other	19	12.0	9	1,666	352	6,683
	Trap	14	20.3	564	13,484	4,719	66,066
	Troll	22	1.0	6	1,392	253	5,558
Queen Snapper	Diving	5	0.3	8	391	95	475
	Handline	22	1.3	4,904	37,704	17,851	392,731
	Longline	22	2.8	175	18,564	5,248	115,458
	Other	1	1.0	1,474	1,474	1,474	1,474
	Trap	6	0.4	4	817	225	1,350
	Troll	2	0.2	16	21	18	37
Silk Snapper	Diving	5	0.3	12	234	69	344
	Handline	22	1.7	17,524	87,377	38,458	846,070
	Longline	22	**7.4**	4,805	35,189	15,673	344,796
	Other	6	2.1	1	1,010	194	1,165
	Trap	13	1.7	48	10,776	3,731	48,502
Blueline Tilefish	Diving	9	0.5	2	156	38	340
	Handline	22	2.3	3,432	25,834	12,621	277,657
	Longline	22	**8.4**	29,014	156,503	77,333	1,701,334
	Other	6	0.9	2	448	113	675
	Trap	13	0.6	12	5,044	583	7,585
	Troll	3	0.2	6	34	23	68
Goldface Tilefish	Handline	10	0.1	12	478	183	1,828
	Longline	1	0.0	48	48	48	48
Banded Rudderfish	Diving	12	0.4	4	133	48	572
	Gillnet	2	1.5	87	16,567	8,327	16,654
	Handline	22	2.4	5,626	31,782	13,964	307,207
	Longline	21	0.9	27	2,380	911	19,125
	Other	4	1.4	1	1,033	261	1,046
	Trap	5	0.3	4	233	63	316
	Troll	11	0.2	5	619	80	884

Table 33. Summary of percent positive trips (PP) and catch (in numbers) for each fishing mode from the Marine Recreational Fisheries Statistics Survey between 1981 and 2014. Nyear refers to the number of years where the species was reported as present. Total Catch refers to the total number caught summed across years. Development of an index seems unlikely given the low occurrence for all species (mean PP < 5%).

Species	Mode	Nyear	Mean PP	Catch			
				Min	Max	Mean	Total
Scamp	Charterboat	33	1.2	1	1,137	220	7,257
	Headboat	5	2.6	10	48	27	134
	Private	33	0.1	1	173	42	1,374
	Shore	2	0.1	2	7	5	9
Warsaw Grouper	Charterboat	27	0.0	1	43	12	319
	Headboat	3	0.1	1	4	3	8
	Private	29	0.0	1	40	6	172
	Shore	1	0.0	1	1	1	1
Yellowfin Grouper	Charterboat	11	0.1	1	9	4	43
	Headboat	1	0.1	1	1	1	1
	Private	13	0.0	1	23	4	54
	Shore	1	0.0	1	1	1	1
Blackfin Snapper	Charterboat	10	0.0	1	12	4	42
	Private	1	0.0	1	1	1	1
Cubera Snapper	Charterboat	16	0.1	1	17	6	88
	Headboat	2	0.2	2	9	6	11
	Private	17	0.0	1	17	5	79
	Shore	5	0.0	1	4	2	8
Gray Snapper	Charterboat	34	3.7	21	3,095	1,130	38,429
	Headboat	5	7.4	59	163	112	561
	Private	34	4.7	59	10,418	3,016	102,537
	Shore	34	3.8	85	2,166	939	31,914
Queen Snapper	Charterboat	11	0.0	1	11	4	43
	Headboat	1	0.1	2	2	2	2
	Private	4	0.0	1	30	12	48
	Shore	1	0.0	1	2	2	3
Silk Snapper	Charterboat	27	0.1	1	148	24	639
	Headboat	5	0.6	1	29	11	55
	Private	4	0.0	1	27	17	66
	Shore	1	0.2	8	13	11	21

Species	Mode	Nyear	Mean PP	Catch Min	Max	Mean	Ntotal
Goldface Tilefish	–	–	–	–	–	–	–
Blueline Tilefish	Charterboat	17	0.1	1	47	12	212
	Private	9	0.0	1	8	3	27
Banded Rudderfish	Charterboat	24	0.6	2	1,064	289	6,937
	Private	21	0.0	1	55	9	184
	Shore	11	0.1	1	296	49	536

Table 34. Summary of percent positive trips (PP) and catch (in numbers) for each fishing mode from the Texas Parks and Wildlife Department dataset between 1983 and 2014. Nyear refers to the number of years where the species was reported as present. Total Catch refers to the total number caught summed across years. Development of an index seems unlikely given the low occurrence for all species (mean PP < 5%).

Species	Nyear	Mean PP	Count Min	Max	Mean	Ntotal
Scamp	21	0.1	1	6	3	57
Warsaw Grouper	30	0.3	1	45	7	218
Yellowfin Grouper	2	0.0	1	1	1	2
Blackfin Snapper	1	0.0	4	4	4	4
Cubera Snapper	8	0.0	1	9	3	24
Gray Snapper	32	3.9	1	1,646	279	8,930
Queen Snapper	–	–	–	–	–	–
Silk Snapper	–	–	–	–	–	–
Blueline Tilefish	–	–	–	–	–	–
Goldface Tilefish	–	–	–	–	–	–
Banded Rudderfish	4	0.0	1	2	2	10

Table 35. Summary of length observations from commercial and recreational fishery samples, tournaments, and scientific surveys between 1984 and 2015. Nyear refers to the number of years where length samples were recorded. Total refers to the total number of length observations summed across years. *Potential* composition data are highlighted in bold (mean observations per year > 100, long time series > 10 yr), although additional data filtering may alter the numbers.

Species	Data Source	Nyear	Length Measurements			
			Min	Max	Mean	Total
Scamp	Commercial Handline	32	101	2,774	**1,269**	40,596
	Commercial Longline	32	83	3,308	**1,335**	42,725
	Commercial Other	30	1	168	57	1,708
	SRHS Headboat	10	1	51	14	171
	MRFSS Charterboat	17	1	85	19	374
	MRFSS Private	4	1	6	3	11
	Tournament	11	1	12	3	34
	Scientific Survey	3	2	5	4	12
Warsaw Grouper	Commercial Handline	32	8	206	65	2,067
	Commercial Longline	32	2	161	51	1,621
	Commercial Other	13	1	69	18	233
	SRHS Headboat	1	9	9	9	9
	MRFSS Charterboat	5	1	6	2	15
	MRFSS Private	1	4	4	4	4
	Tournament	5	1	5	2	19
Yellowfin Grouper	Commercial Handline	26	1	51	11	275
	Commercial Longline	24	1	208	22	525
	Commercial Other	17	1	20	5	77
	SRHS Headboat	1	2	2	2	2
	MRFSS Private	1	1	1	1	1
Blackfin Snapper	Commercial Handline	28	1	432	92	2,586
	Commercial Longline	25	1	144	50	1,241
	Commercial Other	11	1	59	17	185
Cubera Snapper	Commercial Handline	22	1	35	5	107
	Commercial Longline	23	1	28	7	152
	Commercial Other	11	1	219	21	233
	SRHS Headboat	1	1	1	1	1
	MRFSS Charterboat	1	2	2	2	2
	Tournament	8	1	3	2	13
Banded Rudderfish	Commercial Handline	20	1	553	**125**	2,504
	Commercial Longline	4	1	2	1	5
	Commercial Other	4	1	6	3	13

Species	Data Source	Nyear	Length Measurements			
			Min	Max	Mean	Ntotal
Gray Snapper	Commercial Handline	32	3	2,860	**1,113**	35,628
	Commercial Longline	29	8	451	**220**	6,382
	Commercial Other	30	6	824	**123**	3,679
	SRHS Headboat	10	1	155	25	254
	MRFSS Charterboat	20	1	303	44	1,063
	MRFSS Private	21	1	68	22	547
	Tournament	17	1	60	16	372
	Scientific Survey	5	2	9	6	28
Queen Snapper	Commercial Handline	30	2	800	**145**	5,643
	Commercial Longline	29	1	103	31	1,289
	Commercial Other	9	2	48	16	140
	SRHS Headboat	1	24	24	24	24
	MRFSS Charterboat	1	7	7	7	7
Silk Snapper	Commercial Handline	29	5	478	**163**	4,729
	Commercial Longline	29	1	357	74	2,139
	Commercial Other	12	1	333	53	633
	SRHS Headboat	1	23	23	23	23
	MRFSS Charterboat	2	1	2	2	3
Blueline Tilefish	Commercial Handline	29	1	348	63	1,834
	Commercial Longline	29	1	2,473	**441**	12,793
	Commercial Other	14	1	81	12	174
	SRHS Headboat	1	4	4	4	4
Goldface Tilefish	Commercial Handline	19	1	188	48	906
	Commercial Longline	13	1	89	23	304
	Commercial Other	6	6	66	23	140

Table 36. Number of length observations from commercial and recreational fishery samples obtained from GulfFIN and FWC by state. Note that observations have not been assessed for quality and therefore numbers may change.

Species	State	Recreational				Commercial	Unknown
		Charter	Private	Headboat	Shore		
Scamp	FL	604	60	102	-	1,687	105
	AL	411	6	0	-	0	0
	TOTAL	1,015	66	102	-	1,687	105
Warsaw Grouper	FL	16	0	3	-	16	0
Yellowfin Grouper	FL	-	-	-	-	-	-
Blackfin Snapper	FL	0	0	0	-	129	0
Cubera Snapper	FL	0	0	1	-	4	11
Gray Snapper	FL	1,969	712	1,960	118	50	3,326
	AL	209	27	0	26	1	0
	MS	0	14	0	0	15	0
	LA	2,920	2,084	58	1	309	0
	TX	220	287	0	0	0	0
	TOTAL	5,318	3,124	2,018	145	375	3,326
Queen Snapper	FL	0	0	0	-	65	0
Silk Snapper	FL	1	0	16	-	152	11
Blueline Tilefish	FL	2	2	2	-	9	1
Goldface Tilefish	FL	-	-	-	-	-	-
Banded Rudderfish	FL	527	0	322	-	0	88
	AL	6	0	0	-	0	0
	TOTAL	533	0	322	-	0	88

Table 37. Summary of otoliths inventoried at NMFS Panama City between 1990 and 2016 (up to August 2016) determined from the NMFS Panama City AGR Access Database (all sources 1980s through 2016, including TIP 1991-2010) and NMFS Miami BSD Oracle Database (only TIP source, 2011-2016). Ntotal refers to the total number across years. Nyear refers to the number of years where otoliths were collected. The availability of age data for assessment would require substantial resources and time to process samples and validate annual band increments to ensure age assignments.

Species	Nyear	Trip Interview Program Samples			
		Min	Max	Mean	Total
Scamp	26	81	3,648	1,432	37,235
Warsaw Grouper	24	1	188	66	1,592
Yellowfin Grouper	19	1	23	9	165
Blackfin Snapper	21	1	472	93	1,955
Cubera Snapper	23	1	28	7	170
Gray Snapper	26	70	1,506	512	13,323
Queen Snapper	20	4	884	185	3,705
Silk Snapper	26	1	446	110	2,866
Blueline Tilefish	16	3	185	70	1,113
Goldface Tilefish	7	1	34	9	64
Banded Rudderfish	2	1	5	3	6

Species	Nyear	Other Data Sources			
		Min	Max	Mean	Total
Scamp	26	8	370	107	2,787
Warsaw Grouper	27	0	65	9	240
Yellowfin Grouper	3	1	1	1	3
Blackfin Snapper	5	1	40	14	72
Cubera Snapper	7	1	5	2	15
Gray Snapper	26	7	507	124	3,235
Queen Snapper	7	1	5	2	14
Silk Snapper	10	1	29	4	43
Blueline Tilefish	13	1	109	27	347
Goldface Tilefish	4	1	2	2	6
Banded Rudderfish	11	1	21	8	93

Table 38. *Potentially feasible* data-limited method types (as indicated by X) for the managed species that have not yet been assessed. Note that available data have not been vetted for quality, and hence feasibility may change, particularly for uncertain data inputs (identified by ? in the table below). The availability of age data for assessment would require substantial resources and time to process samples and validate annual band increments to ensure age assignments.

Species	Method type					
	Catch-based	Index-based	Length-based	Depletion-based	Mean length-based mortality estimator	Age-based
Scamp	X	X	X	0	X	0
Warsaw Grouper	X	X?	X	0	X	0
Yellowfin Grouper	X	0	0	0	0	0
Blackfin Snapper	X	0	X	0	X	0
Cubera Snapper	X	0	0	0	0	0
Gray Snapper	X	X	X	0	X	0
Queen Snapper	X	0	0	0	X	0
Silk Snapper	X	X?	X	0	X	0
Blueline Tilefish	X	X	X	0	X	0
Goldface Tilefish	X	0	0	0	0	0
Banded Rudderfish	X	X?	0	0	0	0

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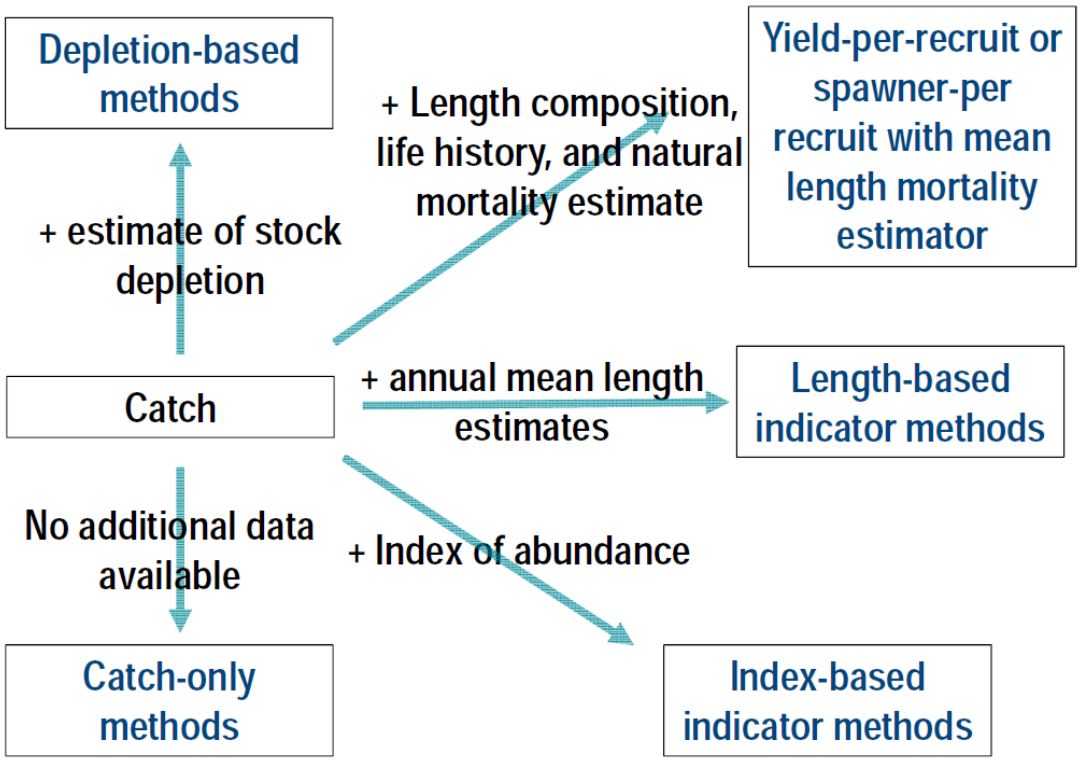

Figure 1. Depiction of method types available in the Data-limited Methods Toolkit (DLMtool) as well as required data inputs.

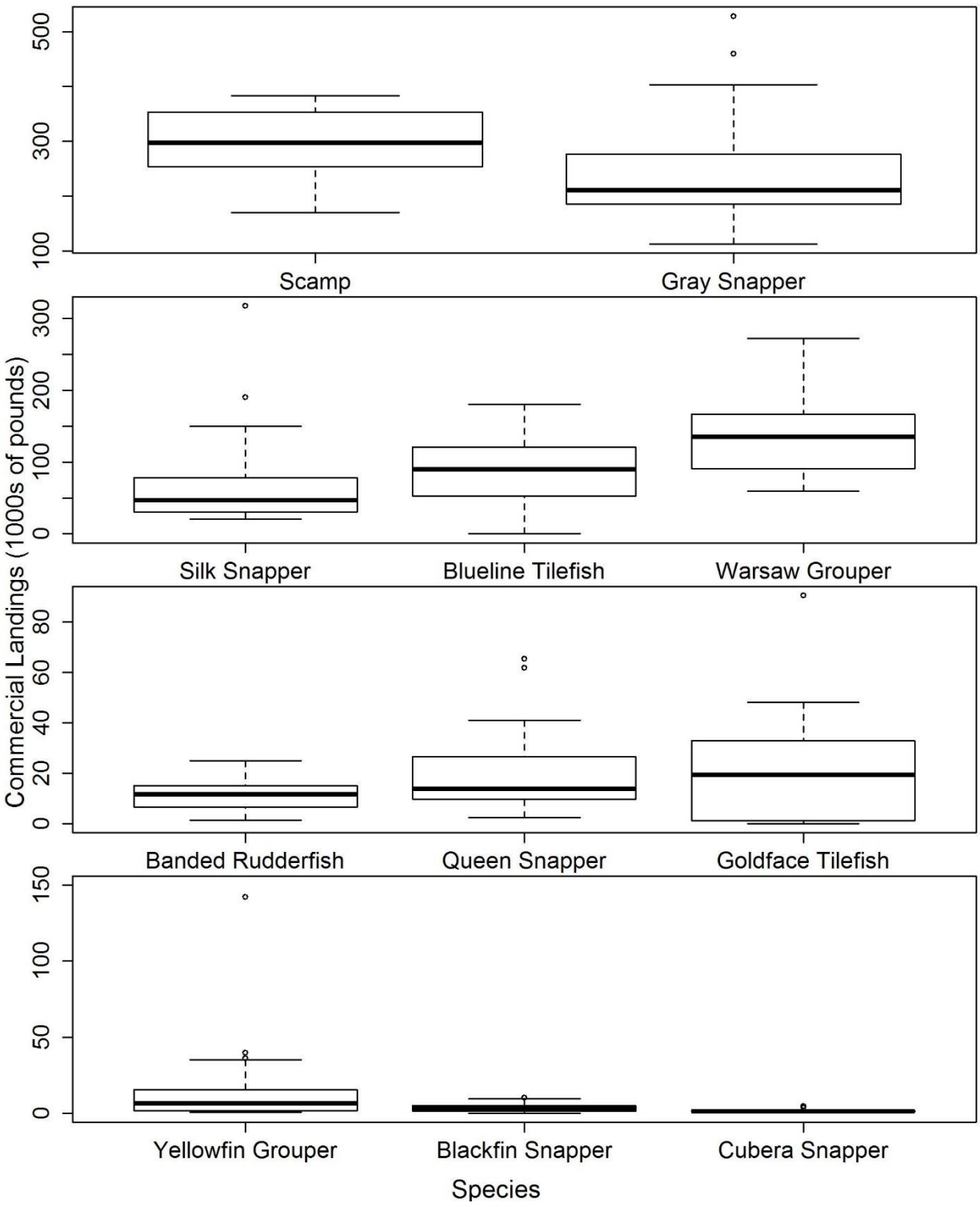

Figure 2. Summary of commercial landings (in pounds) for the managed species that have not yet been assessed. The boxplots represent the inter-quartile range, the solid lines represent the medians, and the open circles represent outliers.

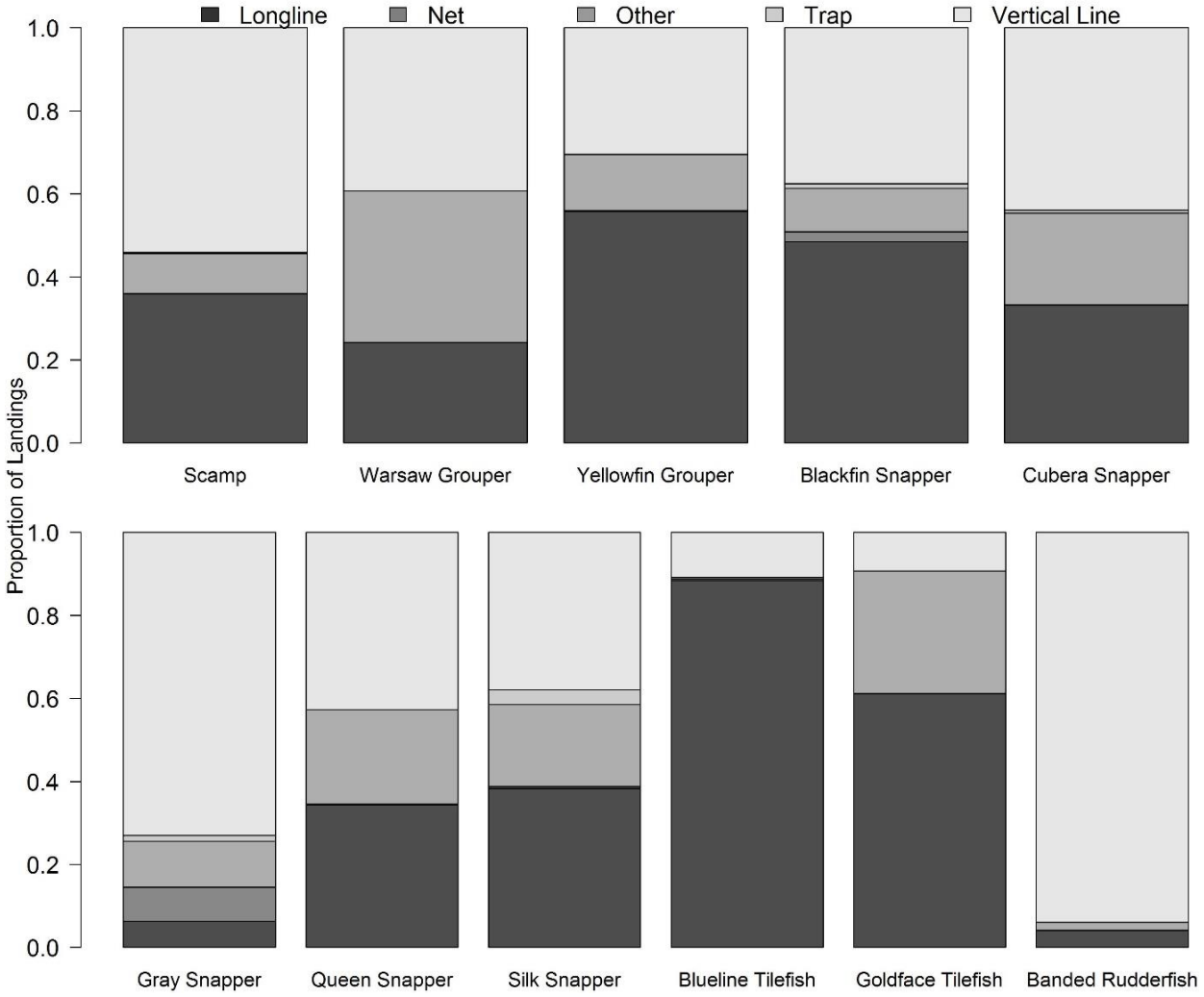

Figure 3. Proportion of landings for each commercial gear type for the managed species that have not yet been assessed.

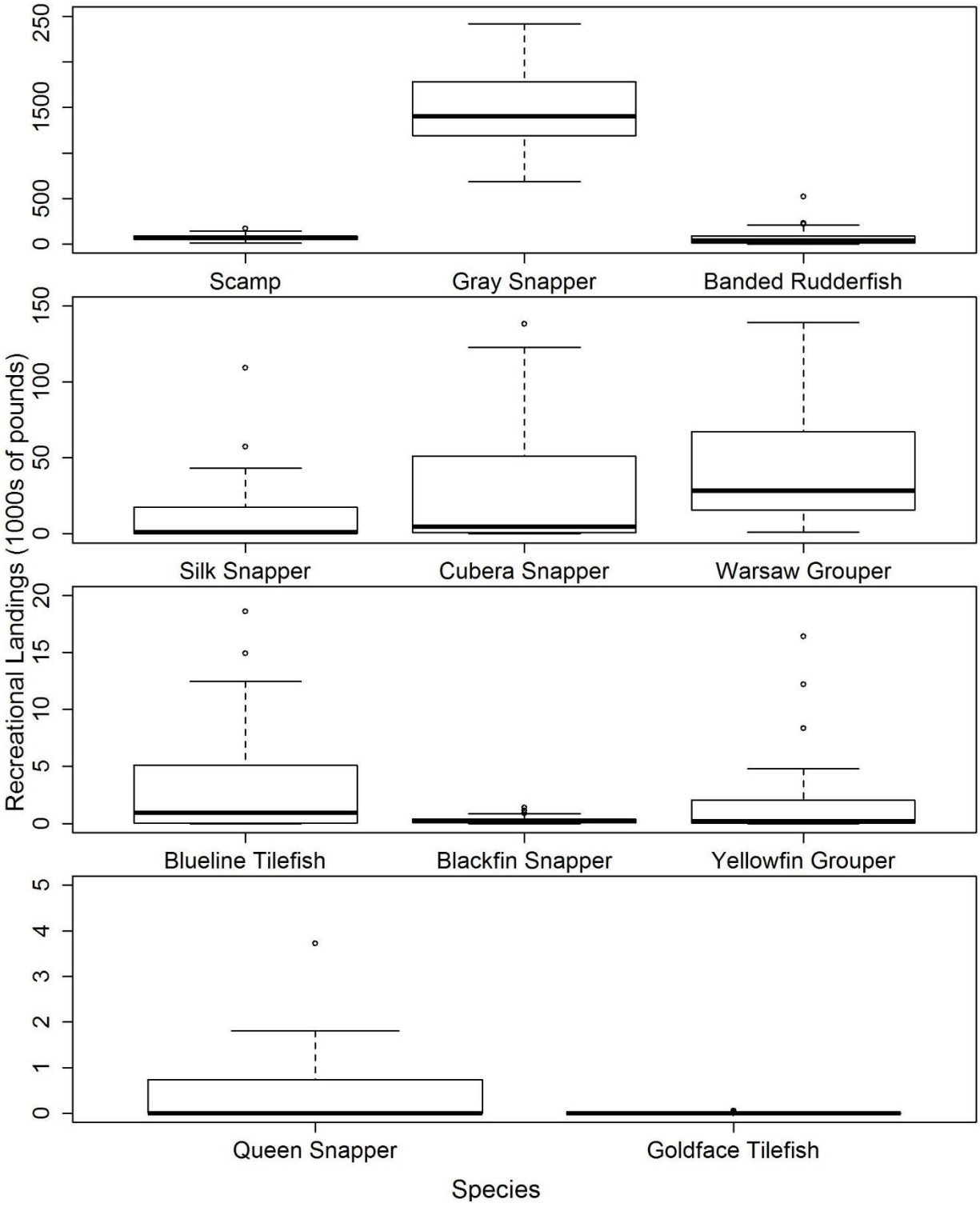

Figure 4. Summary of recreational landings (in pounds) for the managed species that have not yet been assessed. The boxplots represent the inter-quartile range, the solid lines represent the medians, and the open circles represent outliers. Note that some outliers have been removed to enhance interpretation.

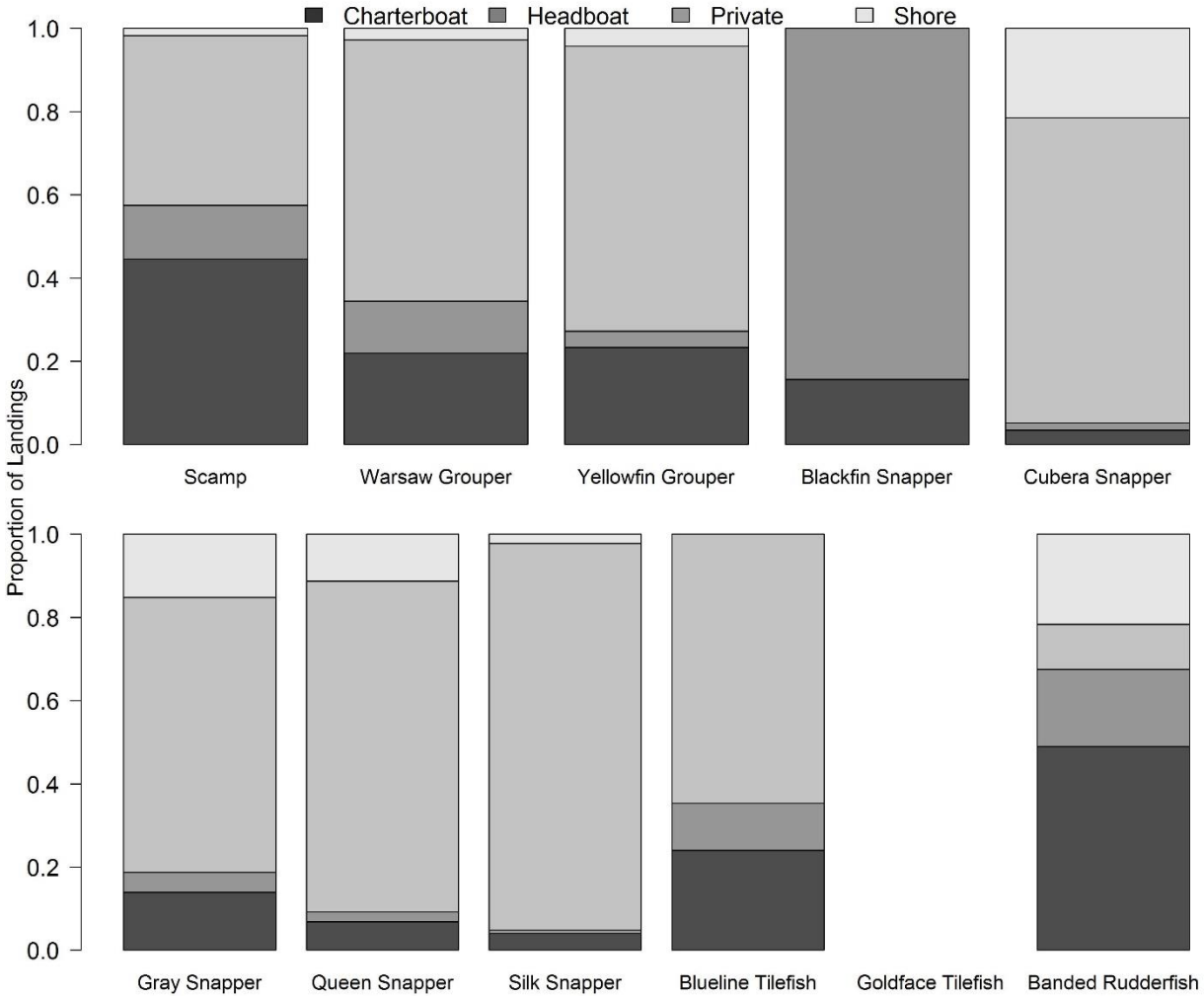

Figure 5. Proportion of landings for each recreational fishing mode for the managed species that have not yet been assessed.

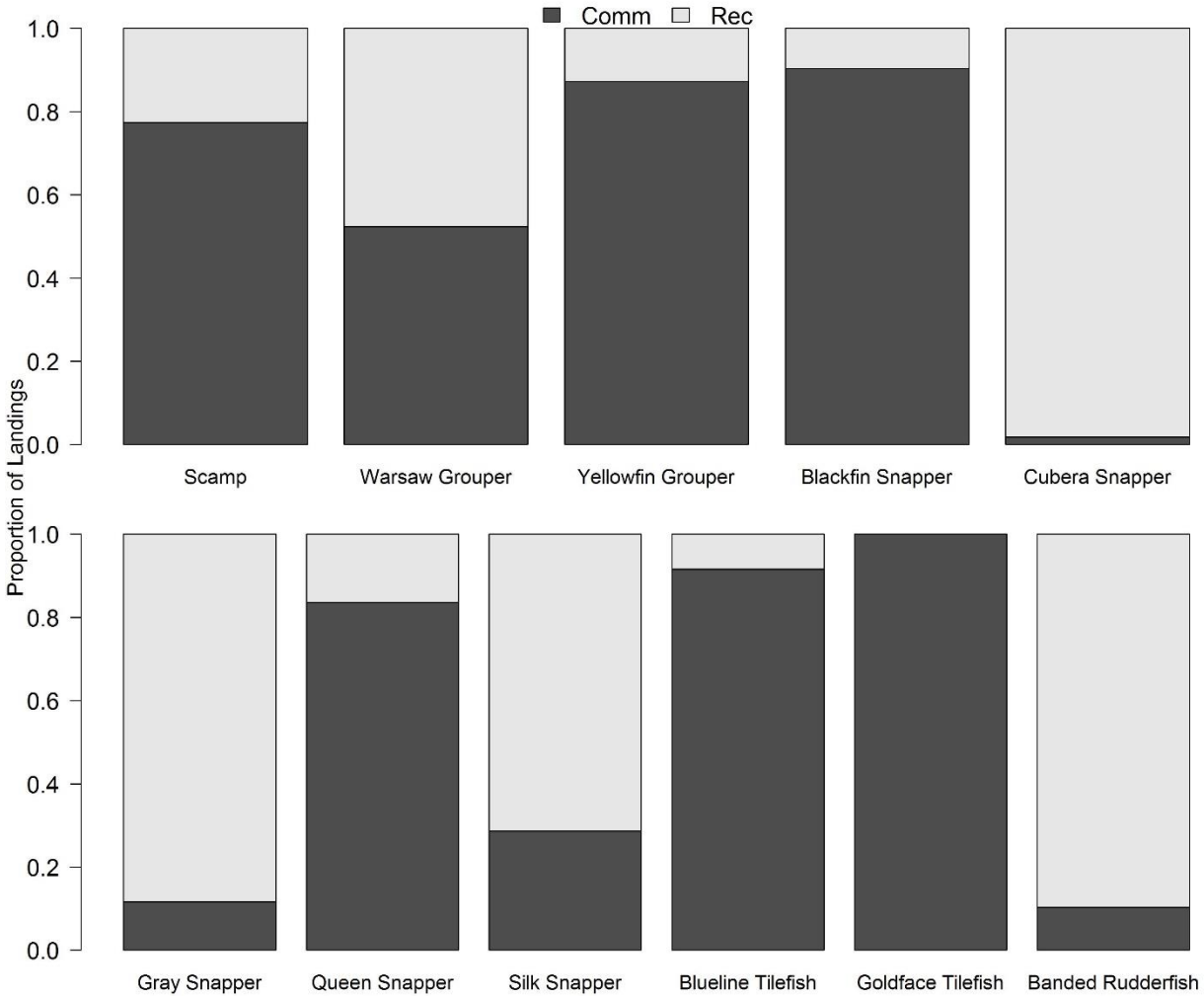

Figure 6. Comparison of the magnitude of commercial and recreational landings for the managed species that have not yet been assessed.

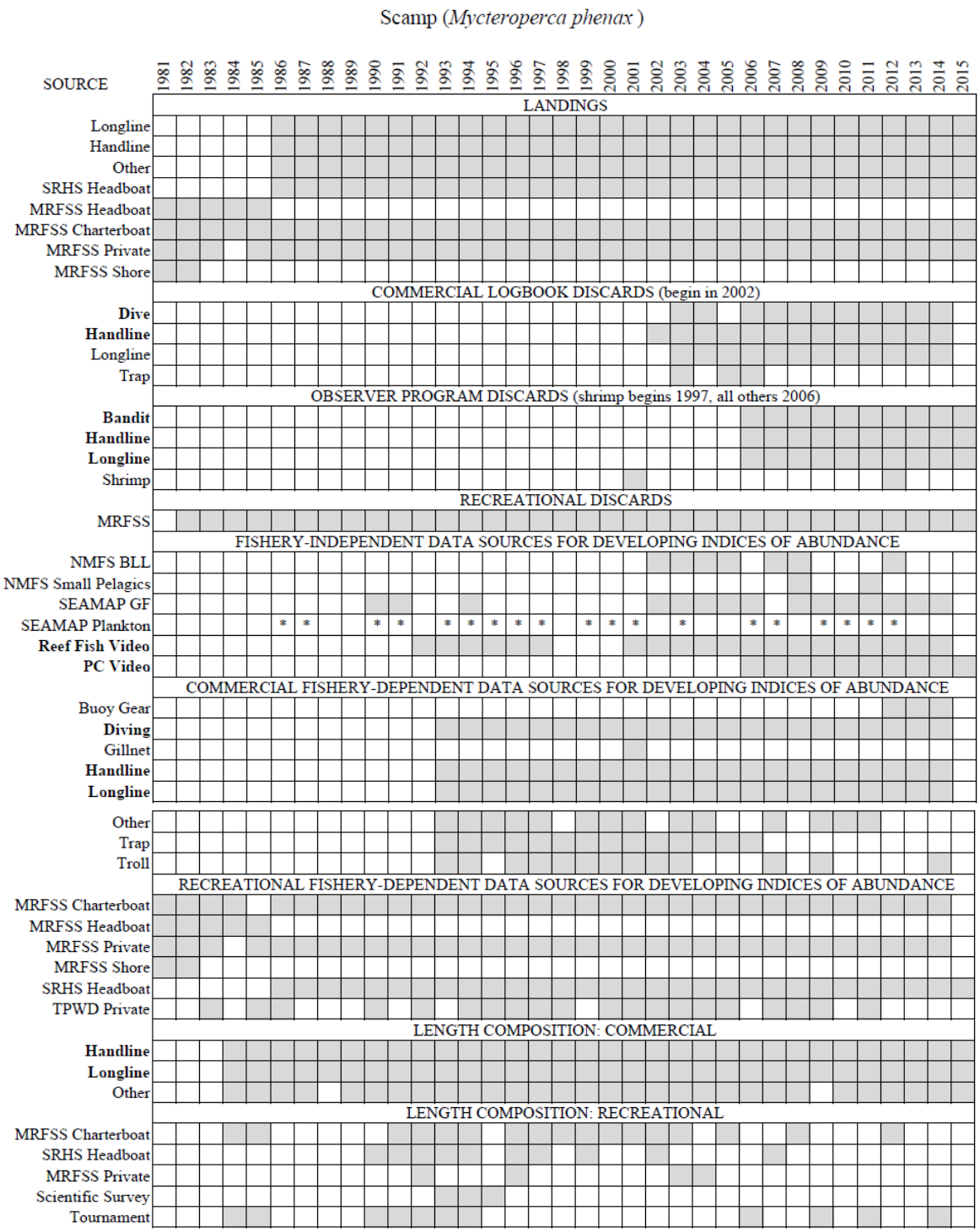

Figure 7. Synthesis of available data for Scamp. Gray shading is indicative of the presence of data (i.e., but not the quantity of data available). Sources include data source or gear source, with bolded text used to highlight data sources and/or gear types with data deemed potentially useful. * indicates that larvae cannot be identified to species level and/or are not caught in any numbers.

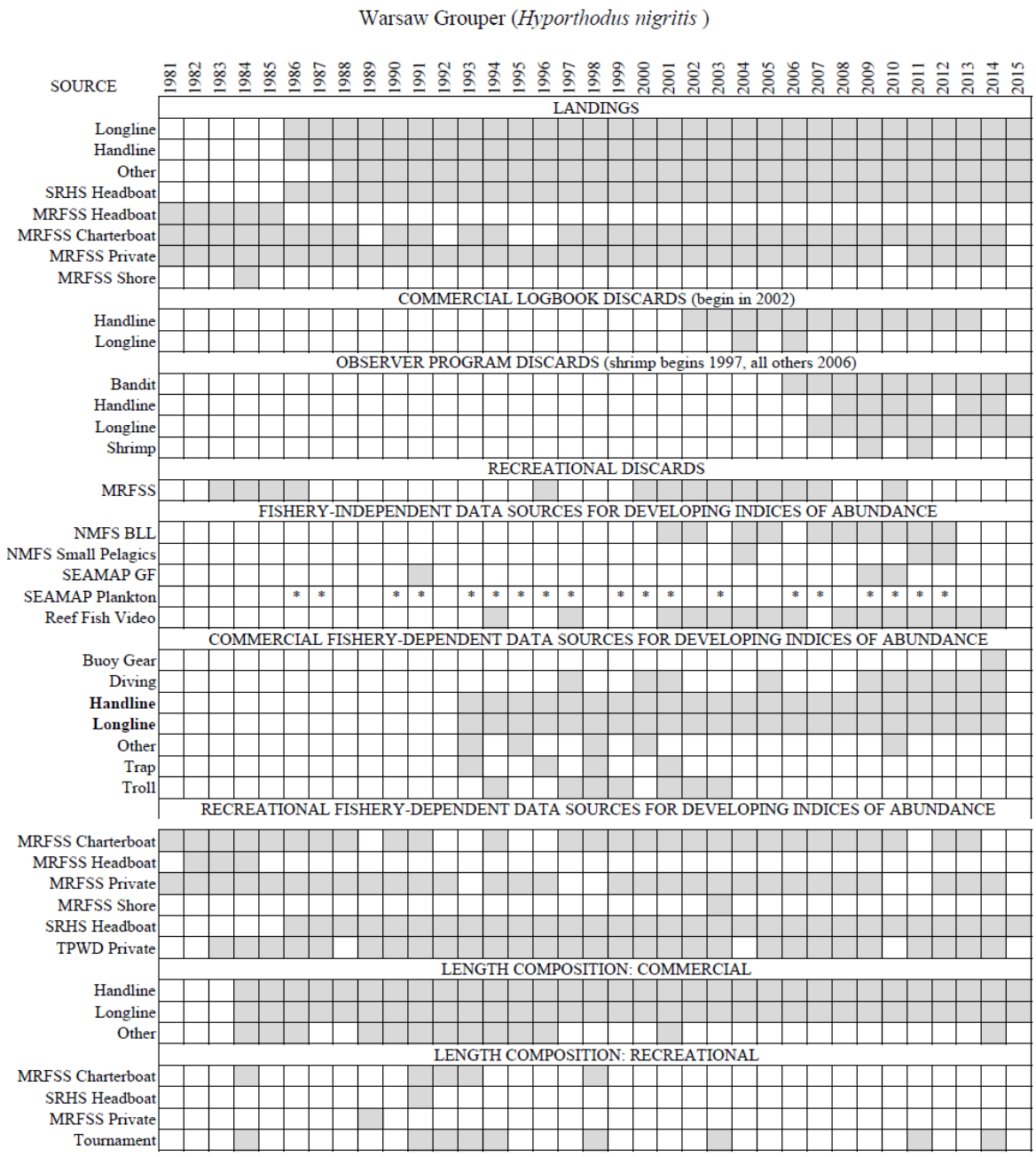

Figure 8. Synthesis of available data for Warsaw Grouper. Gray shading is indicative of the presence of data (i.e., but not the quantity of data available). Sources include data source or gear source, with bolded text used to highlight data sources and/or gear types with data deemed potentially useful. * indicates that larvae cannot be identified to species level and/or are not caught in any numbers.

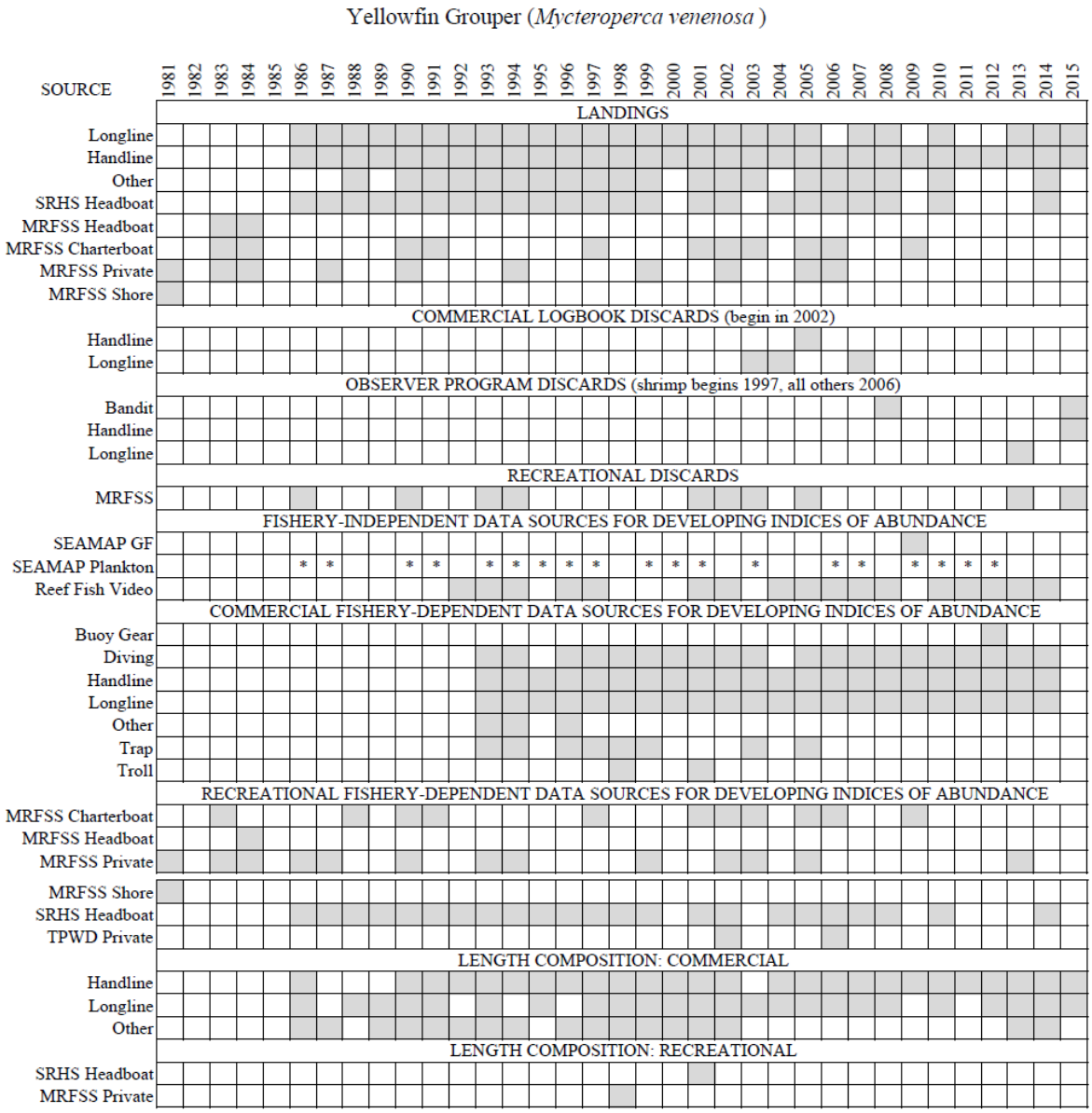

Figure 9. Synthesis of available data for Yellowfin Grouper. Gray shading is indicative of the presence of data (i.e., but not the quantity of data available). Sources include data source or gear source, with bolded text used to highlight data sources and/or gear types with data deemed potentially useful. * indicates that larvae cannot be identified to species level and/or are not caught in any numbers.

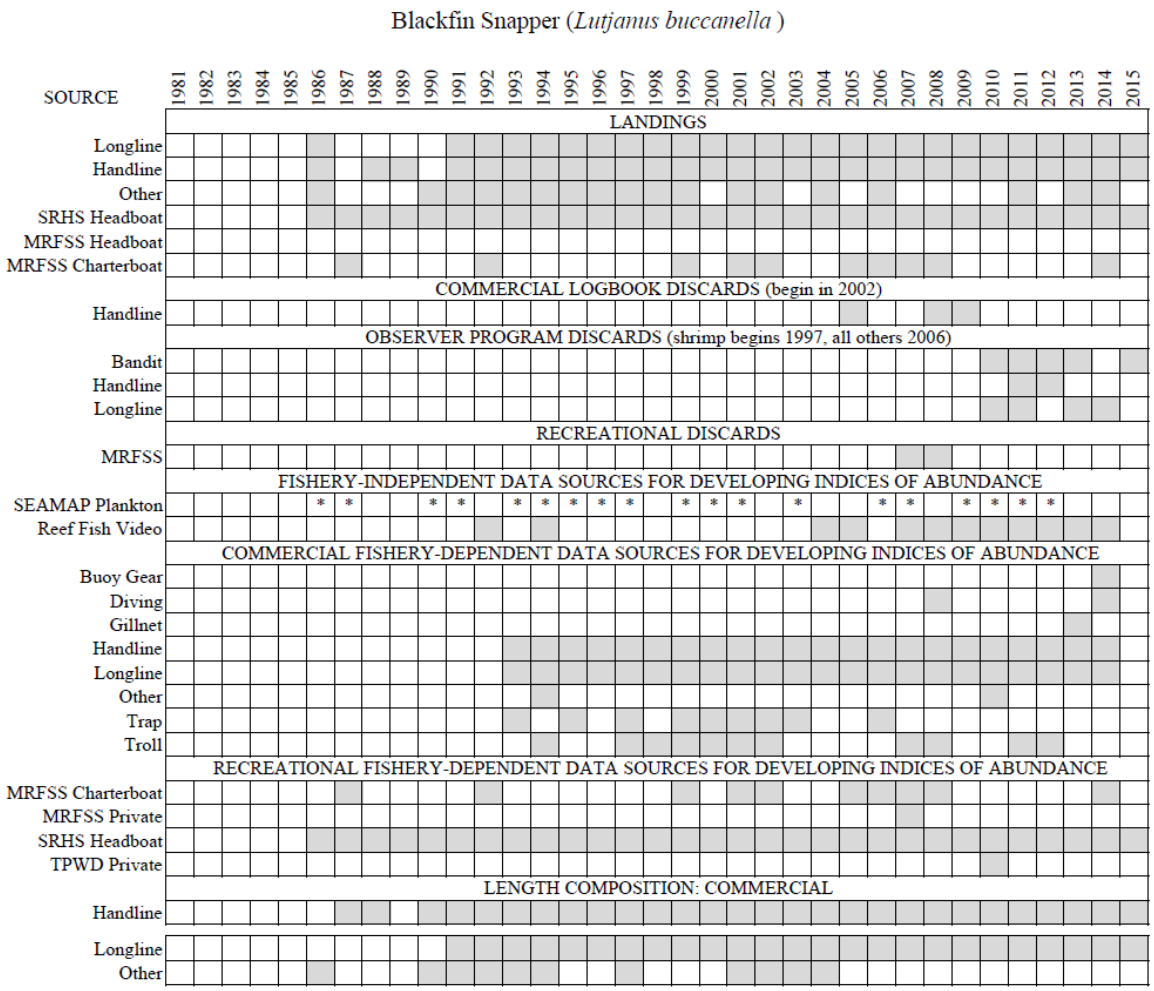

Figure 10. Synthesis of available data for Blackfin Snapper. Gray shading is indicative of the presence of data (i.e., but not the quantity of data available). Sources include data source or gear source, with bolded text used to highlight data sources and/or gear types with data deemed potentially useful. * indicates that larvae cannot be identified to species level and/or are not caught in any numbers.

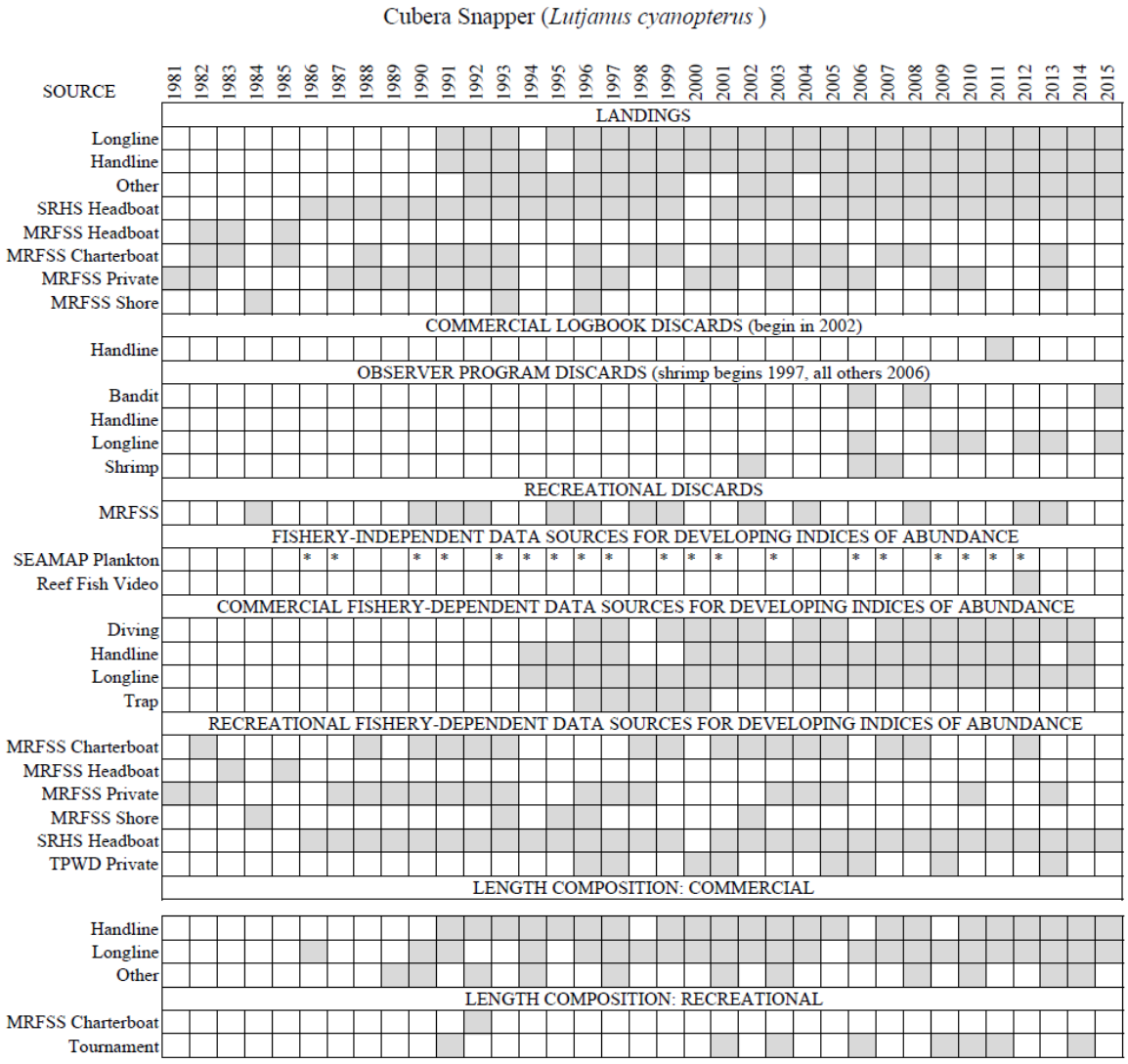

Figure 11. Synthesis of available data for Cubera Snapper. Gray shading is indicative of the presence of data (i.e., but not the quantity of data available). Sources include data source or gear source, with bolded text used to highlight data sources and/or gear types with data deemed potentially useful. * indicates that larvae cannot be identified to species level and/or are not caught in any numbers.

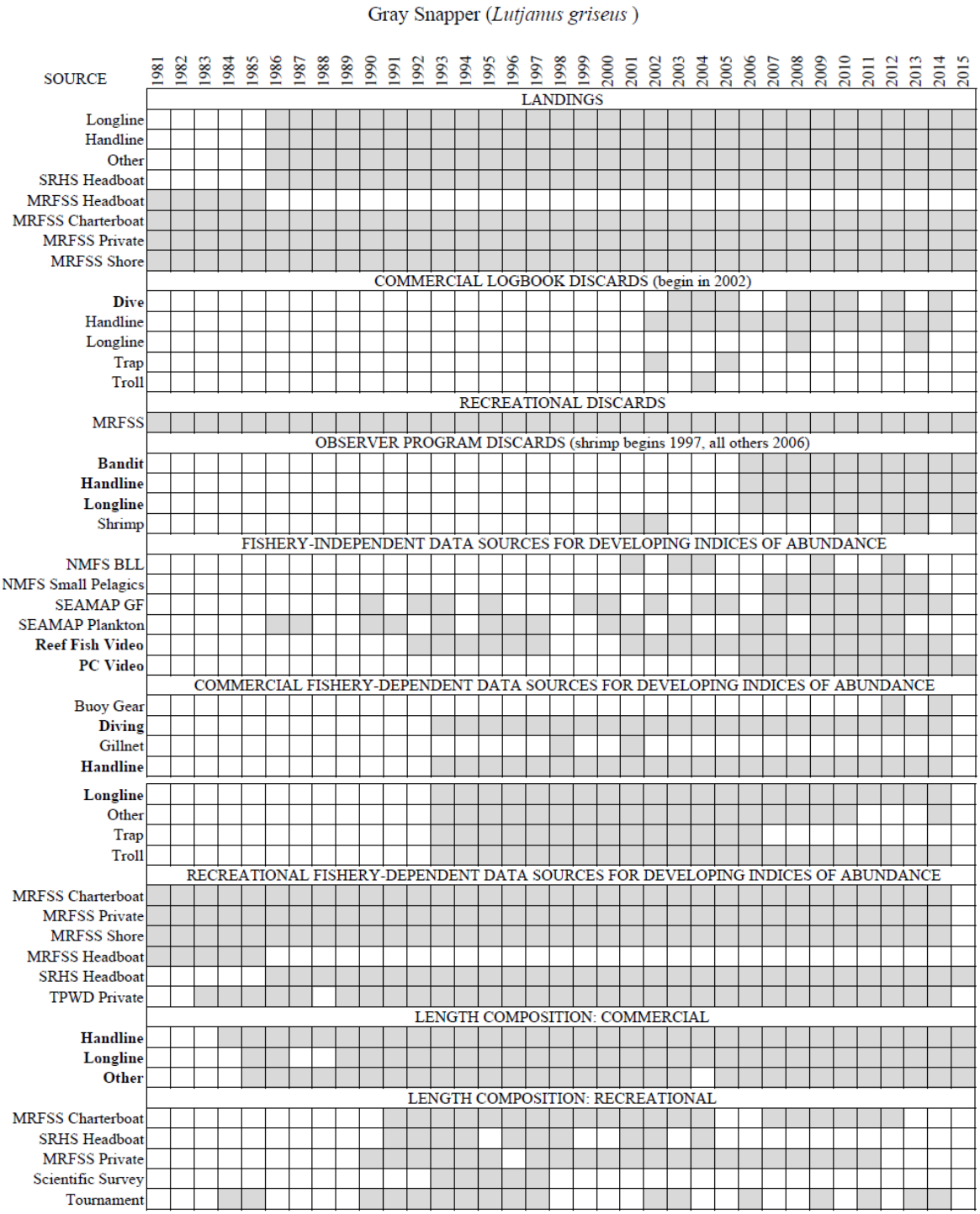

Figure 12. Synthesis of available data for Gray Snapper. Gray shading is indicative of the presence of data (i.e., but not the quantity of data available). Sources include data source or gear source, with bolded text used to highlight data sources and/or gear types with data deemed potentially useful.

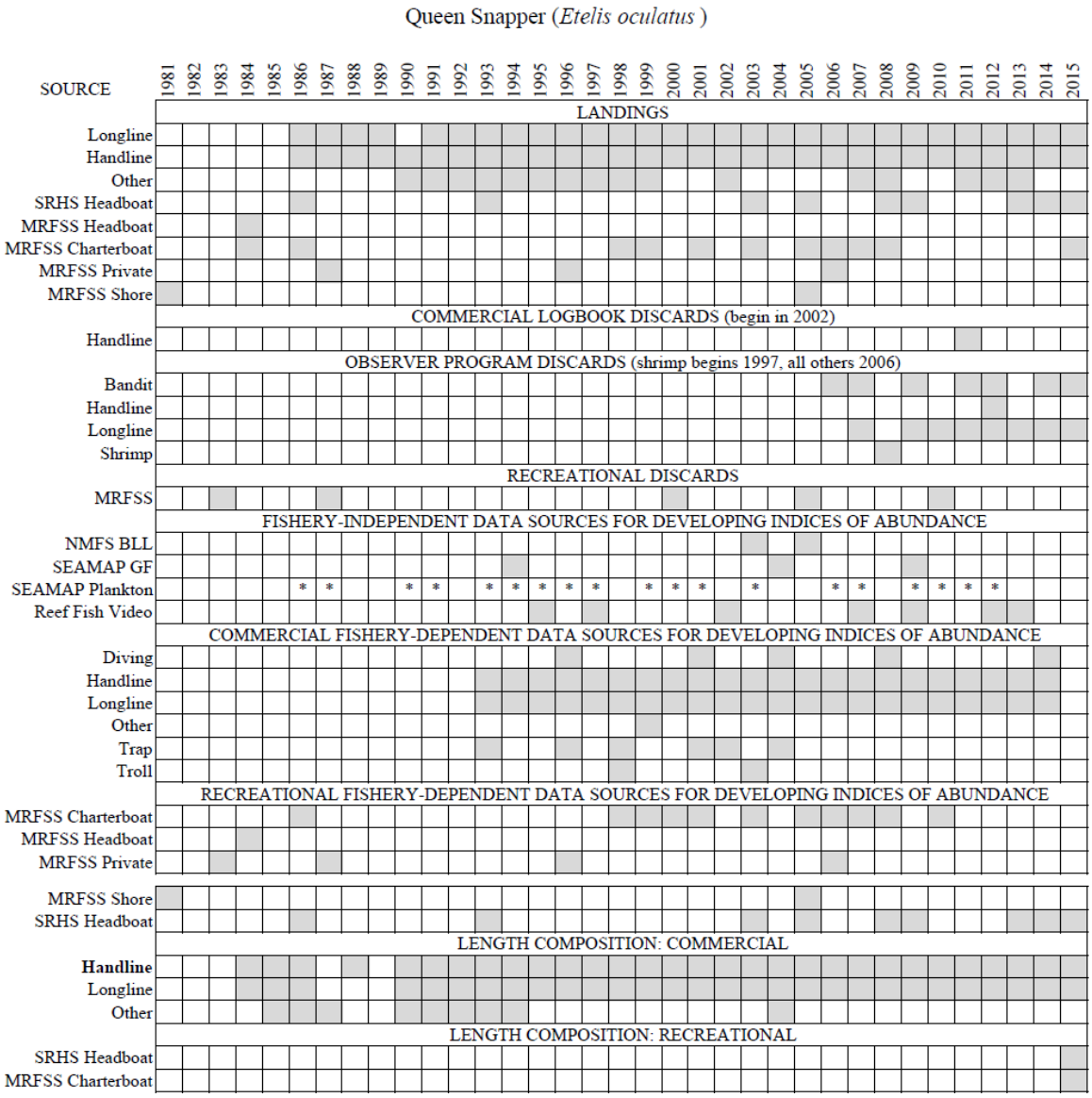

Figure 13. Synthesis of available data for Queen Snapper. Gray shading is indicative of the presence of data (i.e., but not the quantity of data available). Sources include data source or gear source, with bolded text used to highlight data sources and/or gear types with data deemed potentially useful. * indicates that larvae cannot be identified to species level and/or are not caught in any numbers.

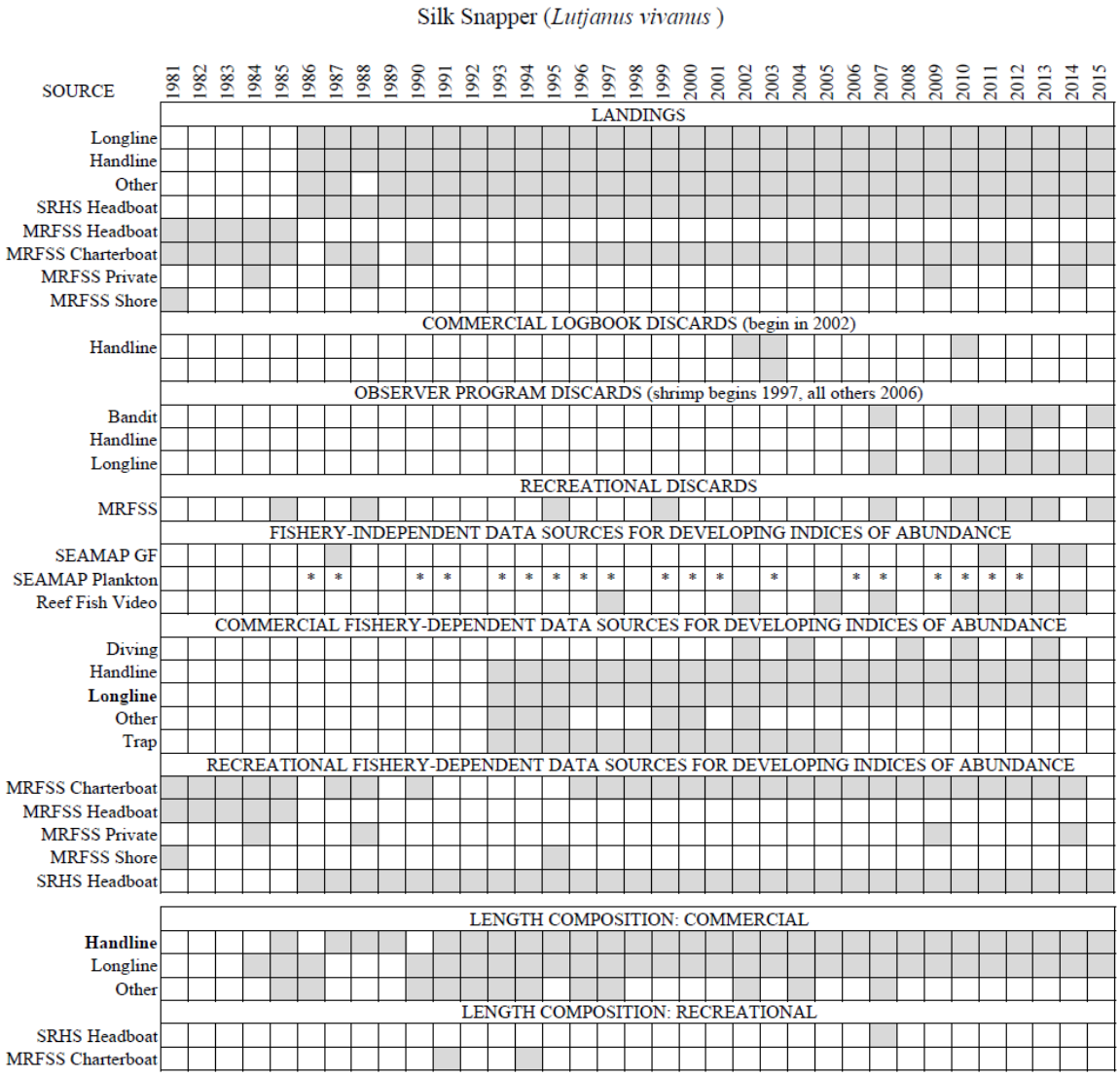

Figure 14. Synthesis of available data for Silk Snapper. Gray shading is indicative of the presence of data (i.e., but not the quantity of data available). Sources include data source or gear source, with bolded text used to highlight data sources and/or gear types with data deemed potentially useful. * indicates that larvae cannot be identified to species level and/or are not caught in any numbers.

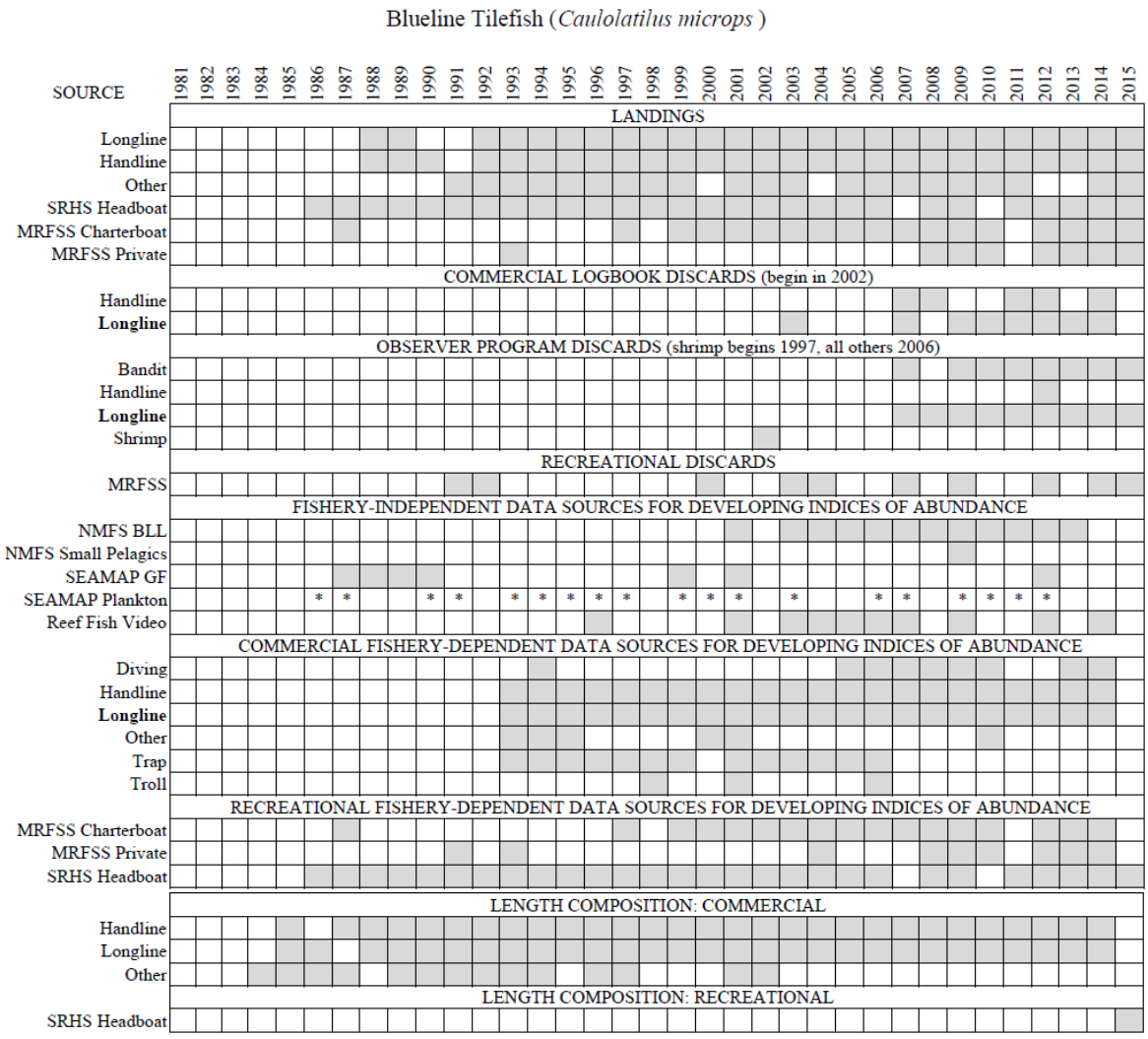

Figure 15. Synthesis of available data for Blueline Tilefish. Gray shading is indicative of the presence of data (i.e., but not the quantity of data available). Sources include data source or gear source, with bolded text used to highlight data sources and/or gear types with data deemed potentially useful. * indicates that larvae cannot be identified to species level and/or are not caught in any numbers.

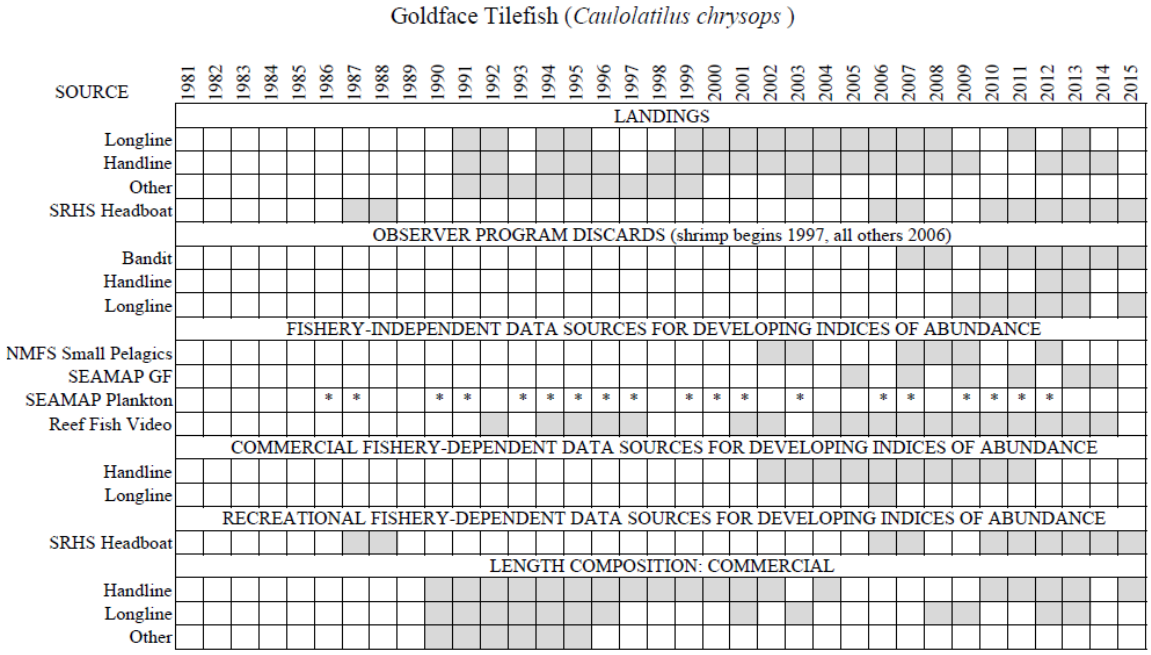

Figure 16. Synthesis of available data for Goldface Tilefish. Gray shading is indicative of the presence of data (i.e., but not the quantity of data available). Sources include data source or gear source, with bolded text used to highlight data sources and/or gear types with data deemed potentially useful. * indicates that larvae cannot be identified to species level and/or are not caught in any numbers.

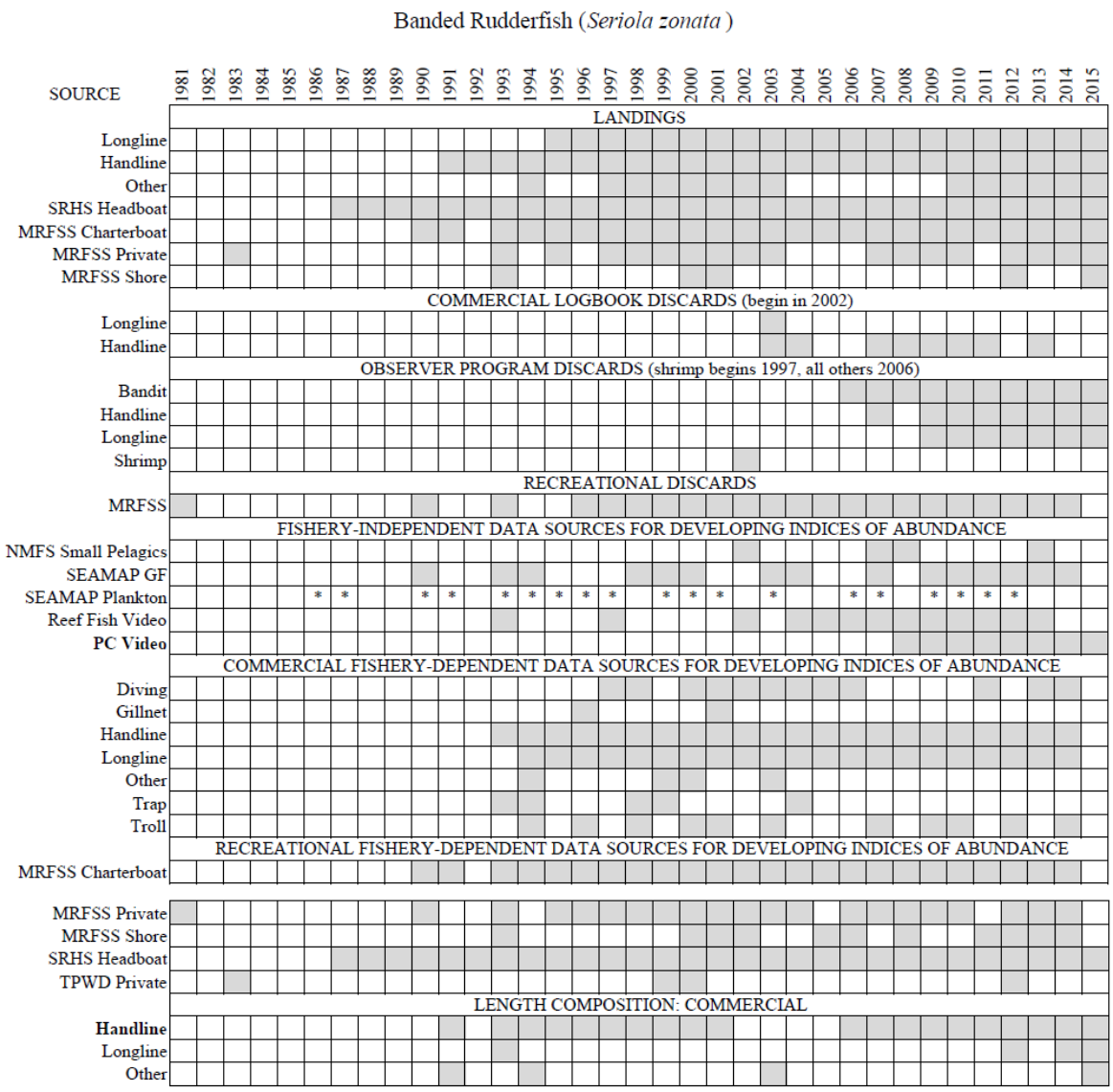

Figure 17. Synthesis of available data for Banded Rudderfish. Gray shading is indicative of the presence of data (i.e., but not the quantity of data available). Sources include data source or gear source, with bolded text used to highlight data sources and/or gear types with data deemed potentially useful. * indicates that larvae cannot be identified to species level and/or are not caught in any numbers.