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Louisiana Black Drum

Fishery Management Plan

Louisiana Department of Wildlife and Fisheries

Office of Fisheries

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Executive Summary

BLACK DRUM (*POGONIAS CROMIS*).

Louisiana's black drum (*Pogonias cromis*) resource supports one of the state's top commercial finfish fisheries and the largest commercial fishery for black drum in the United States. Commercial fishermen have harvested black drum in Louisiana waters for more than a century. Historically, black drum was harvested commercially as bycatch in other fisheries and secondary to its more popular cousin, the red drum (*Sciaenops ocellatus*). However, as commercial harvests for red drum were prohibited in federal and most state waters (including Louisiana's) in the late 1980s, markets for black drum grew and the commercial fishery rapidly expanded. Recent commercial harvests of black drum have averaged nearly 3.9 million pounds per year with a dockside value of more than $3.7 million. Black drum are typically a secondary target for recreational fishermen in Louisiana but increased slightly in popularity beginning in the 1980s as more restrictive regulations were placed on more popular primary target species such as red drum and spotted seatrout (*Cynoscion nebulosus*).

As Louisiana's black drum fisheries developed, managers implemented a number of measures to prevent overharvesting and maintain the black drum population at sustainable levels. Biologists regularly monitor and assess the condition of this valuable resource to ensure these measures are effective and to inform future management decisions, all in an effort to protect the viability of the black drum resource for future generations.

This fishery management plan creates a centralized document that summarizes current information about the biology and status of Louisiana black drum, Louisiana's commercial and recreational fisheries for black drum, effects of Louisiana's black drum fisheries on the ecosystem, and environmental influences on Louisiana's black drum resource. In addition, this plan describes management approaches within the state and regional framework, defines long-term management goals and objectives, identifies management issues, recommends options to address these issues, and outlines future research and data needs.

Introduction

Definition of Management Unit

The management unit includes black drum and its fisheries in coastal and estuarine waters of Louisiana.

Management Authority and Process

The Louisiana Legislature (Legislature), Louisiana Wildlife and Fisheries Commission (Commission), and Louisiana Department of Wildlife and Fisheries (LDWF) are responsible for managing black drum fisheries in Louisiana's state waters, which include inland waters and extend seaward from the shoreline to 3 nautical miles.

Louisiana Revised Statutes (LA R.S.) Title 56 provide for the preparation and implementation of fishery management plans that will prevent overfishing and achieve and maintain plentiful fish populations to ensure, on a continuing basis, the optimum yield from each fishery. Louisiana's fishery management plans are developed according to applicable principles and standards of the Food and Agriculture Organization of the United Nations' (FAO) Code of Conduct for Responsible Fisheries.

Responsible fisheries management requires an ongoing process of continual improvement, with active monitoring of fisheries resources and fisheries and timely response to any observed changes. Fishery management plans are flexible and can be improved with collection and analyses of relevant data. Plan work groups will continuously review new research and monitoring data every year, document progress toward fishery management goals and objectives, and fully review and revise management plans as managers and stakeholders prioritize issues and identify and refine management options.

Management Goals and Objectives

The goal of the Louisiana Black Drum Fishery Management Plan is to ensure long-term conservation and sustainable use of the black drum resource for the maximum environmental, social, and economic benefit to the state of Louisiana, its citizens, and visitors. LDWF will use the following objectives to achieve this goal:

1. Prevent overfishing and ensure black drum are able to successfully reproduce and maintain the population.
2. Achieve a level of fishing capacity that provides for a sustainable harvest and allows for a profitable fishery.
3. Minimize conflicts among user groups.
4. Minimize fishery impacts on undersized black drum and other species while maintaining a sustainable adult spawning population.
5. Continue to produce stock assessments that establish acceptable biological reference points for fishing mortality and population abundance.
6. Promote research to better understand the impacts of environmental factors on both the black drum population and fisheries as well as the black drum fisheries' impacts on the ecosystem.
7. Promote research to improve knowledge of the commercial and recreational fisheries for black drum, including harvest data and socioeconomic information to enhance social and economic benefits derived from the use of the resource.

Description of the Stock

Biological Profile

Numerous well-known texts such as Beckman et al. (1988, 1989, and 1990a and b), Chao (1976), Leard et al. (1993), Luquet et al. (2001), Murphy and Taylor (1989), Parker et al. (1988), and Welsh and Breder (1924) thoroughly describe all aspects of black drum biology and ecology.

Physical Description

Depending on their habitat, black drum are silvery to blackish with black or dusky colored fins—in Gulf of Mexico (Gulf) waters, they are silvery; in muddy waters, they are dark gray, bronze, or jet black. Young black drum usually have four to six vertical black bars on their sides; these bars fade as drum grow older (Chao 1976, Hildebrand and Schroeder 1928, Johnson 1978).

Black drum have heavy bodies with a hump-shaped back. They have large heads with a blunt snout and 12 to 13 pairs of whisker-like barbels along their lower jaw. Black drum have large teeth in the back of their throat that they use to crush their prey (Chao 1976, Hildebrand and Schroeder 1928, Johnson 1978).

Distribution

Black drum are found along the western Atlantic coast from the Bay of Fundy, Nova Scotia, southward into the Gulf and south to Argentina (Gilhen 1986). They are common from New Jersey southward, more common from Chesapeake Bay to the mouth of the Rio Grande, and most abundant in the Gulf along the Texas and Louisiana coasts in both state waters

and the federal Exclusive Economic Zone (EEZ; George et al. 2008, Silverman 1979, Welsh and Breder 1924).

Adult and juvenile black drum are found in Louisiana's estuaries year round with numbers increasing from May through July east of the Mississippi River (Bane et al. 1985). Large, adult black drum primarily inhabit Gulf waters (Osburn and Matlock 1984); Saucier and Baltz (1993) observed the highest frequencies of large spawning aggregations of black drum in and near passes west of the Mississippi River from January through April.

Habitat

Black drum have been found in salinities ranging from 0 to 80 parts per thousand (ppt; Gunter 1945, Perret et al. 1971, Simmons and Breuer 1962, Thomas 1971). Black drum are often found in highly saline waters but are considered euryhaline as they are able to tolerate a wide range of salinities (Simmons and Breuer 1962). Black drum have been observed in water temperatures ranging from 3 to 38°C (37.4 to 100.4°F; Bean 1902, Frisbie 1961, Pearson 1929, Simmons and Breuer 1962, Thomas 1971).

Black drum spawn both inshore and offshore, often near passes and channels (Fitzhugh et al. 1987, Holt et al. 1985, Jannke 1971, Osburn and Matlock 1984, Parker et al. 1988, Pearson 1929, Saucier and Baltz 1993, Simmons and Breuer 1962). Black drum larvae travel into the estuary with incoming tides (Holt et al. 1988, Jannke 1971, King 1971). Juvenile black drum are typically found in areas of little tidal movement and low current, such as boat basins, channels, stagnant sloughs, ditches, and creeks. Juveniles prefer nutrient-rich marsh areas near muddy bottoms and sometimes sand and gravel bottoms (Peters and McMichael 1990, Richards 1973, Thomas 1971). Fox and Mock (1968) collected juvenile black drum from shallow, turbid water with shoreline vegetation, from shell reefs, and from fine silt bottoms in Barataria Bay. Habitat bottom type, rather than salinity, appears to be more critical for juvenile black drum habitat selection (Thomas and Smith 1973).

Adult black drum, typically fish longer than 610 millimeters (27 inches), primarily reside in waters off of the coast of Louisiana (Osburn and Matlock 1984). Adults occasionally re-enter the estuary from April through June (Richards 1973, Thomas and Smith 1973). Adult black drum also form spawning aggregations near coastal passes from January through April just prior to moving into the estuaries (Saucier and Baltz 1993).

Reproduction

Fitzhugh et al. (1987) found that male and female black drum in Louisiana reached sexual maturity between 600 and 640 millimeters (23.6 and 25.2 inches); sexual maturity was defined by the size at which 50 percent of individuals exhibit generation and development of gonads. Nieland and Wilson (1995) noted similar sizes at sexual maturity for males (50 percent were mature at age 4 and 610 to 620 millimeters, or 24 inches, fork length) and females (100 percent were mature at age 5 and 640 to 649 millimeters, or 25 inches, fork length). LDWF's most recent black drum stock assessment considers that no fish between the ages of 0 to 3 spawn, 33 percent of age 4 fish spawn, 66 percent of age 5 fish spawn, and 100 percent of fish greater than age 5 spawn (Davis et al. 2015).

In Louisiana, black drum generally spawn from October to May (Fitzhugh et al. 1987, Fitzhugh et al. 1993, Nieland and Wilson 1995, Parker et al. 1988). Black drum predominantly spawn in shallow inshore and offshore Gulf waters near dusk, often near passes and channels between barrier islands (Fitzhugh et al. 1987, Holt et al. 1985, Jannke 1971, Osburn and Matlock 1984, Parker et al. 1988, Pearson 1929, Saucier and Baltz 1993, Simmons and Breuer 1962). Black drum migrating into spawning aggregations make a drumming sound that can be heard from a boat; spawning is thought to occur near dusk based upon recorded drumming behavior and the developmental stages of black drum eggs sampled (Fitzhugh et al. 1987, Holt et al. 1985, Mok and Gilmore 1983, Saucier and Baltz 1993).

Black drum are batch spawners—they can spawn multiple times in one season, approximately every 2.2 to 7 days (Bumguardner et al. 1995, Fitzhugh et al. 1987, Fitzhugh et al. 1993, Nieland and Wilson 1995, Parker et al. 1988, Wallace and Selman 1981). Individual batch fecundity (the amount of eggs produced by one female during one spawning event) for black drum in Louisiana and the northern Gulf ranges from 0.7 million to 1.6 million (Fitzhugh et al. 1987, Fitzhugh et al. 1993, Nieland and Wilson 1995, Parker et al. 1988). Spawning activity peaks during the new or full moon phase when eggs can be transported seaward by tides and currents.

Black drum larvae typically hatch from eggs within 24 hours of fertilization and range in size from 1.9 to 2.4 millimeters (0.075 to 0.094 inches) total length (Joseph et al. 1964). Once sufficiently developed, larvae move inland and young continue their development inshore (Saucier and Baltz 1993). Once juvenile black drum reach about 15 millimeters (0.6 inches) total length, they have all the characteristics and general shape of adult black drum.

Age and Growth

Black drum can live a long time, up to 60 years (Beckman et al. 1990a and b, Matlock 1990, Murphy and Taylor 1989); however, specimens from the northern Gulf rarely exceed 40 years (Nieland and Wilson 1995). The oldest black drum aged by LDWF is a 45-year-old male at 1,062 millimeters (41.8 inches) long.

Growth is rapid during the first four years of life and slows afterwards. Unpublished LDWF data indicate that age 1 black drum range between 214 and 363 millimeters (9 and 15 inches) total length. Murphy and Taylor (1989) found an average growth rate of 100 millimeters (4 inches) per year for black drum ages 1 to 3 and 10 to 30 millimeters (0.4 to 1.2 inches) per year for black drum ages 15 to 20. Black drum can grow to more than 1,300 millimeters (51 inches; Beckman et al. 1990a and b, Matlock 1990, Murphy and Taylor 1989). The world record black drum weighed 51.3 kilograms (113 pounds) and was landed in Delaware; however, black drum from the Gulf typically do not grow larger than 50 pounds. Small black drum from 1 to 10 pounds are called puppy drum; larger drum are called bull drum.

Predator-Prey Relationships

Once black drum reach maturity, they have no known predators other than man; however, sharks likely prey on mature black drum. Larval and juvenile black drum are prey for any number and variety of predators, such as filter feeders and piscivorous fish, birds, and mammals. Ctenophores and various hydromedusae prey on black drum eggs and early larvae, which can be a significant factor in their survival (Cowan et al. 1992, Saucier and Baltz 1993).

In general, black drum feed on the water bottom and eat a variety of bottom-dwelling organisms. Larvae feed on zooplankton. Young black drum feed on marine worms and small fish. Larger drum feed on shrimp, fish, and mollusks such as oysters, clams, and mussels.

Black drum are opportunistic feeders, eating whatever food is most available. Their diet varies depending on the age and size of the individual. Dugas (1986) reported results from a stomach analysis of black drum in and near Barataria Bay, Louisiana:

- Stomachs of juveniles less than 100.0 millimeters (3.9 inches) total length contained crustaceans, insects, mollusks including dwarf surf clams (*Mulinia lateralis*) and oysters (*Crassostrea virginica*), annelids (both oligochaetes and polychaetes), and some fish.
- Stomachs of black drum 201.0 to 300.0 millimeters (7.9 to 11.8 inches) total length contained mostly crustaceans, followed by polychaetes; mollusks including dwarf surf clams, coquina (*Donax variabilis*), and arrow papermussel (*Amygdalum sagittatum*); and fish.
- Stomachs of black drum 301.0 to 400.0 millimeters (11.9 to 15.7 inches) total length contained mainly crustaceans, mollusks (significantly more than smaller size classes; including dwarf surf clams and oysters), fish, and polychaetes.
- Stomachs of black drum longer than 400.0 millimeters (15.7 inches) total length contained crustaceans, mollusks (including dwarf surf clam and more than four times the amount of oysters found in smaller black drum), fish, and polychaetes.

In another study conducted in Barataria Bay, Louisiana, George et al. (2008) found molluscan prey in 99.3 percent of black drum stomachs sampled (n=537); dwarf surf clam made up the majority (63.2 percent) of stomach contents, followed by Eastern oyster (31.7 percent), hooked mussel (28.7 percent), polychaetes (29.0 percent), crabs (20.7 percent), barnacles (7.6 percent), snails (1.5 percent), and rare taxa (7.0 percent). About one quarter (24.7 percent) of stomachs were empty. In this study, the occurrence of oysters in black drum stomachs increased linearly from 15.2 percent to 52.8 percent for fish less than 53.0 centimeters (20.9 inches) to fish greater than 76.0 centimeters (29.9 inches), respectively. Rare taxa included species such as Atlantic moon snail (*Polinices duplicatus*), sea snail (*Neritina usnea*), Atlantic brief squid (*Loliguncula brevis*), Atlantic rangia clam (*Rangia cuneata*), isopods, amphipods, annelids, and smooth cordgrass (*Spartina alterniflora*) detritus. It is important to note that fish sampled for this diet analysis were collected over freshly bedded seed oysters with the use of experimental gill nets and trotlines. Black drum in this study ranged in size from 45.0 to 85.0 centimeters (17.7 to 33.5 inches) standard length; a total of 1,357 black drum were captured (140 from trotlines).

In general, Dugas (1986) found that smaller black drum primarily feed on soft-bodied insects and polychaetes, fish, and fragile-shelled mollusks such as dwarf surf clams, while larger black drum feed primarily on oysters. George et al. (2008) also noted a shift in preference from dwarf surf clams to oysters as black drum size increased. Changes in diet from smaller to larger size black drum can be attributed to the development of pharyngeal teeth and associated musculature which allows larger black drum to crush heavy shells of oysters and other strong shelled mollusks. Both Cave (1978) and Dugas (1986) found that drum longer than 300.0 millimeters (11.8 inches) can consume an average of one oyster per pound of body weight

per day.

Diet is also correlated with environment and appears to be seasonal. In Lake Pontchartrain, Louisiana, Darnell (1958) found that 65 percent of sampled black drum stomachs contained mollusks, predominantly the clam *R. cuneata*, and 12 percent contained mud crabs (*Rithropanopeus harrisii*); in fact, Darnell found that *R. cuneata* is the staple food of black drum longer than 100.0 millimeters (3.9 inches) in Lake Pontchartrain. Pearson (1929) noted that black drum are most abundant in shallow muddy lagoons where pelecypods (specifically dwarf surf clams) are common. In Barataria Bay, Louisiana, Brown et al. (2003 and 2008) documented significant oyster predation by black drum in March when large aggregations of black drum returned from spawning and again in October when black drum fed on freshly bedded oysters on leased water bottoms. They found more predation of oysters by black drum in the spring versus the fall suggesting a seasonal component to the intensity of oyster predation by black drum.

Black drum feed with their heads slightly lowered, using their barbels (whiskers) to sense food. When a barbel touches prey, the drum stops swimming, inhales it, then swims forward, using its teeth to crush their prey. They often feed around oyster beds, docks, bridge pilings, and other structures where their favorite foods are present and dig or root out buried mollusks and worms.

Black drum feed during the day and night, but feeding is less intensive in early morning hours (Thomas 1971). Adult black drum occasionally school to feed in areas where food is abundant. While feeding in these aggregations, black drum occasionally dredge the bottom causing the surrounding water to turn muddy; this is often easily visible from the air, enabling spotter planes to locate large schools of these fish. When these feeding aggregations are in shallow water, the fins of feeding fish can be seen above the surface of the water; this behavior is sometimes referred to as headstanding or flagging (Darnell 1958, Dugas 1986, Pearson 1929).

Adult black drum have very few competitors in other fish but must compete with the oyster drill (*Thais haemostoma*) and other molluscan predators for their principal food source, which is mollusks.

Stock Status and Assessment Methodology

Stock Unit Definition

According to DNA studies, black drum may be considered one stock in the Gulf (Gold and Richardson 1998). However, there may be regional differences. Genetic analyses of black drum sampled across the Gulf, using a variety of techniques, have shown strong differences between samples from Texas and samples from the eastern and central Gulf (Gold et al. 1994, Karel et al. 1995, Ramsey and Wakeman 1989). Gold et al. (1994) also found black drum from neighboring localities had greater variation than red drum, indicating that black drum migrate between estuaries less frequently than red drum. For the purposes of this fishery management plan, the management unit is defined as black drum and its fisheries in coastal and estuarine waters of Louisiana, consistent with a non-regional, statewide management strategy, with any mixing from other populations being relatively inconsequential.

Assessment Frequency, Reference Points, and Control Rules

When LDWF's most recent black drum stock assessment was conducted (2015), LA R.S. 56:325.4 required LDWF to assess the black drum stock every five years. If the assessment indicated that the current spawning potential ratio (SPR; an estimate of the impact of fishing on the productivity of the stock) was below 30 percent, LDWF was required to close the season within two weeks for a period of at least one year or provide for the Commission's consideration management options derived from data that indicate that the SPR is estimated to have at least a 50 percent chance of recovery to a 30 percent ratio within 10 years or some other appropriate recovery period based on the biology of the black drum stock, environmental conditions, and the needs of the fishing communities.

Since the most recent LDWF black drum stock assessment was published, the Legislature modified LA R.S. 56:325.4 to require LDWF to monitor and evaluate the black drum stock in Louisiana waters, establish management targets to ensure a sustainable population, and report on the status of the stock to the Legislature no later than March first of that year (2015) and every five years thereafter. If that report indicates the black drum stock is not meeting or is likely to not meet the established targets, LDWF must provide for the Commission's consideration management options to ensure that stock can meet the established management targets. As a result, the Commission promulgated Louisiana Administrative Code (LAC) 76.VII.385, establishing those rules. Both biomass and fishing mortality rate targets must be based upon a historical time series from the beginning of the assessed period through 2013. Biomass targets must be based upon the average (geometric mean) spawning stock biomass (SSB) from the stock's historical time series. The

current biomass target and threshold for black drum are 18.9 million pounds and 8.4 million pounds, respectively. Fishing mortality rate targets must be based upon the fishing mortality rate that corresponds to the stock's SSB targets at equilibrium. The current annual fishing mortality rate target and threshold for black drum are 0.15 and 0.21, respectively.

Stock Status

LDWF's most recent assessment of black drum in Louisiana waters estimated that the stock is currently not undergoing overfishing and is not overfished (Davis et al. 2015).

Average fishing mortality rates have varied over the time series with an overall decreasing trend. Estimated average fishing mortality was highest in 1988 when Louisiana black drum landings were at their peak. Since 1988, average fishing mortality rates have decreased and remained low. The current estimate of fishing mortality relative to the conservation threshold is 0.68, which is less than 1, indicating that overfishing is not occurring. However, model estimates suggest that overfishing occurred in earlier years of the time series.

SSB estimates decreased from 38.6 million pounds in 1985 to a minimum of 8.2 million pounds in 1996. After 1997, SSB estimates increased to 40.7 million pounds in 2013. The 2013 estimate is greater than the long-term mean SSB of 21.7 million pounds. The current estimate of SSB relative to the conservation threshold is 1.3, which is greater than 1, indicating the stock is currently not overfished. However, model estimates suggest the stock was considered overfished for a large portion of the historical time series.

Assessment Methods

LDWF's most recent black drum stock assessment uses an Age-Structured Assessment Program (ASAP), a statistical catch-at-age model, to describe the dynamics of the Louisiana black drum stock from 1985 through 2013 (Davis et al. 2015). This model projects abundance at age from estimates of abundance in the initial year of the time series and recruitment estimates in subsequent years. Minimum data requirements for the model are fishery catch-at-age and an index of abundance.

Fishery Catch-at-Age

Commercial black drum landings were taken from LDWF's trip ticket program and NOAA Fisheries commercial statistical records. Beginning in 2002, black drum landings derived from LDWF's trip ticket program were further delineated into juvenile (less than 27 inches) and bull (greater than or equal to 27 inches) size categories. Annual size compositions of commercial harvest were derived from the Trip Interview Program (TIPS; 1994-2001) and the Fishery Information Network (FIN; 2002-2013). Due to the non-random nature of how black drum FIN samples were collected (i.e. separate sampling goals for juvenile and bull drum), separate annual size compositions were developed to characterize juvenile and bull black drum landings. Size compositions of 1985-1991 commercial catches were derived from a historical database of length frequencies of commercial black drum harvest from the multiple gears used in the fishery during that time (Russell et al. 1986 and 1987). Due to the non-random nature in how these samples were collected, the information was pooled to develop two size compositions representing commercial catches from 1985-1988 (when purse seines were a component of the commercial fishery) and from 1989-1991 (after purse seines were banned).

Recreational black drum landings and corresponding size composition information were taken from NOAA Fisheries' Marine Recreational Fisheries Statistics Survey (MRFSS)/Marine Recreational Information Program (MRIP). Because recreational size composition samples were not taken proportionally to recreational black drum landings, size distributions were weighted by the estimated landings within each year/wave/mode. Landings included observed (Type A) and unobserved harvest (Type B1) estimates only. It is important to note that recent changes in estimation methodology for MRFSS/MRIP and eventual calibration to LDWF's LA Creel survey will change landings estimates in future assessments.

Ages of both commercial and recreational black drum landings are derived from a von Bertalanffy growth function (1985-2001) and otoliths collected from LDWF sampling (2002-2013) for inclusion in the assessment.

Index of Abundance

For sampling purposes, coastal Louisiana is currently divided into five coastal study areas (CSAs; Figure 1). LDWF biologists routinely sample each CSA with standardized gear (marine gill net, trammel net, and beach seines) as part of a long-term comprehensive monitoring program to collect life history information and measure relative abundance and size distributions of recreationally and commercially important species.

Results from the trammel net survey are used in the black drum stock assessment to develop an index of abundance for the assessment model. LDWF conducts the trammel net survey from October to March. Survey gear is a 750-foot long and 6-foot deep net, with three nylon walls. The

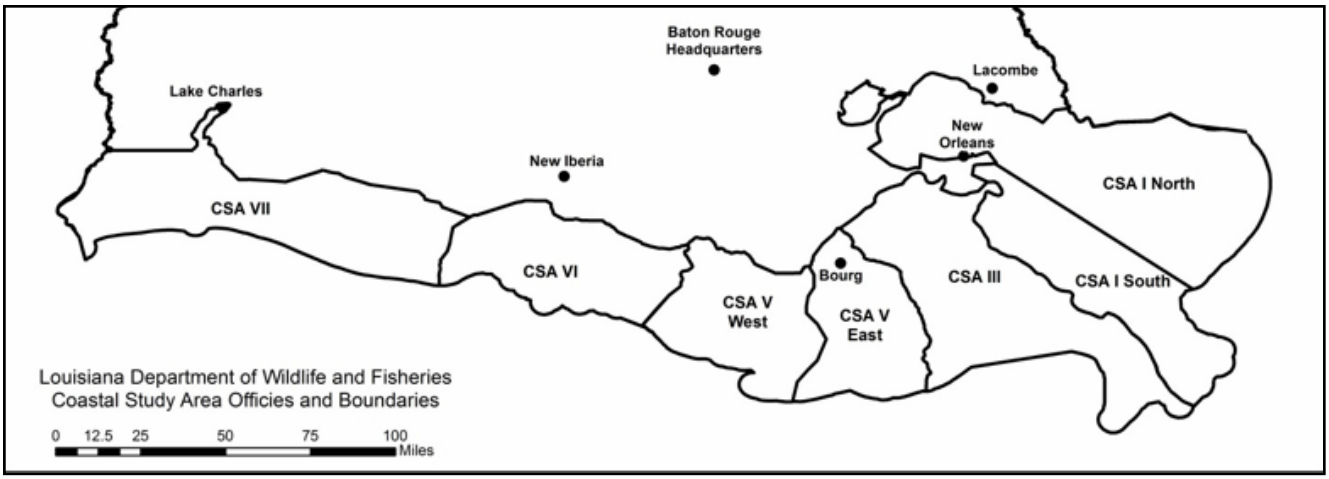

Figure 1. Map of Louisiana's coastal study areas (CSAs). Current CSAs are defined as: CSA 1 - Mississippi state line to South Pass of the Mississippi River (Lake Pontchartrain Basin); CSA 3 - South Pass to Bayou Lafourche (Barataria Basin); CSA 5 - Bayou Lafourche to eastern shore of Atchafalaya Bay (Terrebonne Basin); CSA 6 - Atchafalaya Bay to western shore of Vermilion Bay (Vermilion/Teche/Atchafalaya Basin); and CSA 7 - western shore of Vermilion Bay to Texas state line (Mermentau/Calcasieu/Sabine Basins).

inner wall is a 1-⅝ inch bar mesh; the two outer walls have a 6-inch bar mesh. Biologists count all captured black drum and randomly select a minimum of 50 black drum for length measurements. If more than 50 black drum are captured, biologists derive catch-at-size as the product of total catch and the proportional subsample-at-size. Biologists record water temperature, turbidity, conductivity, and salinity data along with each biological sample. LDWF (2018) contains a full description of the survey methodology.

See the full assessment report in Appendix I for complete details of the current stock status and assessment methods.

Regional Assessment Efforts

Scientists last reviewed the Gulf-wide black drum stock in 1993 and found the population to be abundant (not overfished) and harvested at appropriate levels (no overfishing; Leard et al. 1993). Several Gulf states regularly assess the black drum stock within their state waters and continue to find that the black drum resource is managed sustainably. Given that sampling methods and coverage vary across the Gulf states, producing inconsistent data sets, a Gulf-wide assessment is not currently feasible. Harvest regulations also vary greatly state by state.

Stock Resilience

LDWF's most recent black drum stock assessment evaluates factors that can be used to gauge the resilience of the black drum stock (Davis et al. 2015). Productivity is a function of fecundity, growth rates, natural mortality, age at maturity, and longevity which can be a reasonable proxy for resilience, i.e. 'the ability to rebound after perturbation' (Holling 1973). The assessment characterizes the relative productivity of black drum based on life-history characteristics with a classification scheme developed at the FAO's Second Technical Consultation on the Suitability of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Criteria for Listing Commercially-Exploited Aquatic Species (FAO 2001). Each life history characteristic (von Bertalanffy growth rate, age at maturity, longevity, and natural mortality rate) was assigned a rank (low=1, medium=2, and high=3) and then averaged to compute an overall productivity score. Due to the non-typical von Bertalanffy growth function used in this assessment, the von Bertalanffy growth rate is taken from a traditional three-parameter model (Beckman et al. 1990a and b). In this case, the overall productivity score for Gulf black drum is 1.25, indicating low productivity (Table 1).

Table 1. FAO proposed guideline for indices of productivity for exploited aquatic species.

Parameter	Productivity			Species	Score
	Low (1)	*Medium (2)*	*High (3)*	*Black drum*	
Natural mortality rate (M)	<0.2	0.2–0.5	>0.5	0.1	1
von Bertalanffy growth rate (K)	<0.15	0.15–0.33	>0.33	0.05	1
Age at maturity (t_{mat})	>8	3.3–8	<3.3	5	2
Maximum age (t_{max})	>25	14–25	<14	50	1
Examples	Orange roughy, many sharks	Cod, hake	Sardine, anchovy	Black drum productivity score = 1.25	

Description of the Fishery

FISHERY MONITORING

LDWF monitors commercial landings and fishing effort through a trip ticket program. Through this program, LDWF collects commercial landings data on a trip basis from wholesale/retail seafood dealers and commercial fishermen holding fresh products licenses.

LDWF conducts economic research pertaining to Louisiana and Gulf fisheries resources using information from the trip ticket program and surveys.

Comprehensive descriptions of the Louisiana commercial and recreational black drum fisheries prior to 2000 including development and history of exploitation, effort and harvest, economics, markets, value, and processing are available through numerous publications including Leard et al. (1993) and Luquet et al. (2001).

Data Collection and Analyses

In Louisiana, fishermen have been harvesting black drum commercially since the 1800s, with the earliest documented landings reported from 1923 (60,000 pounds valued at $2,000, or $0.033 cents per pound; Pearson 1929).

LDWF implemented a trip ticket program in 1999 to monitor commercial landings and fishing effort. Through this program, LDWF collects commercial landings data on a trip basis from wholesale/retail seafood dealers and fresh products license holders (commercial fishermen, or their spouses, licensed to sell their catch directly to consumers). LDWF requires dealers purchasing black drum from commercial fishermen and fresh products license holders to submit trip tickets to capture information about the catch—for example, what it is, where it was caught, how it was caught, and how much was caught. As of May 2000, dealers can submit trip tickets through a computerized electronic trip ticket program. To date, about 306 dealers use electronic trip tickets to submit their data.

Unless otherwise noted, the commercial data presented throughout this section are sourced from LDWF's trip ticket program. All data collected by LDWF are published in aggregate form, meaning the sum of data submitted by three or more individuals; data submitted by less than three individuals are confidential and are denoted as such in the tables below. Data are presented from 2000 (when the electronic trip ticket program was implemented) through 2017. Value is presented as real dockside value, in constant, inflation-adjusted 2017 dollars calculated from the nominal or current dollar values using the U.S. Bureau of Economic Analysis Implicit Price Deflator. Volume is presented in pounds whole-weight.

Prior to 2014, recreational landings data are available through MRFSS/MRIP. In 2014, LDWF created a recreational landings survey called LA Creel to estimate recreational harvest of saltwater finfish in Louisiana. From 2014 forward, LDWF has not participated in MRFSS/MRIP; MRFSS/MRIP landings estimates are not yet directly comparable to LA Creel landings estimates. NOAA Fisheries and LDWF are currently working together to calibrate landings estimates from the two surveys to allow for historical comparison of recreational landings; however, this methodology has not yet been fully validated. While commercial landings data for 2018 were not complete in time for inclusion in this fishery management plan, recreational landings data for 2018 were available. Due to the relatively short time span of the current recreational landings data collection program (LA Creel, described above), 2018 data are included here.

LDWF's Socioeconomic Research and Development Section conducts economic research pertaining to Louisiana and Gulf fisheries resources using information from Louisiana's trip ticket program, LA Creel, and surveys. This section publishes results in LDWF reports and peer-reviewed scientific journals, presents research findings at professional and scientific meetings, and provides information and support to LDWF and other agencies to support scientific research and resource management.

Commercial Fishery

In the Gulf, black drum are most abundant along the coasts of Louisiana and Texas. The Gulf states, primarily Louisiana, have been the top supplier of black drum in the United States.

In Louisiana waters, commercial fishermen historically harvested black drum as bycatch in other fisheries and secondary to its more popular cousin, the red drum. Most fishermen would only target black drum when red drum were not available. Black drum were considered undesirable and relatively underutilized until the early 1980s, when the blackened redfish craze took over and markets for red drum boomed. Almost identical in taste and texture to red drum, black drum is an excellent substitute for the popular fish. As commercial harvests for red drum were prohibited in federal and most state waters (including Louisiana's) in the late 1980s, markets for black drum grew and the fishery rapidly expanded. (Leard et al. 1993, Luquet et al. 2001)

Coinciding with the sustained popularity of drum seafood products, emerging markets for large black drum on the East Coast, especially the Northeast, and increased regulation of the harvest of other fish, Louisiana's commercial harvest of black drum dramatically increased from less than half a million pounds in 1980 to nearly nine million pounds in 1988 (pers. comm. Harlon Pearce, Harlon's LA Fish & Seafood, 2019). New regulations for size limits, quotas, and permits as well as other factors such as market demand, fishing effort, and resource abundance limited annual harvests to two to four million pounds from 1989 to 1995. The Legislature prohibited the use of trammel nets, gill nets, and seines by 1997 and harvest declined further. Primary gears shifted to baited trotlines and other set lines, otter trawls, skimmer nets, and butterfly nets, and commercial harvest eventually increased again, but never to levels seen in the late 1980s. A number of factors including hurricanes in 2005 and 2008 and the 2010 *Deepwater Horizon* oil spill impacted the infrastructure supporting the fishery as well as the commercial fleet and harvests. Today, black drum is one of the most highly sought after commercial finfish species in Louisiana, with recent harvests averaging nearly 3.9 million pounds per year with dockside revenue of more than $3.7 million. In fact, black drum was the second most valuable species of saltwater fish landed in Louisiana in 2017.

Volume and Value of Landings

NOAA Fisheries reported black drum landings in 11 different states, from New York to Texas, for 12 of the 18 years between 2000 and 2017. (Landings of a few pounds from Rhode Island were reported in two years during this period.) Louisiana and Texas accounted for 92.7 percent of the volume and 94.0 percent of the dockside value of all commercial black drum landings in the United States in 2017.

Louisiana comprised a majority of the average volume (Figure 2) and dockside value (Figure 3) of commercial U.S. black drum landings between 2000 and 2017. Texas produced 34.6 percent of the average volume and 40.4 percent of the average dockside value.

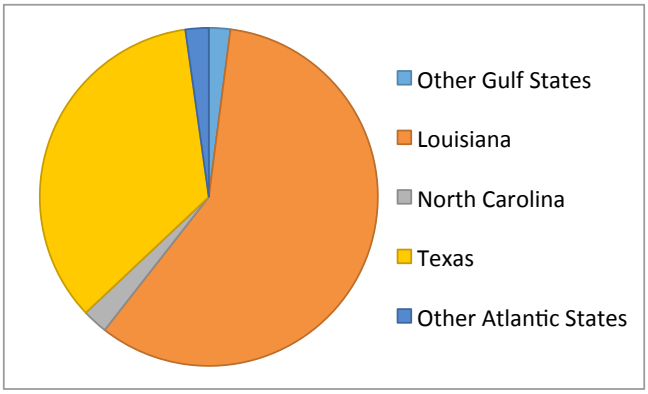

Figure 2. Average volume of annual black drum landings by state, 2000–2017.

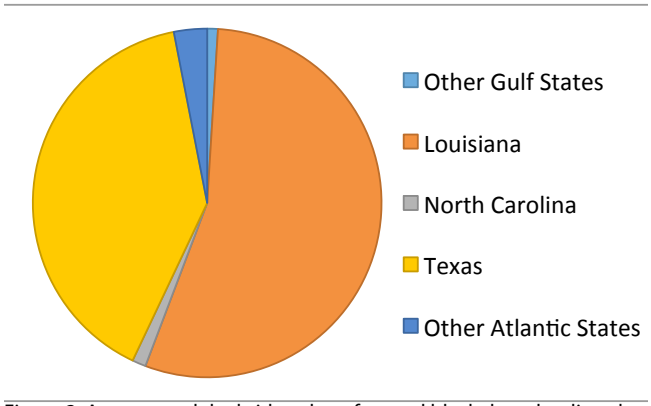

Figure 3. Average real dockside value of annual black drum landings by state, 2000–2017.

Table 2. Volume of annual black drum landings (thousands of pounds) by major black drum producing U.S. states, 2000–2017.

	2001	2001	2002	2003	2004	2005	2006	2007	2008	2009
Alabama	93.4	108.4	70.2	38.6	74.8	71.3	42.7	129.4	142.7	162.3
Delaware	1.0	1.6	1.4	1.7	4.2	6.6	2.1	21.9	9.4	30.9
Florida (East Coast)	17.6	19.3	8.3	9.5	12.6	5.2	4.0	12.8	19.4	15.9
Florida (West Coast)	10.0	9.4	6.0	5.2	3.7	3.2	7.1	17.9	16.9	13.7
Louisiana	2,842.7	3,197.8	3,114.5	3,511.7	3,758.6	2,375.7	1,932.8	2,364.4	2,456.9	3,148.7
Maryland	2.1	0.0	0.0	0.9	1.1	0.1	0.4	0.1	0.0	0.1
Mississippi	14.2	10.9	8.7	8.4	12.5	13.5	11.6	6.2	7.9	9.9
New Jersey	51.1	21.3	17.5	12.6	13.1	2.0	16.5	1.5	1.5	6.4
New York	0.1	0.0	0.2	0.2	0.1	0.03	0.04	0.0	0.0	0.1
North Carolina	98.8	77.9	497.5	148.8	62.5	45.0	125.3	148.3	302.1	149.1
Texas	2,837.1	2,319.9	2,330.7	1,676.7	1,717.1	2,077.4	2,211.8	1,686.8	1,468.1	1,610.1
Virginia	60.4	62.8	30.8	113.9	77.1	88.8	51.6	67.7	44.0	57.2

	2010	2011	2012	2013	2014	2015	2016	2017	Average
Alabama	35.4	97.8	68.5	62.3	77.5	113.1	61.1	91.2	85.6
Delaware	49.7	49.9	10.9	24.6	18.6	39.3	49.1	0.7	17.9
Florida (East Coast)	15.7	22.3	14.1	28.4	91.6	50.5	27.0	41.3	23.0
Florida (West Coast)	15.2	9.1	11.6	23.1	43.1	43.9	31.9	22.5	16.3
Louisiana	2,844.4	3,771.2	4,189.2	3,876.8	3,332.5	4,278.5	3,876.4	3,411.5	3,238.2
Maryland	0.0	0.0	0.1	0.5	0.2	0.0	0.1	0.1	0.4
Mississippi	11.4	9.4	7.1	10.6	9.4	12.2	12.5	14.0	10.6
New Jersey	3.1	3.1	19.0	16.3	9.3	6.5	2.2	21.2	12.4
New York	0.0	0.0	0.1	0.05	0.3	0.4	0.1	0.2	0.1
North Carolina	69.2	56.1	94.4	127.2	51.2	51.1	90.7	182.9	132.1
Texas	1,729.1	1,795.5	1,623.1	1,689.5	1,747.3	1,878.6	1,994.8	1,926.1	1,906.6
Virginia	58.2	44.9	104.2	87.2	88.4	86.9	52.3	43.3	67.8

Table 3. Real dockside value of annual black drum landings (thousands of dollars) by major black drum producing U.S. states, 2000–2017.

	2001	2001	2002	2003	2004	2005	2006	2007	2008	2009
Alabama	$58.8	$65.4	$44.3	$35.6	$45.1	$15.5	$19.7	$48.0	$44.9	$33.5
Delaware	$0.4	$1.1	$0.9	$1.1	$2.7	$2.1	$0.7	$20.4	$4.2	$14.1
Florida (East Coast)	$25.9	$28.0	$12.0	$13.3	$17.9	$7.8	$5.3	$18.3	$25.4	$20.2
Florida (West Coast)	$8.0	$7.2	$4.9	$4.3	$3.3	$2.5	$5.4	$12.1	$10.8	$8.2
Louisiana	$2,363.7	$2,151.4	$2,153.6	$2,534.4	$2,854.4	$2,152.7	$1,646.1	$2,085.2	$2,133.7	$2,720.7
Maryland	$0.6	$0.0	$0.0	$0.3	$0.9	$0.03	$0.1	$0.02	$0.0	$0.2
Mississippi	$10.0	$8.0	$7.7	$5.0	$7.0	$7.3	$4.8	$2.9	$3.6	$3.3
New Jersey	$12.7	$8.7	$5.0	$5.1	$11.9	$0.8	$5.3	$0.5	$0.7	$2.2
New York	$0.02	$0.02	$0.1	$0.1	$0.3	$0.1	$0.04	$0.0	$0.0	$0.1
North Carolina	$35.1	$30.9	$147.5	$48.1	$17.4	$15.2	$45.8	$58.7	$120.1	$73.7
Texas	$3,249.5	$2,303.9	$2,423.4	$1,784.9	$1,839.1	$2,367.5	$2,412.1	$1,937.2	$1,560.6	$1,565.1
Virginia	$24.2	$25.9	$17.9	$45.9	$56.0	$38.4	$21.7	$61.0	$214.3	$253.5

	2010	2011	2012	2013	2014	2015	2016	2017	Average
Alabama	$19.6	$26.5	$20.3	$21.1	$28.2	$26.9	$14.0	$20.6	$32.2
Delaware	$19.6	$20.2	$4.2	$11.4	$7.1	$17.9	$20.3	$0.4	$8.2
Florida (East Coast)	$20.3	$36.2	$22.0	$46.8	$134.4	$80.9	$52.8	$83.8	$36.2
Florida (West Coast)	$10.6	$6.6	$8.3	$18.5	$32.2	$34.4	$26.5	$19.0	$12.4
Louisiana	$2,614.7	$3,167.9	$3,604.1	$3,559.4	$3,267.3	$4,155.0	$3,845.5	$3,141.4	$2,783.2
Maryland	$0.0	$0.0	$0.03	$0.3	$0.1	$0.0	$0.1	$0.1	$0.2
Mississippi	$4.7	$3.2	$3.8	$6.9	$0.1	$13.1	$10.5	$9.6	$6.6
New Jersey	$1.5	$1.1	$5.9	$4.5	$7.9	$2.9	$1.0	$5.8	$4.4
New York	$0.0	$0.0	$0.1	$0.04	$0.3	$0.3	$0.1	$0.3	$0.1
North Carolina	$36.7	$28.9	$58.6	$84.9	$33.6	$44.6	$84.4	$184.7	$63.8
Texas	$1,766.5	$1,593.3	$16,10.0	$1,802.3	$2,062.1	$2,136.2	$2,325.9	$2,457.8	$2,066.5
Virginia	$248.4	$212.4	$357.3	$70.4	$67.8	$71.8	$43.3	$33.6	$103.5

Table 4. Annual Louisiana commercial landings of black drum, by volume (pounds), real dockside value, and real dockside value per pound, 2000–2017.

Year	Volume	Real Dockside Value	Real Dockside Value per Pound	Year	Volume	Real Dockside Value	Real Dockside Value per Pound
2000	2,842,724	$2,363,712	$0.83	**2009**	3,148,715	$2,720,666	$0.86
2001	3,197,869	$2,151,418	$0.67	**2010**	2,844,429	$2,614,699	$0.92
2002	3,114,508	$2,153,647	$0.69	**2011**	3,771,243	$3,167,891	$0.84
2003	3,511,682	$2,534,166	$0.72	**2012**	4,189,204	$3,604,108	$0.86
2004	3,758,565	$2,854,383	$0.76	**2013**	3,876,785	$3,559,621	$0.92
2005	2,375,706	$2,152,681	$0.91	**2014**	3,332,461	$3,267,349	$0.98
2006	1,932,808	$1,646,060	$0.85	**2015**	4,278,500	$4,155,016	$0.97
2007	2,364,413	$2,085,222	$0.88	**2016**	3,876,423	$3,845,482	$0.99
2008	2,456,880	$2,133,748	$0.87	**2017**	3,411,454	$3,141,429	$0.92

Louisiana landings of black drum totaled 3.4 million pounds and $3.1 million in 2017 (Tables 2 and 3). Between 2000 and 2016, average landings were 3.2 million pounds with a real dockside value of $2.8 million. Landings ranged between a low of 1.9 million pounds and $1.7 million in 2006 and a high of 4.3 million pounds and $4.2 million in 2015.

Estimates of average real dockside value per pound for each year were calculated as the quotient of the real dockside value divided by the volume of black drum landed in that year. Average real dockside value per pound has followed a generally upward trend from 2000 ($0.67 per pound) to 2017 ($0.92 per pound; Table 4).

Landings by Month

Louisiana's commercial black drum fishery operates year-round. The fishing year begins September 1, and the season stays open until the commercial quotas are met. Since the fishing year and quotas were established, the season has never closed.

Black drum landings fluctuate considerably throughout the year. Between 2000 and 2017, the highest average volume of landings occurred in January (383,371 pounds), nearly twice as high as the average for the month with the lowest landings (204,915 pounds for September; Table 5). Average landings were highest in the cooler months (January, February, March, and December) and lowest in the warmer months (May through September). However, average real dockside value per pound tended to be lower in the cooler months when landings were larger and higher in the warmer months when landings were smaller.

Table 5. Average monthly black drum landings by volume (pounds), real dockside value, and real dockside value per pound, 2000–2017.

Month	Average Volume	Average Real Dockside Value	Average Real Dockside Value per Pound
January	383,371	251,779	$0.66
February	319,263	215,113	$0.67
March	378,594	286,895	$0.76
April	243,922	218,395	$0.90
May	219,577	229,452	$1.04
June	222,719	232,984	$1.05
July	218,697	224,105	$1.02
August	222,995	229,156	$1.03
September	204,915	200,689	$0.98
October	249,723	239,074	$0.96
November	268,219	236,149	$0.88
December	306,026	222,391	$0.73

Landings by Gear Type

In the mid-1990s, the Legislature banned the use of gill nets, trammel nets, and seines for harvest of black drum. Today, commercial fishermen primarily use baited trotlines and other set lines, otter trawls, skimmer nets, and butterfly nets to harvest black drum.

Though commercial black drum landings were associated with more than two dozen different types of gear from 2000 through 2017, trotlines accounted for the majority of landings (Tables 6 and 7). Trotlines were used to harvest three quarters of the landings in 2017 (2.6 million pounds) and at least 62 percent of the volume for each year since 2004. The combined landings of handlines, otter trawls, and skimmer nets represented an additional 19.8 percent of 2017 landings and 16 to 27 percent of black drum landings in each year from 2004 through 2016.

Table 6. Volume of annual black drum landings (pounds) by most commonly used gear type, 2000–2017.

Year	Hand-lines	Otter Trawl, Fish	Otter Trawl, Shrimp	Skimmer Nets	Trotlines
2000	243,973	127,831	551,973	72,742	1,671,687
2001	86,656	226,646	977,992	155,579	1,672,298
2002	174,674	154,150	756,552	232,567	1,725,340
2003	222,766	299,911	602,290	127,779	2,204,497
2004	328,884	101,801	440,767	141,008	2,695,526
2005	98,991	77,059	193,947	48,004	1,930,495
2006	27,631	92,940	94,549	74,601	1,626,720
2007	98,430	55,845	250,970	77,966	1,840,513
2008	223,149	27,563	157,357	76,548	1,933,800
2009	155,990	113,683	130,451	173,496	2,537,542
2010	80,165	125,928	81,657	177,559	2,300,926
2011	338,253	166,434	62,604	63,020	2,889,054
2012	343,514	138,280	166,041	53,967	3,212,679
2013	390,116	238,044	47,259	83,086	2,834,858
2014	259,326	148,988	91,149	78,274	2,414,767
2015	388,743	434,182	302,232	87,529	2,655,389
2016	306,382	289,739	104,360	51,795	2,778,934
2017	217,585	278,651	127,916	51,505	2,586,648

Table 7. Value of annual black drum landings by most commonly used gear type, 2000–2017.

Year	Hand-lines	Otter Trawl, Fish	Otter Trawl, Shrimp	Skimmer Nets	Trotlines
2000	$218,304	$93,988	$245,897	$59,591	$1,331,355
2001	$67,252	$138,618	$377,866	$96,301	$1,171,964
2002	$131,083	$95,269	$254,574	$137,141	$1,234,169
2003	$166,095	$157,785	$239,250	$84,261	$1,552,955
2004	$208,771	$58,087	$204,944	$83,792	$1,923,990
2005	$96,367	$49,431	$133,988	$38,677	$1,559,435
2006	$24,149	$27,564	$52,045	$51,055	$1,277,037
2007	$73,712	$31,963	$119,317	$60,510	$1,513,921
2008	$165,344	$24,280	$93,176	$54,978	$1,507,387
2009	$112,898	$90,448	$72,439	$95,477	$1,992,123
2010	$55,682	$117,098	$67,783	$109,490	$1,888,336
2011	$264,024	$119,325	$50,354	$41,673	$2,172,800
2012	$232,333	$105,779	$127,531	$38,599	$2,446,761
2013	$268,840	$197,515	$33,503	$70,342	$2,350,055
2014	$174,724	$155,098	$65,597	$61,230	$2,131,462
2015	$268,190	$481,869	$176,600	$82,652	$2,359,630
2016	$175,684	$331,915	$69,836	$40,583	$2,481,927
2017	$94,298	$286,864	$78,245	$49,862	$2,112,933

Landings by Vessel Length

Vessels between 21 and 30 feet long accounted for the majority of commercial black drum landings in every year between 2002 and 2017 (Table 8). Vessels between 16 and 20 feet also accounted for sizeable portions of landings between 2000 and 2017. Vessel length was not reported for average of about 9 percent of commercial black drum landings between 2000 and 2017.

Landings by Area

LDWF's trip ticket program requires commercial fishermen to identify the area in which they caught the majority of the fish they are landing from every commercial fishing trip. Louisiana's commercial black drum fishery operates primarily within state inside waters (from the coastline inland to the saltwater line) and outside territorial waters (from the coastline seaward to 3 miles); there is also some harvest from federal waters of the EEZ (from the state water boundary seaward to 200 nautical miles).

Combined commercial landings from the Atchafalaya, Vermilion, and Teche basins totaled 1.2 million pounds in 2017, more than one third of the volume of Louisiana commercial black drum landings that year (Tables 9 and 10). In 2017, about one quarter of commercial black drum landings was harvested from the Lake Pontchartrain Basin

Table 8. Volume of annual black drum landings (pounds) by vessel length, 2000–2017.

Year	Under 15'	16' to 20'	21' to 30'	31' to 40'	41' to 50'	51' to 60'	Longer than 60'	Unknown
2000	170,265	927,475	627,153	120,016	40,067	93,665	408,812	455,271
2001	162,370	755,784	732,643	223,093	128,822	109,718	784,362	301,079
2002	183,184	794,532	1,021,067	292,025	112,256	63,885	551,901	95,659
2003	81,668	943,869	1,499,391	376,053	36,851	66,717	470,009	37,124
2004	106,406	1,190,620	1,657,097	276,375	51,183	$87,866	284,364	104,653
2005	73,790	657,972	1,239,083	127,012	23,087	$26,045	176,577	52,140
2006	59,516	491,981	1,125,857	44,389	26,022	$45,017	103,807	36,218
2007	59,509	711,723	1,136,569	116,313	25,197	$22,843	220,313	71,946
2008	18,818	848,004	1,159,734	248,797	23,278	$30,048	107,131	21,070
2009	109,254	1,170,058	1,293,685	410,764	27,358	$37,090	67,441	33,065
2010	109,164	903,584	1,257,569	385,490	67,037	$20,245	22,532	78,807
2011	88,201	1,160,628	1,924,625	408,027	9,372	$13,158	32,573	134,659
2012	135,074	1,117,951	2,116,600	384,403	12,433	$30,692	18,586	373,465
2013	119,100	1,092,623	1,719,405	489,250	39,207	$23,825	39,048	354,327
2014	87,814	723,125	1,371,424	311,588	18,186	$30,656	69,067	720,601
2015	138,362	718,190	1,713,292	482,401	16,634	$159,109	134,478	916,034
2016	66,655	650,912	1,831,444	300,192	7,973	$90,617	106,127	822,503
2017	57,461	509,791	1,709,750	255,523	21,706	$87,613	99,146	670,465
Average	101,478	853,824	1,396,466	291,762	38,148	$57,712	205,349	293,283

Table 9. Volume (thousands of pounds) of annual black drum landings by area, 2000–2017.

Year	Calcasieu/ Mermentau/ Sabine	Atchafalaya/ Vermilion/ Teche	Terrebonne	Barataria	Mississippi River	Lake Pontchartrain	Federal Offshore Waters	Statewide
2000	694.7	269.1	324.3	895.4	220.3	136.7	302.3	2,842.7
2001	535.6	384.7	345.2	1,223.6	310.0	165.6	233.2	3,197.9
2002	290.4	601.1	295.5	1,111.6	338.9	215.7	261.3	3,114.5
2003	268.0	1,103.8	214.7	1,104.4	594.8	191.4	34.5	3,511.7
2004	552.6	1,421.0	319.9	832.5	432.6	102.0	98.1	3,758.6
2005	389.8	1,101.3	180.7	402.6	101.2	94.2	105.9	2,375.7
2006	308.0	860.4	102.1	520.5	46.7	21.2	73.8	1,932.8
2007	385.5	758.0	129.4	862.3	128.0	53.1	48.2	2,364.4
2008	337.0	1,045.7	45.4	549.5	249.4	216.9	13.1	2,456.9
2009	641.7	1,067.4	150.7	371.3	302.6	610.3	4.7	3,148.7
2010	347.4	1,173.9	215.9	208.6	151.2	738.5	7.8	2,844.4
2011	919.4	1,268.3	240.0	286.6	177.4	858.4	18.6	3,771.2
2012	1,100.1	1,382.0	282.4	366.5	187.3	841.1	28.3	4,189.2
2013	877.1	1,186.0	358.7	400.8	225.4	766.3	60.6	3,876.8
2014	920.8	757.9	247.1	401.6	207.8	765.9	30.0	3,332.5
2015	671.3	1,112.1	103.6	653.6	450.9	1,260.9	23.1	4,278.5
2016	566.0	1,084.6	249.2	361.2	354.1	1,253.2	4.4	3,876.4
2017	378.3	1,216.8	282.7	269.6	229.4	1,014.6	20.0	3,411.5

in the eastern portion of the state and 11 percent from the Calcasieu, Mermentau, and Sabine basins (combined) in the western portion of the state. One sixth was harvested from the Terrebonne and Barataria basins and 6.7 percent from the area surrounding the month of the Mississippi River. Relatively little commercial black drum landings were harvested in federal waters.

Calcasieu, Mermentau, and Sabine Basins

Commercial harvest of black drum from these basins has been relatively small in recent years, but they were major production areas in earlier years. In 2012, area landings peaked at 1.1 million pounds, one quarter of that year's statewide landings.

The average real dockside value per pound for black drum from this area was $1.17 in 2017. Since 2011, the average value per pound in this area has been higher than the state average.

Atchafalaya, Vermilion, and Teche Basins

Combined commercial black drum landings from the Atchafalaya, Vermilion, and Teche basins varied widely between 2000 and 2017. Area volume climbed from a period low of 269,100 pounds in 2000 to 1.4 million pounds in 2004, dipped to 758,000 pounds in 2007, and then rose to more than 1 million pounds for all but one year (2014) since 2008. Atchafalaya River levels can influence landings of black drum in this basin as high river levels early in the year extend cooler and fresher water into the system, possibly disrupting the normal distribution of black drum (pers. comm. Jeff Marx, LDWF, 2019).

The average real dockside value per pound for black drum from this area was $0.75 per pound in 2017. The area average dockside value has consistently been below the corresponding statewide average between 2000 and 2017.

Terrebonne Basin

The Terrebonne Basin has provided relatively moderate amounts of black drum, generally between 100,000 to 300,000 pounds per year. The volume landed from this area in 2017 (282,700 pounds) was the second highest from the area since 2004.

The average real dockside value per pound of black drum harvested from the Terrebonne Basin in 2017 ($0.77 per pound) was below the statewide average real dockside value per pound ($0.92 per pound). The average real dockside value per pound for black drum from this basin was less than the statewide average in ten of the last 11 years of the time period.

Table 10. Average real dockside value per pound of annual black drum landings by area, 2000–2017.

Year	Calcasieu/ Mermentau/ Sabine	Atchafalaya/ Vermilion/ Teche	Terrebonne	Barataria	Mississippi River	Lake Pontchartrain	Federal Offshore Waters	Statewide
2000	$1.01	$0.67	$0.86	$0.71	$0.97	$0.95	$0.73	$0.83
2001	$0.87	$0.73	$0.68	$0.57	$0.60	$0.92	$0.60	$0.67
2002	$0.81	$0.71	$0.68	$0.63	$0.74	$0.94	$0.52	$0.69
2003	$0.84	$0.69	$0.86	$0.69	$0.69	$0.87	$0.63	$0.72
2004	$0.85	$0.78	$0.83	$0.67	$0.66	$0.87	$0.91	$0.76
2005	$1.09	$0.85	$0.91	$0.87	$0.86	$0.89	$0.94	$0.91
2006	$1.14	$0.84	$0.86	$0.70	$0.87	$0.78	$0.90	$0.85
2007	$1.16	$0.87	$0.79	$0.80	$0.76	$0.98	$0.85	$0.88
2008	$1.15	$0.87	$0.87	$0.83	$0.82	$0.59	$0.86	$0.87
2009	$1.01	$0.85	$0.78	$0.88	$0.63	$0.87	$0.55	$0.86
2010	$0.93	$0.85	$0.87	$0.78	$0.69	$1.12	$0.97	$0.92
2011	$0.88	$0.81	$0.77	$0.57	$0.62	$1.00	$0.92	$0.84
2012	$0.95	$0.75	$0.80	$0.88	$0.62	$0.98	$0.93	$0.86
2013	$1.02	$0.85	$0.68	$0.96	$0.66	$1.07	$0.82	$0.92
2014	$1.06	$0.79	$0.82	$0.99	$0.68	$1.21	$0.88	$0.98
2015	$1.12	$0.88	$0.71	$0.75	$0.66	$1.22	$0.87	$0.97
2016	$1.12	$0.78	$0.76	$0.89	$0.61	$1.30	$1.26	$0.99
2017	$1.17	$0.75	$0.77	$0.83	$0.53	$1.18	$1.41	$0.92

Barataria Basin

The volume of commercial black drum landings reported from the Barataria Basin dropped by approximately 1 million pounds from a period high of 1.2 million pounds in 2001 to a period low of 208,600 pounds in 2010. Area landings climbed to 653,600 pounds in 2015 and declined to 269,600 pounds in 2017.

Average real dockside value per pound for landings from the Barataria Basin was $0.83 in 2017. In every year since 2010, average real dockside value per pound in this area was lower than the statewide average.

Mississippi River Basin

The Mississippi River Basin, consisting mostly of the waters surrounding the "bird foot" at the mouth of the Mississippi River, was the source of 229,400 pounds of commercial black drum landings in 2017. The volume landed from this area was between 100,000 and 250,000 pounds for 10 years within the period between 2000 and 2017 and between 300,000 and 595,000 pounds for 7 years within this period. In every year between 2007 and 2017, the average real dockside value per pound for the basin was below the statewide average for those years.

Lake Pontchartrain Basin

Though the Lake Pontchartrain Basin has provided a large portion of statewide commercial black drum landings in the last three years, the area once accounted for a relatively small share of Louisiana's commercial black drum landings. Following a low of 21,200 pounds in 2006, area landings jumped to 858,400 pounds in 2011 and 1 million pounds or more in 2015, 2016, and 2017.

The average real dockside value per pound for black drum harvested from the Lake Pontchartrain Basin was $1.18 per pound in 2017. Average real dockside value per pound in this area has been higher than the statewide average in every year since 2010.

Federal Waters

Federal waters of the Gulf from Florida to Texas have been a minor source of Louisiana's commercial black drum landings over the last 10 years of the period from 2000 through 2017, ranging from 4,400 pounds in 2016 and 60,600 pounds in 2013. The average real dockside value per pound for black drum from federal waters in 2016 ($1.26) and 2017 ($1.41) were above the corresponding statewide values per pound.

Commercial Black Drum Fishermen

The number of commercial black drum fishermen in a given year can be identified by the number of unique commercial fishing license numbers included in trip ticket records of black drum landings. This number does not include deckhands, crew members, or other workers employed in the harvest of commercial seafood who are not recorded in trip ticket transactions. In 2017, 306 commercial fishermen reported black drum landings, about a third of the number of fishermen (934) reporting black drum landings in 2000 (Table 11).

Table 11. Annual number of licensed commercial fishermen landing black drum in Louisiana, 2000–2017.

Year	Commercial Fishermen	Year	Commercial Fishermen
2000	934	**2009**	538
2001	847	**2010**	391
2002	746	**2011**	419
2003	517	**2012**	376
2004	704	**2013**	352
2005	436	**2014**	377
2006	340	**2015**	380
2007	415	**2016**	352
2008	414	**2017**	306

In all but two years between 2000 and 2009, more commercial fishermen used skimmer nets to harvest black drum than any other single gear (Table 12). Since 2010, most commercial fishermen have used trotlines to harvest black drum.

Fishing Effort

The number of fishing vessels reporting commercial black drum landings followed a generally downward trend for most of the period between 2000 and 2017—1,411 vessels reported commercial black drum landings in 2000, more than three times the number in 2017 (373; Table 13). Because an individual fisherman may use more than one boat on different trips during a given year, the number of vessels associated with black drum landings was somewhat higher than the number of fishermen.

The number of commercial fishing trips with black drum landings also generally trended downward for much of the period between 2000 and 2017, although not as steep as the decline in the number of fishermen and vessels (Table 14). Commercial fishing trips with black drum landings numbered 8,321 in 2000 and 7,585 in 2002 and varied between 5,000 and 5,600 per year between 2015 and 2017.

Estimates of the average volume and dockside value per trip for each year were calculated by dividing the number of commercial black drum trips within a year into annual statewide totals for volume and value. Average volume and value have increased since 2000 (341.6 pounds per trip and $284 per trip in 2000) up to 680.3 pounds and $626 per trip in 2017.

Table 12. Annual number of unique licensed commercial fishermen landing black drum in Louisiana by most commonly used gear, 2000–2017.

Year	Handlines	Otter Trawl, Fish	Otter Trawl, Shrimp	Skimmer Nets	Trotlines
2000	107	67	297	380	258
2001	81	47	296	388	203
2002	94	44	269	327	182
2003	86	55	176	185	173
2004	101	46	186	275	262
2005	71	28	101	97	193
2006	30	17	92	107	138
2007	50	23	95	172	150
2008	57	10	107	163	146
2009	55	10	91	267	189
2010	46	14	72	107	194
2011	69	16	64	122	214
2012	62	21	68	111	165
2013	54	18	59	117	165
2014	59	28	69	113	153
2015	49	27	72	110	162
2016	45	26	59	80	181
2017	35	18	45	82	157

Table 13. Annual number of commercial fishing vessels reporting black drum landings, 2000–2017.

Year	Vessels	Year	Vessels
2000	1.411	**2009**	568
2001	1,137	**2010**	443
2002	812	**2011**	483
2003	572	**2012**	466
2004	767	**2013**	415
2005	478	**2014**	437
2006	349	**2015**	431
2007	449	**2016**	402
2008	435	**2017**	373

Table 14. Annual number of trips reporting black drum landings, average volume per trip, and average real dockside value per trip, 2000–2017.

Year	Number of Trips with Black Drum Landings	Average Volume per Trip	Average Real Dockside Value per Trip
2000	8,321	341.6	$284
2001	7,585	421.6	$284
2002	6,879	452.8	$313
2003	6,115	574.3	$414
2004	7,369	510.1	$387
2005	4,570	519.8	$471
2006	3,432	563.2	$480
2007	4,409	536.3	$473
2008	4,558	539	$468
2009	6,090	517	$447
2010	4,210	675.6	$621
2011	5,062	745	$626
2012	5,445	769.4	$662
2013	5,152	752.5	$691
2014	4,623	720.8	$707
2015	5,147	831.3	$807
2016	5,619	689.9	$684
2017	5,015	680.3	$626

Seafood Dealers and Fresh Products Licenseholders

The number of seafood dealers handling black drum (the number of business or vehicle-based dealers buying or fresh product license holders selling the species) was moderate throughout the period between 2000 and 2017 (Table 15). There were 45 dealers in 2016 and 37 in 2017 that handled black drum.

Most of the dealers who handle black drum are land-based firms with resident wholesale/retail dealer licenses. Annually, very few commercial fishermen with fresh products licenses reported sales of black drum directly to the public, indicating that a robust direct fishermen-to-consumer market, like the ones that have been developed for shrimp and blue crab, has yet to develop for black drum.

Processing and Distribution

Though black drum is one of Louisiana's most valuable commercial saltwater fish species, there is little information about the processing and handling of the species beyond the dock. NOAA Fisheries annually surveys seafood processors to measure seafood processing activity in Louisiana. Participation in the survey is optional and all data are strictly confidential. Respondents to the NOAA Fisheries annual survey of seafood processors rarely provide data about black drum.

There have been recent efforts to market and distribute black drum outside the standard processing and marketing channels. The Audubon Nature Institute's Gulf United for Lasting Fisheries (GULF) program, for example, has worked to raise awareness of black drum among consumers and encourage retailers to feature the fish as a fresh, local, sustainable seafood product. The Louisiana State University Agriculture Center (LSU AgCenter) and Louisiana Sea Grant have launched a program to promote black drum as a premium seafood product. They have worked with commercial fishermen to develop 5-pound consumer packs using the brand name, Vermilion Sweet. These and other black drum products are marketed through Louisiana Direct Seafood and a variety of retailers. The LSU AgCenter is also seeking better ways to preserve and package the fish through numerous student research projects.

Table 15. Annual number of licensed dealers reporting purchases of black drum, 2000–2017.

Year	Dealers	Year	Dealers
2000	69	**2009**	30
2001	54	**2010**	32
2002	54	**2011**	35
2003	49	**2012**	37
2004	52	**2013**	36
2005	43	**2014**	44
2006	42	**2015**	39
2007	37	**2016**	45
2008	33	**2017**	37

Domestic and Foreign Market

Black drum accounts for a small share of U.S. seafood landings and an even smaller portion of the national commercial seafood market. There are likely many potential substitutes, i.e. other saltwater or freshwater fish products with similar characteristics. The FAO groups drum with groupers, snappers, and croakers in their classification of the global seafood products trade, an indication that these seafood types occupy a similar market niche. Changes in the supplies of these seafood types may affect the production and value of black drum.

U.S. commercial landings of red drum were moderate from 2000 through 2017, ranging between approximately 100,000 pounds and 440,000 pounds (Table 16). The real dockside value for red drum generally trended upward from $1.57 per pound in 2000 to $2.60 per pound in 2017.

Table 16. Annual U.S. landings of red drum, snappers, groupers, and croakers by volume (millions of pounds) and real dockside value per pound, 2000-2017.

	Red Drum		Snappers		Groupers		Croakers	
Year	Millions of Pounds	Real Dockside Value per Pound	Millions of Pounds	Real Dockside Value per Pound	Millions of Pounds	Real Dockside Value per Pound	Millions of Pounds	Real Dockside Value per Pound
2000	0.32	$1.57	11	$3.06	9.9	$2.81	27	$0.53
2001	0.18	$1.62	11.1	$2.94	9.4	$2.74	28.9	$0.37
2002	0.11	$1.52	10.8	$2.91	9.5	$2.62	26.3	$0.44
2003	0.12	$1.56	10.1	$2.93	8.8	$2.78	28.8	$0.34
2004	0.07	$1.66	10.7	$3.01	9.3	$2.64	25.6	$0.43
2005	0.16	$1.65	9.4	$3.14	8.5	$2.72	24.6	$0.46
2006	0.19	$1.64	9.4	$3.26	8.2	$2.95	20.8	$0.56
2007	0.28	$1.67	8.4	$3.27	6.7	$3.14	20	$0.51
2008	0.26	$1.76	8.7	$3.24	7.8	$2.95	18.9	$0.59
2009	0.24	$1.85	10.3	$2.99	6.3	$2.88	16.1	$0.79
2010	0.27	$2.04	8.7	$3.21	4.7	$3.04	16.3	$0.73
2011	0.12	$2.07	10.4	$3.23	6.9	$3.06	12.1	$0.84
2012	0.1	$2.21	10.4	$3.36	7.6	$3.10	11.7	$1.06
2013	0.44	$2.02	10.6	$3.68	6.8	$3.33	9.7	$1.05
2014	0.16	$2.32	11.5	$3.74	8.2	$3.46	8.4	$0.92
2015	0.14	$2.53	11.9	$3.76	7.1	$3.59	7.1	$1.03
2016	0.14	$2.60	12	$3.75	6.7	$3.58	6.6	$1.03
2017	0.25	$2.60	12.7	$3.72	5.2	$3.75	4.2	$1.15

Table 17. FAO estimates of annual global mariculture production of red drum, 2004-2016.

Year	China	United States	Global		
	Millions of Pounds	Millions of Pounds	Millions of Pounds	Millions of Rea Dollars	Real Value per Pound
2004	83.9	3.0	89.6	$64.1	$0.72
2005	88.2	3.3	93.5	$69.6	$0.74
2006	93.0	3.3	98.6	$72.4	$0.73
2007	108.7	4.0	114.2	$78.5	$0.69
2008	112.3	3.1	117.1	$91.9	$0.78
2009	108.3	3.1	113.5	$91.4	$0.81
2010	115.2	2.5	120.2	$101.5	$0.85
2011	142.9	3.2	148.4	$140.1	$0.94
2012	144.9	3.2	150.0	$150.3	$1.00
2013	130.4	3.3	136.8	$147.5	$1.08
2014	154.2	3.3	160.5	$177.4	$1.11
2015	158.1	3.3	163.9	$174.9	$1.07
2016	152.1	2.3	157.2	$167.6	$1.07

U.S. commercial landings of all species of snapper dropped from 11.0 million pounds in 2000 and 2001 to 8.4 million pounds in 2007 then subsequently rose to about 12.0 million pounds in 2016 and 2017 (Table 16). U.S. commercial landings of all species of grouper dropped from 9.9 million pounds in 2000 to 4.7 million pounds in 2010, climbed to 8.2 million pounds in 2014, and once again fell to 5.2 million pounds in 2017 (Table 16). Judging by their

Table 18. Annual U.S. imports of grouper products by volume (millions of pounds), value (millions of real dollars), and real value per pound, 2000-2017.

Year	Fresh Grouper			Frozen Grouper		
	Millions of Pounds	Millions of Real Dollars	Real Value per Pound	Millions of Pounds	Millions of Real Dollars	Real Value per Pound
2000	8.1	$21.5	$2.67	0.6	$1.5	$2.33
2001	5.8	$14.5	$2.49	0.8	$1.3	$1.68
2002	7.7	$18.8	$2.44	0.8	$1.5	$1.74
2003	7.2	$17.9	$2.49	1.2	$2.2	$1.88
2004	7	$19.0	$2.72	1.3	$2.2	$1.67
2005	8.4	$24.6	$2.94	1.1	$2.0	$1.84
2006	8.8	$29.2	$3.30	1.4	$2.8	$2.02
2007	9.2	$31.4	$3.40	1.4	$2.2	$1.54
2008	7.8	$26.2	$3.37	1	$2.2	$2.25
2009	8.3	$24.8	$2.99	1.2	$2.2	$1.86
2010	9.4	$30.4	$3.24	1.6	$3.1	$1.95
2011	8.2	$28.8	$3.53	2	$3.8	$1.92
2012	9.2	$33.7	$3.67	1.3	$2.6	$2.07
2013	10	$38.4	$3.85	1.5	$3.7	$2.50
2014	8.6	$36.9	$4.29	1.8	$3.7	$2.14
2015	10.7	$45.7	$4.29	1.3	$3.2	$2.57
2016	11.4	$48.1	$4.21	0.8	$1.5	$1.89
2017	12.3	$50.7	$4.13	1.4	$1.9	$1.33

relatively high real dockside values, snappers and groupers are likely to occupy a higher value portion of the market than drum and may thus be imperfect substitutes for black drum.

Commercial landings of croaker, mainly Atlantic croaker (*Micropogonias undulatus*) but also Pacific white croaker (*Genyonemus lineatus*), dropped from 27.0 million pounds in 2000 and 28.9 million pounds in 2001 to 4.2 million pounds in 2017 (Table 16). Real dockside value per pound of croaker rose from $0.53 per pound in 2000 to $1.15 per pound in 2017.

Mariculture Production of Red Drum

Red drum is also produced in mariculture operations around the world. According to the FAO, global production of red drum rose from 89.6 million pounds and $64.2 million in 2004 to 157.1 million pounds and $167.6 million in 2016 (Table 17). As global output increased, the estimated real value per pound also rose from $0.72 per pound in 2004 to $1.07 per pound in 2015 and 2016. Information on the shipment and disposition of production is not available.

Most of the increase in global output was associated with increased productivity in China. Production from China climbed from 83.8 million pounds in 2004 to 152.1 million pounds in 2016. Chinese output represented 93.7 percent of reported global production in 2004 and 96.8 percent in 2016.

U.S. production generally fluctuated between 3.0 and 3.3 million pounds between 2004 and 2016, reaching a high of 4.0 million pounds in 2007 and a low of 2.3 million pounds in 2016. Most U.S. commercial mariculture production of red drum is centered in Texas which contained five red drum farms covering 1,100 acres in 2016 (Treece 2017).

Foreign Trade

No statistics are publicly available on U.S. trade of black drum or croaker. Statistics are available for domestic trade of snappers and groupers, which may be used to describe trends for possible substitutes for black drum. Trade statistics are reported for two product forms: fresh fish and frozen fish.

The United States imported between 7.0 million pounds and 9.4 million pounds of fresh grouper in the first 12 years of the period between 2000 and 2017 (Table 18). U.S. imports of fresh grouper totaled 10 million pounds or more in four of the last five years. The volume of imported frozen grouper was comparatively small during the period, ranging between 634,000 pounds and 2.0 million pounds.

The value of fresh grouper imports represented at least 88 percent of the total value of grouper imports in each year since 2000. Fresh grouper imports in 2017 ($50.7 million) comprised 96.4 percent of the year's combined value of grouper imports.

The value per pound of imported grouper was consistently higher for fresh product than for frozen product. In 2017, the value per pound of fresh grouper ($4.21) was nearly twice the corresponding value for frozen grouper ($1.89). In addition, the value per pound of imported fresh grouper was generally higher at the end of the period between 2000 and 2017. Value ranged between $2.44 per pound and $2.72 per pound from 2000 to 2004 and between $3.67 per pound and $4.29 per pound from 2012 to 2017.

The value per pound of frozen grouper generally trended upward between 2007 and 2013 then downward since 2014. The value per pound of frozen grouper declined from $2.50 in 2013 to $1.33 in 2017.

The United States imported more snapper than grouper between 2000 and 2017. U.S. imports of fresh snapper ranged between 21.4 million pounds and 29.0 million pounds for most of the period between 2000 and 2016 then rose to 31.0 million pounds in 2017 (Table 19).

U.S. imports of frozen snapper were nearly 13.0 million pounds in 2017. The volume of frozen snapper imports fluctuated fairly widely during the period from a low of 5.5 million pounds in 2000 to a high of 14.4 million pounds in 2016.

The value of fresh snapper imports in 2017 ($90.0 million) was about 72 percent of the total value of snapper imports that year. In previous years, imports of fresh snapper accounted for at least 69 percent of the total value of imported snapper.

Value per pound of both imported snapper product forms generally trended upward between 2000 and 2017. Value per pound of fresh snapper imports climbed from $2.14 in 2000 to $2.89 in 2017. Value per pound of frozen snapper imports climbed from $2.13 per pound in 2000 and $1.72 per pound in 2011 to $2.72 per pound in 2017.

No exports of snapper or grouper from the United States were reported during the 2000-2017 time period.

Table 19. Annual U.S. imports of snapper products, by volume (millions of pounds), value (millions of real dollars), and real value per pound, 2000-2017.

Year	Fresh Snapper			Frozen Snapper		
	Millions of Pounds	Millions of Real Dollars	Real Value per Pound	Millions of Pounds	Millions of Real Dollars	Real Value per Pound
2000	24.5	$52.4	$2.14	5.5	$11.7	$2.13
2001	25.2	$55.4	$2.20	7.6	$13.1	$1.72
2002	25.6	$57.3	$2.24	8.4	$14.9	$1.78
2003	27	$59.0	$2.19	9	$16.6	$1.84
2004	26.2	$59.5	$2.27	8.5	$15.5	$1.82
2005	27.5	$64.3	$2.34	12.7	$24.0	$1.89
2006	26.3	$65.3	$2.49	12	$24.6	$2.06
2007	29	$70.3	$2.43	12.5	$28.0	$2.25
2008	23.8	$62.7	$2.64	8.3	$19.5	$2.36
2009	21.4	$56.1	$2.62	8.1	$18.0	$2.22
2010	22.8	$66.7	$2.93	11	$26.7	$2.42
2011	21.7	$67.3	$3.10	8.5	$21.9	$2.57
2012	22.6	$70.7	$3.12	11.4	$31.4	$2.75
2013	23.1	$72.0	$3.11	10.5	$28.3	$2.70
2014	23.6	$75.2	$3.19	9.3	$25.4	$2.72
2015	26.1	$81.3	$3.12	12.3	$34.1	$2.77
2016	30.5	$91.9	$3.01	14.4	$38.7	$2.69
2017	31.1	$90.0	$2.89	12.8	$34.7	$2.72

Recreational Fishery

Black drum are typically a secondary target for Louisiana recreational fishermen but did increase slightly in popularity beginning in the 1980s as more restrictive regulations were placed on more popular primary target species such as red drum and spotted seatrout. Recreational fishermen use a variety of tackle to catch black drum and typically fish for black drum in bayous, bays, and other estuarine waters near the coast. Black drum can also be targeted from the bank as well as near bridges and offshore and inshore oil rigs. When recreational fishermen keep black drum, they usually prefer smaller fish (under 5 pounds).

Recreational landings estimates from 2000 through 2013 show a large variability in the amount of black drum landed in Louisiana (Table 20). In recent years, landings have been more consistent but seem to vary cyclically. Recreational landings averaged 1.4 million black drum (2.1 million pounds) annually from 2003 through 2013 (pers. comm. NOAA Fisheries, Fisheries Statistics Division, 2018).

LA Creel landings estimates show that recreational black drum landings were relatively stable in 2014 and 2015 at around 200,000 fish, dropped slightly in 2016 and 2017 to around 140,000 fish, and rose again in 2018 to just under 150,000 fish (Figure 4).

The total number of saltwater fishing trips taken by private recreational fishermen in Louisiana between 2014 and 2018 has varied from a low of 2.1 million trips in 2016 to a high of 2.3 million trips in 2015 with an average of 2.1 million trips for the time period (Table 21). During the same time period, an average of 166,325 for-hire trips were taken in Louisiana. For-hire trips varied from a high of 183,301 trips in 2018 to a low of 130,615 trips in 2014. The total number of recreational saltwater fishing trips, including private and for-hire, in Louisiana averaged 2.3 million trips from 2014 through 2018.

Black drum landings were observed in 5.2 to 8.5 percent of private recreational fishing trips surveyed through LA Creel (Table 22). Black drum landings were observed in 8 to 12.5 percent of for-hire trips surveyed through LA Creel.

Between 2014 and 2018, private recreational fishermen in Louisiana landed the most black drum per year from the Terrebonne/Timbalier Basin, with an average of 51,688 black drum per year, a high of 66,659 black drum in 2015, and a low of 33,960 black drum in 2017 (Figure 5). The next highest amount of annual private recreational landings came from the Lake Pontchartrain Basin with an average of 44,130 black drum per year, a high of 74,455 black drum in 2014, and a low of 28,041 black drum in 2018. The Barataria Basin averaged private recreational landings of 29,674 black drum per year, with a high of 39,674 black drum in 2015 and low of 17,762 black drum in 2016. The Calcasieu Basin averaged private recreational landings of 21,023 black drum per year, with a high of 33,327 black drum in 2014 and a low of 10,949 black drum in 2018. The Vermilion/Teche Basin averaged private recreational landings of 5,516 black drum per year, with a high of 7,959 black drum in 2014 and a low of 3,722 black drum in 2018. There is very little recreational catch of black drum in the offshore waters off Louisiana—offshore landings averaged 547 black drum per year during the same time period, with a high of 1,114 black drum in 2014 and a low of 169 black drum in 2018.

Table 20. Annual recreational landings of black drum in Louisiana, 2000-2013. Source: NOAA Fisheries MRIP, Harvest (Type A + B1).

Year	Number of Fish	Pounds
2000	1,652,765	6,654,370
2001	1,464,905	5,999,691
2002	1,338,409	5,008,561
2003	987,891	6,392,531
2004	705,015	3,205,393
2005	629,198	3,004,220
2006	685,131	3,301,823
2007	726,323	3,709,390
2008	944,238	4,098,502
2009	1,040,060	4,171,980
2010	896,988	4,582,565
2011	1,090,560	5,579,003
2012	994,540	4,876,464
2013	1,020,323	7,356,313

Table 21. Annual estimated private recreational and for-hire saltwater fishing trips, 2014-2018.

Year	Private Trips	For-Hire Trips	Total Trips
2014	2,096,246	130,615	2,226,861
2015	2,268,764	159,786	2,428,550
2016	2,063,151	179,239	2,242,390
2017	2,126,789	178,683	2,305,472
2018	2,092,640	183,301	2,275,941

Table 22. Annual percentage of surveyed private recreational and for-hire saltwater fishing trips that landed black drum, 2014-2018.

Year	Percent Private	Percent For-Hire
2014	5.2%	8.1%
2015	8.5%	12.5%
2016	6.2%	9.0%
2017	5.9%	11.5%
2018	5.7%	11.5%

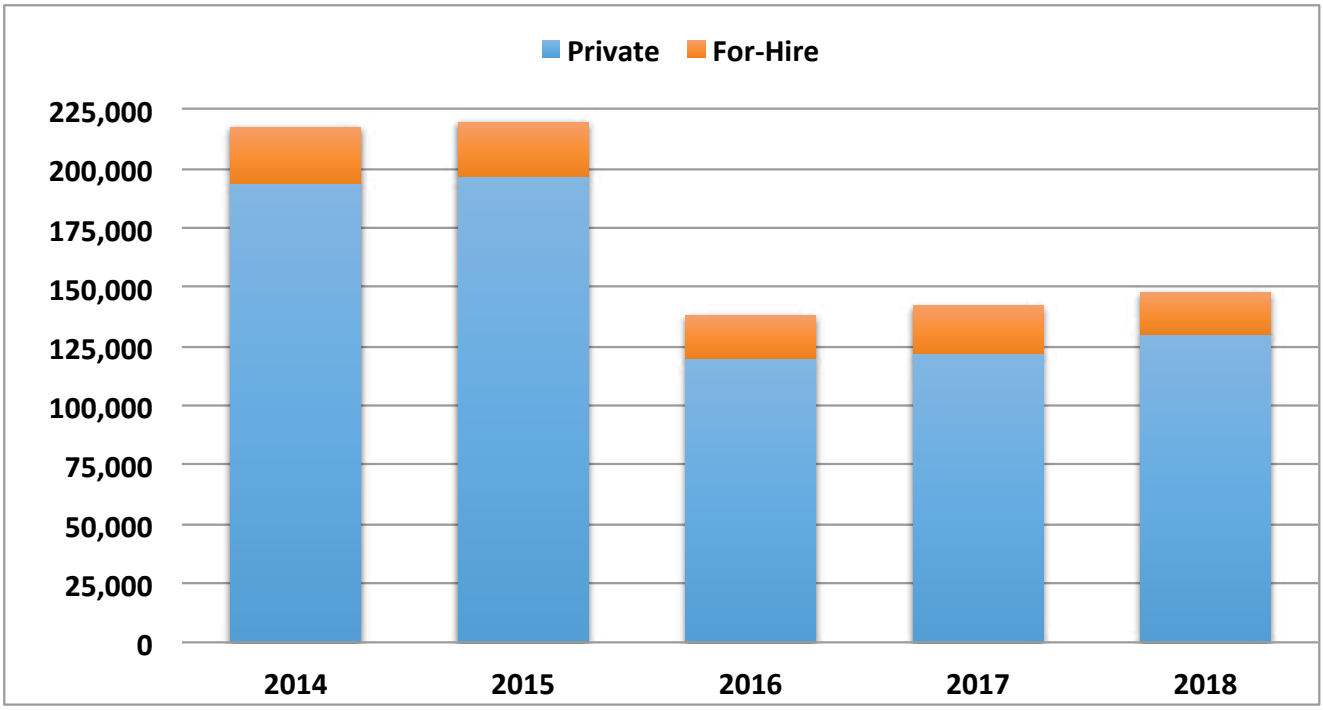

Figure 4. Annual private recreational and for-hire landings of black drum in Louisiana in number of fish, 2014-2018.

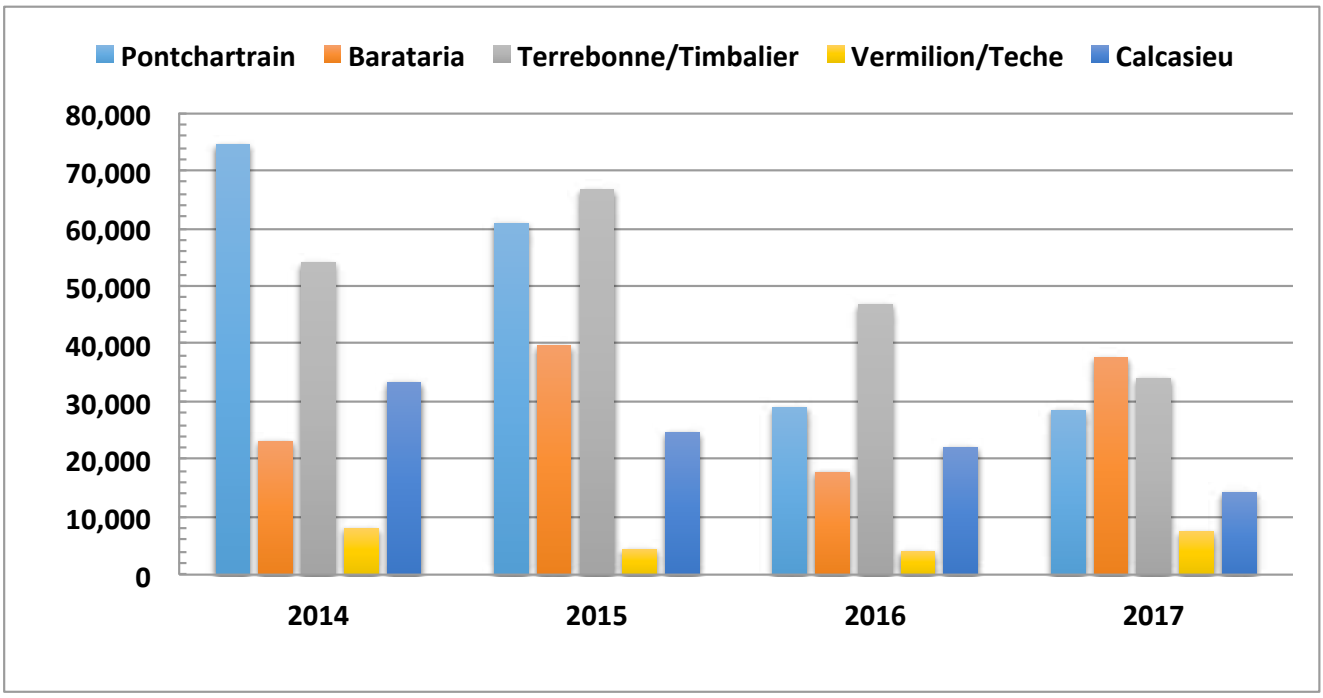

Figure 5. Annual private recreational landings of black drum in Louisiana by area in number of fish, 2014-2018.

From 2014 through 2018, for-hire landings of black drum in Louisiana averaged highest in the Barataria Basin at 11,083 black drum per year, with a high of 15,483 black drum in 2015 and a low of 8,864 black drum in 2014 (Figure 6). The next highest average annual for-hire landings came from the Terrebonne/Timbalier Basin, with an average of 4,244 black drum per year, a high of 5,425 black drum in 2015, and a low of 2,018 black drum in 2014.

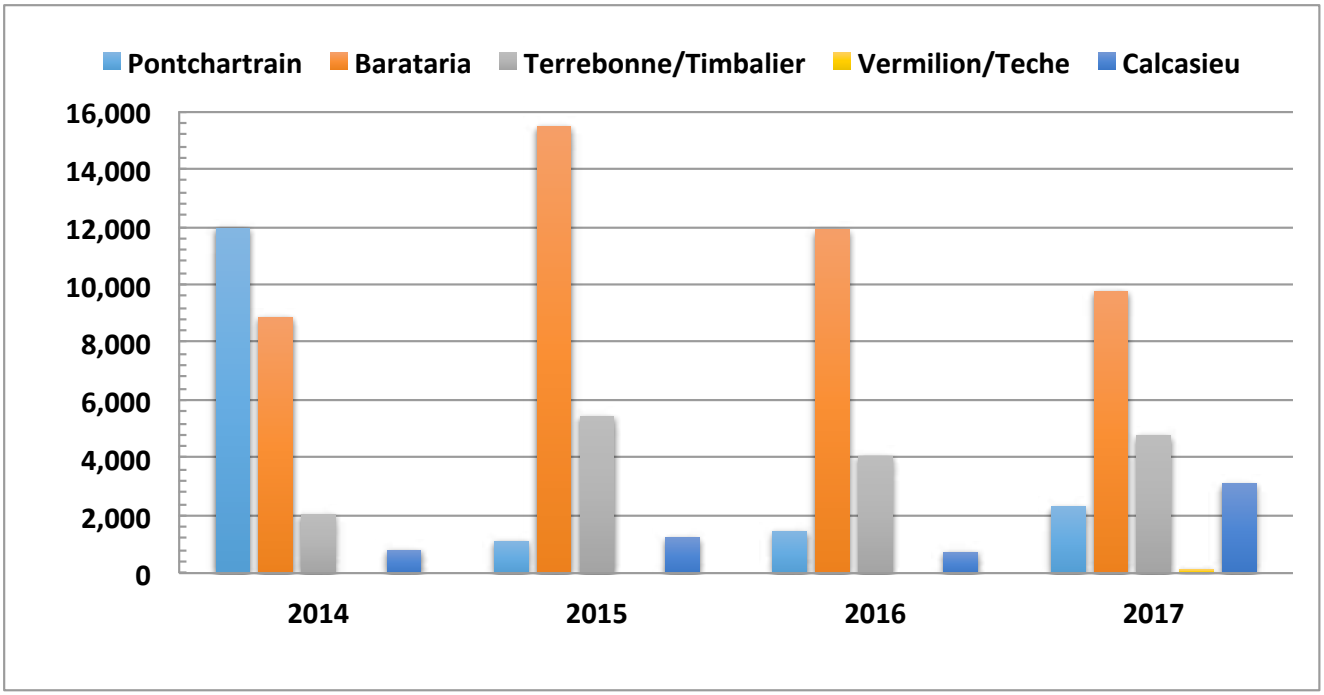

Figure 6. Annual for-hire landings of black drum in Louisiana by area in number of fish, 2014-2018.

The Lake Pontchartrain Basin averaged 3,585 black drum per year, with a high of 11,949 black drum in 2014 and a low of 1,099 black drum in 2015. The Calcasieu Basin averaged 1,539 black drum per year, with a high of 3,090 black drum in 2017 and a low of 723 black drum in 2016. For-hire landings in the Vermilion/Teche Basin were only recorded for two years during the time period—121 and 10 black drum were landed from this area in 2017 and 2018, respectively. Offshore for-hire landings of black drum averaged 38 black drum per year during the time period; there were no offshore for-hire landings recorded in 2015 and 59 black drum recorded in 2017.

Statewide, the majority of black drum landed by Louisiana recreational fishermen are between 1 and 6 years of age, with a peak age of 3 years in most basins throughout the state. However, the majority of black drum landed in the Barataria Basin are typically 2 to 3 years old, whereas the majority of fish landed from the Calcasieu Basin are slightly older (3 to 5 years old) than the rest of the state. The majority of black drum landed recreationally in Louisiana are between 16 and 20 inches, indicating anglers may prefer the lower end of the current 16 to 27 inch slot limit.

Interactions with Other Fisheries or User Groups

George et al. (2008) noted that trotlines are less likely to cause user group conflicts because they lie on the substrate and are less hazardous to boats than gill nets. However, there are conflicts between users of trotline and trawl gear within the commercial black drum fishery during late fall and winter (November through March) due to market conditions. Currently, it is legal to harvest finfish as bycatch with shrimp trawl gear during open shrimp seasons from waters open to shrimping and to target finfish with trawls during these same seasons. LDWF has historically extended the shrimp season into January in certain areas and kept some offshore state waters open to shrimping, which allows fishermen to target or incidentally catch black drum with shrimp trawl gear. Black drum are mainly harvested in shrimp trawls in the Barataria and Lake Pontchartrain basins and adjacent offshore state waters during the fall and winter. Black drum are also easier to harvest with trotline gear during the winter. With the combined landings from incidental catch of black drum in shrimp trawls, directed catch in fish trawls, and directed catch in the trotline fishery, more black drum enter the market during the winter. Increases in the volume of black drum landings at this time of year could influence black drum prices negatively as the resulting surplus of black drum could cause a decline in price per pound of black drum. Daily declines could be significant if there are large daily catches from either gear type. However, seafood demand is typically lower in fall and winter and prices may simply reflect demand. In addition, suppliers and restaurants depend on excess black drum from winter harvests once demand increases in the spring, especially during the Lenten season. Both trotline and trawl-caught black drum are necessary to supply the market as neither sector is able to fully supply the annual demand for black drum.

In addition, LDWF receives complaints from crab trap and trotline fishermen in the Lake Pontchartrain and Vermilion/Teche basins about trawling for black drum and other finfish and the associated displacement of crab traps and trotlines by trawl vessels. When shrimp or fish trawling occurs in areas where fishermen are using trotlines and crab traps, it potentially limits the area available for those fishermen to place their gear. Harvest of black drum and crabs in fish trawls can also temporarily reduce the amount of those species available in a local area to fishermen using other gear types.

Ecosystem Considerations and Environmental Factors

Ecosystem Considerations

Habitat

Few data are available specifically on the impacts of Louisiana's commercial and recreational black drum fisheries on habitat. However, they are likely low. Commercial trotlines and handlines have minimal impact on habitats other than coral, sponge, or seagrasses, none of which are found within the geographic distribution of Louisiana's black drum fisheries. While commercial trawls can disturb bottom habitat, fishermen harvest black drum over mud and sand bottoms, which are less sensitive to impacts of fishing gear. Recreational hook and line gear has minimal impact on habitat.

Commercial fishing is prohibited in more than 625,000 acres of Louisiana's coastal areas, approximately 343,699 acres of which are water bottoms, including black drum habitat. There are restrictions on recreational fishing in some of these areas as well. These coastal areas include state wildlife management areas, private sanctuaries, state and federal wildlife refuges, and areas designated by LA R.S. 56 or LAC 76.

Commercial and recreational trawling are prohibited over LDWF's 29 artificial reef sites, covering more than 3,000 acres, in Louisiana's inshore waters. There are also six nearshore and 76 offshore artificial reef sites covering 888 and 23,147 acres, respectively. While trawls and trotlines are not specifically prohibited over the nearshore and offshore artificial reefs, these reefs are mostly made from substrate that would snag gear or hamper fishermen, which nearly eliminates fishing activities.

Bycatch and Discards

Data are limited regarding the type and frequency of bycatch and discards in Louisiana's commercial and recreational black drum fisheries as there is no observer monitoring nor studies specific to bycatch and discards in these fisheries. However, other studies, landings data, and interviews with fishermen can provide a general description of bycatch and discards in these fisheries.

Finfish

In Louisiana, commercial fishermen mainly harvest black drum with baited trotlines. A trotline is a horizontal line anchored at the ends of the desired fishing location; hooks hang along its length at various depths. Based on LDWF trip ticket data, sheepshead (*Archosargus probatocephalus*) are caught as bycatch in this commercial black drum trotline fishery. Studies in Texas identified the most common bycatch in this fishery as hardhead catfish (*Arius felis*), red drum, and spotted seatrout. Atlantic croaker, gafftopsail catfish (*Barge marinus*), ladyfish (*Elops saurus*), and southern flounder (*Paralichthys lethostigma*) are also caught as bycatch but not frequently (McEachron et al. 1988; Morris et al. 1991).

Trotlines are fairly selective and incidentally caught species can likely be released unharmed if gear is properly attended. In fact, in a study in Louisiana to test the use of baited trotlines to effectively remove black drum from commercial oyster reefs to increase oyster survival without bycatch of important fishes, marine mammals, or turtles, researchers caught six fish species (Atlantic stingray (*Hypanus sabina*), gafftopsail catfish, sheepshead, crevalle jack (*Caranx hippos*), hardhead catfish, and red drum) and no marine mammals or turtles on their trotlines. They were able to release most fishes alive and unharmed (George et al. 2008). However, it is important to note that researchers operated trotlines in this study differently than how they are operated in the commercial black drum trotline fishery. In a study of survival of released black drum, red drum, and spotted seatrout caught on trotlines in Texas, survival was 67 percent, 100 percent, and 64 percent, respectively (Martin et al. 1987).

Commercial trotline fishermen can reduce bycatch of red drum (a commercially prohibited species) and other species by positioning trotline baits on the water bottom. In Louisiana, regulations prohibit trotline hooks from being elevated above the surface of the water except in certain exempt areas (White Lake in Vermilion Parish and Grand Lake and Lake Misere in Cameron Parish). Regulations also require that trotline hooks are spaced at least 24 inches apart with no more than 440 yards of line, limiting the number of hooks to 660 per line.

Commercial fishermen also harvest black drum with handlines. Handlines are not anchored like trotlines; when used to target black drum, handlines have historically been used from small boats with limited capacities crewed by one or two fishermen (Luquet et al. 2001). Recent trip ticket data still show commercial black drum landings with handlines. However, information is limited regarding how commercial fishermen currently operate this gear. Like trotlines, handlines are fairly selective and incidentally caught species can likely be released unharmed.

Commercial fishermen use a variety of trawl gear (otter trawls, butterfly nets, and skimmer nets) to harvest black drum as well; however, they can only use these gear types during open shrimp seasons in areas open to shrimping. When used to target fish, trawl nets are typically made of a larger mesh than when used for shrimping to reduce drag of the gear in the water. Fish trawls have less bycatch than shrimp trawls as their nets have larger webbing and are more selective as a result. Supan and Bankston (1988) found that fish trawls were extremely efficient in catching black drum and sheepshead, commercial species targeted in their study. Bycatch mainly included stingrays, mullet, and small sheepshead. While not required to do so, some commercial fishermen voluntarily use bycatch reduction devices (BRDs) in fish trawls. A BRD is an opening in the trawl net to allow finfish or other incidentally captured aquatic animals to escape while the target species is directed towards the tail bag or cod end of the net.

Commercial fishermen are permitted to retain and sell most bycatch for commercial purposes as long as they are in compliance with appropriate regulations for those

species. However, they may not commercially harvest gamefish or spotted seatrout (unless it is captured by rod and reel gear and the fisherman possesses both a spotted seatrout permit and a rod and reel permit). LDWF monitors landings and sales of these species through the state's trip ticket program. Commercial fishermen may also retain fish for personal consumption as long as it is within minimum size and recreational daily possession limits; however, they must have applicable recreational fishing licenses and any retained fish must be within recreational minimum size and daily possession limits.

Black drum are typically a secondary target for recreational fishermen in Louisiana fishing for red drum or spotted seatrout. When recreational fishermen target or catch and keep black drum, they usually prefer smaller fish (under 5 pounds).

Protected Species

Five species of sea turtles share some habitat with black drum in Louisiana and Gulf waters. All of these species are currently listed as threatened or endangered under the Endangered Species Act (ESA; Table 23).

Table 23. Protected sea turtles in Louisiana and Gulf waters.

Common Name	Scientific Name	ESA Status
Loggerhead sea turtle	*Caretta caretta*	Threatened
Green sea turtle	*Chelonia mydas*	Threatened
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered

Sea turtles infrequently interact with trotlines. Plotkin and Amos (1990) documented one sea turtle entangled in a trotline in Texas, although they did not specify which species. There are no other documented cases of sea turtles caught as bycatch in the commercial black drum trotline fishery; however, there is also no observer monitoring for this fishery.

While federal regulations require installation of turtle excluder devices (TEDs) or the use of tow-time restrictions for shrimp trawls, fish trawls are exempt from these rules as their onboard or landed catch of shrimp is less than 1 percent by weight of all fish comprising their onboard or landed catch.

Under Section 118 of the Marine Mammal Protection Act (MMPA), NOAA Fisheries is required to classify all U.S. commercial fisheries into one of three categories based on the level of incidental serious injury and mortality of marine mammals. The Gulf trotline and mixed species trawl fisheries are listed as Category III fisheries, meaning there is remote likelihood of/no known incidental mortality or serious injury of marine mammals; the handline fishery is not listed. Owners of vessels or gear engaged in a Category III fishery are not required to register with NOAA Fisheries or obtain a marine mammal authorization to lawfully take non-endangered and non-threatened marine mammals incidental to commercial fishing operations. However, they must report to NOAA Fisheries all incidental mortalities and injuries of marine mammals that occur during commercial fishing operations, regardless of the category in which the fishery is placed (I, II, or III) within 48 hours of the end of the fishing trip. In addition, any animal that ingests fishing gear or any animal that is released with fishing gear entangling, trailing, or perforating any part of the body is considered injured, regardless of the presence of any wound or other evidence of injury, and must be reported.

Environmental Factors

Hydrological Conditions (Salinity, Water Temperature, Dissolved Oxygen, and Turbidity)

Black drum are considered euryhaline because they can quickly adapt to a wide range of salinities (Simmons and Breuer 1962). Fontenot and Rogillio (1970) reported no correlation of salinities to sampling success but observed peak catches in salinities of 15 to 20 ppt. Rogillio (1975) noted that salinity had little effect on black drum, and Frisbie (1961) found no apparent correlation between size of fish and salinity.

Various stages of black drum have been found in salinities ranging from 0 to 80 ppt; however, adults found at 80 ppt often had glazed eyes, were blind, and had lesions on their bodies (Simmons and Breuer 1962). Thomas and Smith (1973) found young black drum in salinities from 0 to 28 ppt but suggested that factors such as bottom type, current, and temperature are more critical in determining habitat of the young than salinity. Adults are commonly found in salinities ranging from 25 to 50 ppt (Simmons and Breuer 1962).

Thomas (1971) collected young black drum (with mean total lengths of 10.1 to 36.8 millimeters, or 0.4 to 1.4 inches) in waters with salinities ranging from 0 to 6 ppt. Perret et al. (1971) collected black drum 45 to 370 millimeters (1.8 to 14.6 inches) from coastal Louisiana waters in salinities ranging from 0.2 to 24.9 ppt. Barrett et al. (1978) collected black drum 160 to 870 millimeters (6.3 to 34.3 inches) total length from the Timbalier Island

area and offshore with ranges of salinity at 0.7 to 20.7 ppt. Samples (1978 through 1989) associated with LDWF's Louisiana Offshore Oil Port (LOOP) monitoring program found juveniles in salinities from 0.8 to 33.8 ppt and adults in salinities from 21.1 to 36.7 ppt (LDWF unpublished data). LDWF fishery independent net samples (1986 through 2018) found black drum in state waters at salinities ranging from 0.0 to 36.9 ppt (LDWF unpublished data).

Black drum have been observed in water temperatures ranging from 3 to 38.1°C (37.4 to 100.6°F). Thomas (1971) collected young black drum (with mean total lengths of 10.1 to 36.8 millimeters, or 0.4 to 1.4 inches) in waters with temperatures ranging from 21.5 to 28.5°C (70.7 to 83.3°F). Barrett et al. (1978) collected black drum 160 to 870 millimeters (6.3 to 34.3 inches) total length from the Timbalier Island area and offshore in water temperature ranging from 8.6 to 31.5°C (47.5 to 88.7°F). LDWF fishery independent net samples (1986 through 2018) found juvenile drum in inshore waters at water temperatures from 4.0 to 38.1°C (39.2 to 100.6°F).

Sudden drops in temperature can impact black drum, typically causing them to migrate to deeper waters but also potentially causing mass mortalities if low temperatures last for extended periods of time. Frisbie (1961) reported an observation by Bean (1902) that a low water temperature of 3.3°C (37.9°F) killed young black drum in captivity. Simmons and Breuer (1962) reported that a freeze in 1951 killed more black drum than spotted seatrout or red drum, but the black drum populations apparently recovered much more rapidly. They also observed that after a sudden decrease in water temperature to 3°C in Laguna Madre, Texas, black drum moved to deeper water. However, according to Pearson (1929), black drum are extremely hesitant to move from shallow intercoastal waters of Texas; as a result, drastic decreases in water temperature often result in mass mortalities. McEachron et al. (1988) reported significant mortalities from three freezes in the 1980s.

Thomas (1971) collected young black drum (with mean total lengths of 10.1 to 36.8 millimeters, or 0.4 to 1.4 inches) in waters with oxygen ranging from 4.5 to 10.5 parts per million (ppm). Barrett et al. (1978) collected black drum 160 to 870 millimeters (6.3 to 34.3 inches) total length from the Timbalier Island area and offshore with ranges of dissolved oxygen at 5.2 to 11.8 ppm.

Large areas of hypoxic or oxygen-depleted waters are found off of Louisiana's continental shelf seasonally, from late spring through early fall, and are largely attributed to heavy nutrient loads discharged by the Mississippi River. Hypoxic areas are often referred to as dead zones where dissolved oxygen levels in lower water layers and the water bottom may be too low to sustain marine life. Dissolved oxygen levels above 4 ppm are adequate to sustain most aquatic organisms; however, levels below 2 ppm, particularly during prolonged periods, may cause stress and mortalities (Renaud 1986).

After Hurricane Andrew passed in August 1992, about 27,000 (mainly adult) black drum were found dead in the path of the hurricane on Point au Fer Island, Louisiana. They were part of a multispecies kill that involved an estimated 9.4 million fish, mainly Gulf menhaden (*Brevoortia patronus*), Atlantic croaker, and striped mullet (*Mugil cephalus*). The cause of this kill was never specifically identified, but the location implied some association with the passage of the storm, perhaps interacting with hypoxic offshore waters (LDWF unpublished data).

While hypoxic events can occur in the estuarine waters of the state, black drum are generally able to move away from these waters and remain unaffected. There are exceptions under certain conditions such as the passage of a major storm or fish being trapped due to prevailing weather and tidal conditions. Persistent hypoxic conditions in an estuary or portion of an estuary may lead to localized reductions in prey availability for black drum if sufficient foraging grounds are not accessible (Bishop et al. 2006).

Black drum are not adversely affected by turbid waters, though Rogillio (1975) noted larger catches in lower turbidities. Simmons and Breuer (1962) observed black drum apparently thriving in turbid water only four inches deep where the temperature was 35°C (95°F).

In developing spawning suitability indices, Saucier and Baltz (1993) found several positive correlations of physical conditions and spawning aggregations of drum: dissolved oxygen from 9.6 to 13.8 ppm; salinities from 10 to 27 ppt; temperatures from 15 to 24°C (59 to 75.2°F); and current velocities from 2 to 70 centimeters per second (0.8 to 27.6 inches per second) in waters ranging from 1.2 to 48.8 meters (0.7 to 160.1 feet) deep (most observations occurred from 4 to 10 meters, or 13.1 to 32.8 feet).

LDWF biologists monitor hydrological conditions through their sampling program to determine how they influence black drum and other resources. LDWF can make a declaration of emergency to close a fishery should biological and technical data regarding hydrological conditions indicate a need to protect the resource or the public.

Diseases and Parasites

Nieland and Wilson (1995) reported bacterial infections in certain samples of formalin fixed ovarian drum tissues.

These were characterized as "...large (8 to 10 micrometer), gram-positive rods." Initially, the report of this infection raised concerns that it could affect reproductive capacity of the affected fish; however, researchers later concluded that these infections were actually artifacts of poor tissue preservation due to the large size of the ovaries.

Numerous parasites have been documented in black drum. Larvae of the tapeworm *Poecilancistrium* sp. is the most common internal parasite found in large black drum. Overstreet (1977) also found *Pseudogrillotia pleistacantha* in large black drum. These parasites are not harmful to humans but are removed during processing as they are unappetizing and reduce the marketability of large drum. Silverman (1979) reported that ectoparasites are fairly common on black drum, including the following copepods: *Caligus repax*, *C. bonito*, *C. latifrons*, *C. pelamydis*, and *C. haemulonis*. Bere (1936) and Simmons and Breuer (1962) found isopod *Nirocila acuminata* on black drum, and Thomas (1971) found *Livonica ovalis* on black drum collected in Delaware. These parasites potentially damage the gill filaments and gill covers of some fish.

Van Duljn (1956) noted the presence of the protozoan *Cryptocaryon irritans*, a parasite which causes white spot disease in finfish, on fins and skin of black drum. Lawler (1977) and Lawler and Cave (1978) reported parasites (the dinoflagellate *Amyloodinium ocellatum* and the monogenetic trematode *Aspinatrium pogoniae* on the gills of black drum.

More recently, Bullard and Overstreet (2004) found a new species of blood fluke (*Cardicola palmieri*), a parasitic flatworm, in the hearts of black drum in and off Mississippi and Louisiana. Curran et al. (2013) reported the presence of another new species of fluke, *Homalometron palmeri*, in black drum in the northern Gulf. Blaylock et al. (2004) found a new species of the microscopic parasite *Kudoa* (*K. hypoepicardialis*) that infects the heart and pericardial cavity of black drum in the northern Gulf, but infections by *Kudoa* spp. are not likely to debilitate fish. Alarcos et al. (2006) documented a new species of nematode (parasitic worm), *Dichelyne* (*Cucullanellus*) *mariajuliae*, in black drum in Argentina.

Olsen (2016) observed emaciated black drum with gelatinous fillets, empty guts, and atrophied organs in Baffin Bay, Texas, in the fall of 2012 during periods of some of the highest salinities on record for the area. In the fall of 2009 and spring of 2011, LDWF received calls from fish processors and some recreational anglers regarding emaciated black drum in the Barataria Basin near Lafitte and Little Lake, Louisiana. These black drum exhibited the same gelatinous fillets, empty guts, and atrophied muscles and organs as the fish in Texas. High salinity levels were recorded during these periods as well; in fact, conditions raised salinity as much as 19 times above previous ambient conditions. LDWF collected samples of these fish and submitted them to the LSU School of Veterinary Medicine for pathological analysis. Results were inconclusive, but pathologists from the LSU School of Veterinary Medicine and LDWF staff speculated that increased levels of domoic acid (a neurotoxin) and microcystin (a liver toxin) in the diet of these fish may have played a role in their condition, although this was never verified (pers. comm. Jason Adriance, LDWF, 2019). (Domoic acid is produced by algae and accumulates in shellfish, mainly from red tides. It causes amnesic shellfish poisoning. It concentrates up the food chain and can be ingested by black drum in the shellfish they consume, potentially causing adverse effects. Microcystin is a toxin produced by blue-green algae and can also bioaccumulate in fish and cause adverse effects such as damage to the liver, gills, and kidneys, ionic disturbances, behavioral changes, reduced growth, and mortality (Tencalla et al. 1994, Rodger et al. 1994, and Li et al. 2005).)

Predation

There is no literature documenting specific black drum predators. Black drum are likely prey for various marine predators during their life cycle. Possible predators include other Sciaenids (drums and croakers), Carangids (jacks, pompanos, jack mackerels, runners, and scads), and Scombrids (mackerels, tunas, and bonitos) as well as sharks. Filter feeders such as Clupeids (herrings, sardines, pilchards, shads, menhadens, and allies) are possible predators of larval black drum. (Leard et al. 1993).

Black drum are molluscivores, known to consume large quantities of oysters, and are key predators of Eastern oysters (Brown et al. 2003 and 2006). With no known specific predators, larger black drum likely influence localized populations of oysters and to some extent the commercial oyster industry. Predation by black drum is especially heavy in March after black drum spawn and in October after small seed oysters are bedded on leases (Brown et al. 2003). Oyster fishermen have long reported impacts of black drum predation on oysters and have used several methods to prevent it such as hanging dead drum from poles on the reef, setting gill nets, building fences to prevent entry, beating the water with poles, and using gas hazing cannons to scare the drum. These efforts have met with limited success. Brown et al. (2006) studied the effectiveness of acoustic deterrents (alarms, low frequency sounds, and mechanically produced sounds) in limiting predation by black drum on Louisiana oyster leases and found no practical solutions to control losses of oysters on

leases to black drum.

Competition from Other Species

Competition among black drum and with other species is largely undocumented. Black drum likely compete with other drum, such as red drum, for benthic food sources. Willis et al. (2015) observed that the diets of opportunistic species (those feeding on whatever is available and abundant) residing in the nearshore environment and feeding on benthic food sources likely overlap, but their different feeding strategies could reduce competition for resources even when their diets significantly overlap.

Invasive Species

Global connectivity has lead to the proliferation of invasive species around the world and in the United States. Invasive species can present many problems for native species by competing for both habitat and prey resources. In Louisiana, invasive species have not yet posed a threat to the black drum population, but the potential for threats continues and should be monitored.

Incidental Catch of Black Drum in Other Fisheries

Black drum are caught as bycatch in the commercial shrimp fishery with otter trawls and skimmer and butterfly nets. However, the amount of bycatch in otter trawls has been significantly reduced with the use of BRDs and TEDs (Luquet et al. 2001). The amount of bycatch of black drum in skimmer and butterfly nets is a minor percentage of the black drum catch.

Habitat Loss and Restoration

Eighty percent of annual coastal marsh loss in the United States occurs in Louisiana. Several factors contribute to the regional loss of marshes, including natural factors such as subsidence, sea level rise, storms, and floods as well as manmade factors such as water management, dredging for oil and gas exploration, construction of pipelines and navigation channels, saltwater intrusion, and coastal development. Changes resulting from natural fluctuations have usually occurred less frequently and over a longer period of time than man-induced changes. (Leard et al. 1993, CPRA 2017). Marsh loss may affect the abundance of estuarine dependent species such as black drum. Most likely, overall populations have been reduced as a result of habitat alterations; loss of vegetated wetlands have the most serious impact to larval and juvenile black drum as these low salinity areas provide food and shelter during these highly sensitive early life stages (Leard et al. 1993).

Changes in habitat have also resulted in the creation of greater amounts of shallow water bottoms, which are primary habitat for juvenile and early adult black drum. Increasing shallow water bottom habitat would be expected to increase survival at these stages; however, the actual effect is unknown. In addition, it is not known whether survival at early or later stages is most important for recruitment to the spawning adult population (Leard et al. 1993).

Louisiana's Coastal Protection and Restoration Authority (CPRA) monitors and measures coastal habitat loss and has proposed and/or implemented a number of coastal protection and restoration projects to help combat and slow some of these impacts through the Louisiana's Coastal Master Plan. These projects range from freshwater diversion and marsh creation to the construction of levees (CPRA 2012). These projects may have both positive and negative impacts on black drum abundance from increased marsh habitat through marsh creation to changes in salinity/temperature regimes through freshwater and sediment diversions. These projects may also impact black drum fisheries. For example, levees and other protection features could create access issues by disrupting travel to or modifying existing fishing grounds; however, they could also protect the existing fishery infrastructure as well as residences of fishermen. LDWF provides input into the Coastal Master Plan, but its authority is limited on project selection. However, LDWF will be directly involved in drafting operational plans for diversions and will, as feasible, guide river reintroduction with sympathy for conditions required for black drum and all estuarine species to thrive while also protecting Louisiana's land-dwelling population. Unfortunately, both habitat loss and efforts to minimize its impacts could affect the ability of marshes to provide habitats for black drum and other estuarine dependent species. In fact, the changing coast of Louisiana would impact the fishery and black drum even if nothing were done to counteract the natural and manmade causes of coastal land loss. Increased monitoring before, during, and after construction of large-scale ecosystem restoration projects will allow LDWF to document response by species of importance and can help inform the adaptive management process, which may be relied on as Louisiana moves forward on these unprecedented steps to maintain some portion of coastal Louisiana.

Deepwater Horizon Oil Spill

The Programmatic Damage Assessment and Restoration Plan (PDARP) documents the impacts to the habitat and natural resources of the Gulf caused by the *Deepwater Horizon* oil spill. According to the PDARP, approximately

65 percent of the total oiled shorelines and oiled wetland shorelines occurred in Louisiana, and the "heaviest and most persistent shoreline oiling occurred in salt marshes in Northern Barataria Bay" (DWH NRDA 2016). While no studies have been conducted specifically on black drum, laboratory toxicity tests demonstrated that exposure of marsh organisms to sediments contaminated with *Deepwater Horizon* oil resulted in a series of adverse effects, including death, reduced growth, and reduced reproductive success. For example, studies noted damage to gill and liver tissues, reduced growth rates, and mortality in southern flounder; growth inhibition in juvenile red drum and Pacific white shrimp (*Litopenaeus vannamei*; used as a surrogate for Gulf brown (*Farfantepenaeus aztecus*) and white shrimp (*Litopenaeus setiferus*) in laboratory testing); reduced reproduction and survival in Gulf killifish (*Fundulus grandis*); and adverse effects in all oyster life stages tested, at varying concentrations.

Projects to restore natural resources injured as a result of the *Deepwater Horizon* oil spill in Louisiana will focus on restoring Louisiana coastal marshes, given both the extensive impacts to Louisiana marsh habitats and species and the critical role that these habitats play across the Gulf for many injured resources and the overall productivity of the Gulf. These projects will be consistent with the Coastal Master Plan, to the extent possible. Additional details regarding completed and ongoing restoration projects can be found at www.gulfspillrestoration.noaa.gov/restoration-areas/louisiana.

Fishery Management Program

COLLABORATIVE FISHERY MANAGEMENT

Louisiana's fishery management authorities collaborate with the other Gulf states, other aquatic resource management authorities, public health and safety authorities, industry, and other stakeholders in the management of the state's black drum resource and fisheries.

Management Framework

The Constitution of Louisiana provides the foundation for the sustainable management of the state's fisheries resources, including black drum, recognizing their importance to Louisiana's environment, citizens, and economy. According to the Constitution of Louisiana, "The freedom to hunt, fish, and trap wildlife, including all aquatic life, traditionally taken by hunters, trappers and anglers, is a valued natural heritage that shall be forever preserved for the people. Hunting, fishing and trapping shall be managed by law and regulation consistent with Article IX, Section I of the Constitution of Louisiana to protect, conserve and replenish the natural resources of the state."

Louisiana's legislative statutes and administrative code provide the legal and administrative framework for the state's fishery management system. LA R.S. 56:638.1-5 define the legislative intent, findings, purposes, policy, and standards for the conservation, management, and sustainability of all species of fish in Louisiana and are similar to those found in the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the law that guides U.S. federal fishery management. According to these statutes, fishery conservation and management in Louisiana should sustain:

- Louisiana's fisheries resources (fish and shellfish)
- The ecosystems in which they live (habitat and other aquatic species)
- The people that depend upon these resources (commercial and recreational fishing

industries and coastal communities).

See Appendix II for specific details of these statutes.

Authorities

Louisiana

Legislature

The primary authority for managing the black drum fishery in Louisiana's state waters rests with the Legislature. The Legislature is the lawmaking body of the state and enacts Revised Statutes defining the legal framework for fishery management. The Constitution of Louisiana empowers the Legislature to enact laws to protect, conserve, and replenish the natural resources of the state, with consideration for the health, safety, and welfare of the people. The Legislature has delegated some of its authority to the Commission and the Secretary of LDWF. In general, management actions such as gear changes, licensing, and entry limitations are under the authority of the Legislature. With respect to black drum, in 1995, the Legislature outlawed the use of set gill nets and trammel nets in saltwater areas of Louisiana and restricted black drum harvest with strike nets to the period between the third Monday in October and March 1 of the following year. The Legislature also implemented requirements for a restricted species permit to harvest black drum and established several criteria to qualify for this permit. In 1997, the Legislature banned use of gill and trammel nets and limited legal commercial gear for black drum harvest to trawl, set line, and hook and line gear.

The Legislature adopts laws according to Louisiana's legislative process. LDWF, in coordination with the Louisiana Finfish Task Force, may develop proposed legislation specific to the black drum industry and assist in finding sponsors for those particular bills. Legislators also develop bills of their own. See Appendix III for a diagram outlining Louisiana's legislative process.

Wildlife and Fisheries Commission

The Commission is charged with the control and supervision of the wildlife of the state, including all aquatic life. Part of the executive branch, the Commission consists of seven members appointed by the governor, subject to confirmation by the Senate. The Commission operates as a policy-making and budgetary control board, with no administrative function.

The Commission receives and reviews biological, socioeconomic, and other technical data and management recommendations from LDWF, gathers public input, and ultimately votes on which actions will best achieve long-term management goals. In general, the Commission is charged with setting seasons, times, places, size limits, quotas, daily take, and possession limits based upon biological data and setting fees for nonresident recreational fishing licenses, among other authorities. With respect to black drum, the Commission is granted the authority to set seasons and limits on black drum (LA R.S. 56:326.1 and 326.3) as well as entry into the fishery (LA R.S. 56:325.4(B)(2)). See Appendix IV for complete details on the Commission's authorities and duties as outlined in LA R.S. 56.

The Commission adopts rules according to the process defined in Louisiana's Administrative Procedure Act (APA, LA R.S. 49:950ff). The APA requires that the Commission give appropriate notice of their intended action, make the proposed rule available for public review and comment, and include a Fiscal and Economic Impact Statement (FEIS), summarizing what social and economic impacts the proposed rule might have. In addition to the FEIS, a proposed rule must also include Family Impact, Poverty Impact, and Provider Impact Statements. Once the rule has gone through the process and is approved, it is published as final in the Louisiana Register and is compiled with other Commission rules in LAC 76.

Department of Wildlife and Fisheries

LDWF serves as the administrative and operational arm of the Commission. The Secretary of LDWF is appointed by the governor, subject to confirmation by the Senate. The Secretary is the executive head and chief administrative officer of LDWF. In general, LDWF monitors fishery populations and fisheries by collecting and analyzing fishery dependent and independent data; conducts scientific research; provides data and management recommendations to the Commission and Legislature; and administers and enforces laws, rules, and regulations as adopted by the Commission and Legislature.

The Legislature and Commission may grant the Secretary of LDWF additional authorities to create administrative rules. For example, the Secretary, when authorized, can make a declaration of emergency in times when public health, safety, and welfare are in jeopardy and quick and immediate action is required.

See Appendix V for complete details of the Secretary and LDWF's authorities and duties related to black drum as described in LA R.S. 56 and LAC 76.

Governor

The governor of Louisiana also has authority to issue executive orders, which are not statutes like those passed by the Legislature but do have the force of law.

Finfish Task Force

The Legislature established the Louisiana Finfish Task Force to study and monitor the finfish industry and to make recommendations to the Commission, LDWF, and other state agencies for the maximization of benefit from that industry for the state of Louisiana and its citizens.

The Louisiana Finfish Task Force is composed of fifteen voting (including six alternates) and six nonvoting members. Voting members include:

- Three certified licensed Louisiana commercial fishermen (and three alternates) appointed by the governor—three of which must be selected from a list of six nominees submitted by the Louisiana Shrimp Association and three of which must be selected from a list of six nominees submitted by the Delta Commercial Fisheries Association
- One active Louisiana dock buyer of finfish appointed by the governor
- Three licensed Louisiana recreational freshwater and saltwater fishermen (and three alternates) appointed by the governor—four of which must be selected from a list of eight nominees submitted by the Coastal Conservation Association of Louisiana and two of which must be selected from a list of four nominees submitted by the Louisiana Chapter of the Bass Anglers Sportsman Society
- One member of the Senate appointed by the president of the Senate
- One member of the House of Representatives appointed by the speaker of the House of Representatives.

Nonvoting members include:

- The governor or his designee
- Three members appointed by the Secretary of LDWF including a fisheries biologist, an enforcement agent, and an economist
- The commissioner of the Louisiana Department of Agriculture and Forestry (LDAF) or his designee
- The secretary of the Louisiana Department of Health (LDH) or his designee.

The Louisiana Finfish Task Force has no direct management authority for the black drum fishery. According to LA R.S. 56:301.10, the Louisiana Finfish Task Force is responsible for:

- Coordinating efforts to increase finfish production and marketability
- Studying the decline in finfish marketability and market price
- Studying the impacts of imported finfish on the domestic market
- Assisting in the development of a state finfish inspection program
- Assisting in the development of a Louisiana finfish certification and branding program
- Making recommendations to the Commission, LDWF, the Louisiana Department of Natural Resources (LDNR), LDAF, and LDH on policies to help enhance the domestic finfish industry
- Making recommendations on issues pertaining to the finfish industry and finfish production to state agencies responsible for elements of the finfish industry in Louisiana, including LDWF, LDNR, CPRA, LDH, LDAF, and the Legislature.
- Developing markets and marketing strategies for the development and expansion of markets for finfish harvested from Louisiana waters
- Representing the interests of the Louisiana finfish industry before federal and state administrative and legislative bodies on issues important to the Louisiana finfish industry
- Contracting for legal services to represent the interests of the Louisiana finfish industry in judicial, administrative, and legislative proceedings
- Performing any acts deemed necessary and proper to carry out its duties and responsibilities.

Other Aquatic Resource Management Authorities

Although not involved in marine fishery management directly, several state and local agencies are involved in managing other aquatic or coastal resources, such as protecting habitat or monitoring water quality. LDNR is charged with regulating development activities and managing resources in Louisiana's coastal zone. Several coastal parishes have also developed their own coastal zone management programs. CPRA is responsible for developing, implementing, and enforcing the Coastal Master Plan, including monitoring and measuring coastal habitat loss and coordinating habitat restoration projects. LDWF collaborates with all of these agencies, reviewing permits, commenting on coastal zone management and habitat restoration activities, and participating in the Coastal Master Plan development process.

Public Health and Safety Authorities

All seafood produced and processed in Louisiana must meet quality and safety standards set forth in the Louisiana Sanitary Code. LDH routinely inspects the state's approximately 350 seafood processing plants using federal Hazard Analysis Critical Control Point (HACCP) requirements to ensure safe handling practices and that only safe product reaches the market. More details on these programs are available from LDH.

The Louisiana Department of Environmental Quality (LDEQ) is responsible for setting pollution standards and monitoring all waters of the state, including the Gulf, to ensure they meet water quality standards.

LDH works with LDEQ to issue fish consumption advisories based on fish tissue sampling in areas of suspected contamination and assessments of risk to human health. LDH and LDEQ consult LDWF and LDAF throughout the advisory development and dissemination process.

Public Participation and Engagement

Louisiana's fishery management authorities encourage public participation throughout the management process to not only ensure stakeholders' interests are considered but also to ensure they understand the regulatory process and resulting management actions. All meetings of the Legislature's natural resources committees and the Commission are open to the public according to Louisiana's Open Meetings Law (LA R.S. 42:12-28). This law mandates that government decisions be made in an open forum, ensuring state integrity and the public's trust and awareness of its governing officials. Meetings must be announced at least 24 hours in advance, provide opportunities for public comment, allow for audience recording of the meeting, and have recorded minutes of the proceedings.

Regional

Other Gulf States

The other U.S. states bordering the Gulf are responsible for the conservation and management of black drum fisheries within their respective waters. Louisiana cooperates with other Gulf states in the scientific research and management of fisheries that cross jurisdictional boundaries, including black drum, through the Gulf States Marine Fisheries Commission (GSMFC). LA R.S. 56:71-87 establish Louisiana's authority to enter into the Gulf States Marine Fisheries Compact with other states. The GSMFC has no direct authority over the black drum fishery but is authorized to make recommendations to the governors and legislatures of the five Gulf states on programs beneficial to management of shared fisheries. The GSMFC also consults with and advises member states over fishery conservation problems, advises U.S. Congress, and testifies on legislation and marine policies affecting the Gulf states.

Specific to the black drum fishery, the GSMFC has assisted in addressing issues of importance to black drum on a regional scale. In 1988, the GSMFC recognized a need to develop a fishery management plan for black drum due to increased demand for and commercial landings of the species, as well as the lack of information on black drum biology, habitat requirements, and other aspects of the fish and fishery. Through this management plan, the GSMFC recommended that the Gulf states assess black drum stocks to determine if further regulations were needed to control future development and to conserve the black drum resource (Leard et al. 1993). In response to this, and to monitoring and analyses of the stock at the state level, most Gulf states set limits on the size and amount of black drum that could be harvested and restricted the fishing gear fishermen could use to harvest black drum. Specific management measures vary across the state management authorities but are generally consistent. See Appendices VI and VII for a table of other states' regulations for commercial and recreational black drum fisheries.

Federal Authorities

The Gulf of Mexico Fishery Management Council (Gulf Council) and NOAA Fisheries are responsible for monitoring and managing fisheries resources in Gulf federal waters (from the seaward boundary of state waters to 200 nautical miles offshore). Black drum fisheries operate almost exclusively in state waters; landings occasionally come from federal waters. Federal agencies do not directly manage black drum, and the Gulf Council has not developed a fishery management plan for black drum. However, through their administration of laws, regulations, and policies, certain federal agencies may influence the black drum resource and fisheries and management thereof. See Appendix VIII for a list of related federal management institutions and their authorities and jurisdictions and Appendix IX for a list of related federal laws, regulations, and policies.

Existing Management Measures

Plans

LDWF's Louisiana Black Drum Fishery Management Plan (1990) summarized relevant scientific information and studies regarding the management of black drum; described the biological and economic aspects of the black drum fishery; reviewed Louisiana management authorities and laws affecting black drum; described the problems and needs of the black drum fishery; and suggested management strategies and options to solve problems and meet the needs to the stocks (Luquet et al. 1990). It included a summary of the first assessment of black drum in the Gulf completed by Geaghan and Garson (1989) and provided the basis for recommendations on commercial

and recreational size limits, commercial quotas for bull and puppy drum, recreational creel limits, and established a fishing year for Louisiana's commercial fishery.

The GSMFC's Black Drum Fishery of the Gulf of Mexico, United States: A Regional Management Plan (1993) summarized, referenced, and discussed relevant scientific information and studies regarding the management of black drum; described the biological, social, and economic aspects of the black drum fishery; reviewed state and federal management authorities and their jurisdictions, laws, regulations, and policies affecting black drum; described the problems and needs of the black drum fishery; and suggested management strategies and options to solve problems and meet the needs of the stocks. Current Louisiana regulations include the majority of applicable management recommendations from the GSMFC.

Policies

LA R.S. 56:325.4 requires the Commission to establish biomass and fishing mortality management targets based on a historical time series of fisheries data to ensure a sustainable black drum population. LDWF must report on the status of black drum every five years and submit that report to the Legislature no later than March 1 of that year. If data indicate the resource or fisheries are not meeting or are likely not to meet the established targets, LDWF must provide, for the Commission's consideration, management options to ensure that the black drum resource and fisheries can remain within established management targets.

Statutes and Rules

Louisiana's black drum fisheries are governed by both legislative statutes (LA R.S. 56) and rules promulgated by the Commission (LAC 76). Specific regulations are described below. This summary of regulations does not retain their exact language and should be not be relied on for legal purposes. See Appendix X for detailed text of these regulations. See Appendix XI for a chronological history of major changes to Louisiana's black drum regulations.

Commercial

Licensing

Both resident and nonresident fishermen must have the appropriate commercial fishing and gear licenses to harvest black drum commercially in Louisiana waters. Gear licenses may be temporarily transferred between licensed commercial fishermen with the same residency status. Nonresidents may not purchase licenses for commercial fishing gear prohibited in the state in which they reside. Five dollars of each resident gear license fee and 20 dollars from each nonresident gear license fee are deposited in the Seafood Promotion and Marketing Fund. Vessel owners must also have the appropriate vessel licenses.

Licensed commercial fishermen may transport and sell their own catch to any licensed Louisiana wholesale/retail seafood dealer located within Louisiana. They must have a fresh products license to sell their catch directly to a consumer; they may purchase a secondary fresh products license for their spouse for a reduced fee. Commercial fishermen that sell their catch to anyone other than a consumer or licensed dealer and anyone else that buys, acquires, handles, transports, or exports black drum for sale or resale must have the appropriate licenses. A portion of each license fee is deposited in the Seafood Promotion and Marketing Fund.

Licenses may be suspended, denied or revoked for failure to pay child support, nonpayment of unemployment compensation overpayment, and nonpayment of individual income taxes.

Fishery Access

The black drum fishery is an open access fishery.

Legal Gear and Gear Requirements

Commercial fishermen typically harvest black drum with trawl, set line (trotline), and rod and reel gear. Commercial fishermen may only use trawls in waters where and when the shrimp season is open and follow all relevant requirements for the size and configuration of trawl gear. Trotlines must be no longer than 440 yards and hooks must be at least 24 inches apart. Commercial fishermen must have a spotted seatrout permit to use rod and reel as a commercial gear in state waters.

Commercial fishermen may not use any of the following types of gear to harvest black drum (and other species) in state saltwater areas:

- Spears
- Stupefying substances or devices
- Guns
- Poisons
- Explosives
- Tree-topping devices
- Electric shocking instruments or devices
- Seines
- Gill, trammel, and strike nets
- Snagging devices (not including bows and arrows)
- Longlines
- Bandit gear
- Elevated trotlines (except in exempt areas).

Additionally, commercial fishermen may not use any aircraft including fixed-wing aircraft, dirigibles, balloons, helicopters, or any other form of aerial surveillance to assist in harvesting black drum.

Seasons

The commercial fishing year begins September 1 of each year. The Secretary of LDWF must close the commercial fishery(s) for black drum when the quota(s) has been met or is projected to be met, with a 72-hour advance notice to the public. Once the black drum commercial quota(s) has been met, the purchase, barter, trade or sale of black drum taken in Louisiana after the closure is prohibited.

Size and Possession Limits

Black drum must be at least 16 inches total length or longer to be harvested for both conservation and market purposes. Commercial fishermen must return undersized fish back to the water unharmed; five percent (by number) of each species of commercial fish harvested may be smaller than the legal limit. No one may sell, purchase, barter, trade, or exchange undersized fish (or attempt to do any of these activities).

The quota for black drum between 16 and 27 inches total length (puppy drum) is 3.25 million pounds during the fishing year. The quota for black drum greater than 27 inches total length (bull drum) is 300,000 fish during the fishing year.

Bycatch

Commercial fishermen are permitted to retain and sell most bycatch for commercial purposes as long as they are in compliance with appropriate regulations for those species. However, they may not commercially harvest gamefish or spotted seatrout (unless it is captured by rod and reel gear and the fisherman possesses both a spotted seatrout permit and a rod and reel permit). LDWF monitors landings and sales of these species through the state's trip ticket program. Commercial fishermen may also retain bycatch for personal consumption; however, they must have applicable recreational fishing licenses and any retained fish must be within recreational minimum size and daily possession limits.

Fishermen may not waste any fish of this state. Waste is defined as harvesting of any fish for commercial purposes which results in the excessive killing of such fish. Excessive killing is defined as the killing resulting from taking or attempting to take any fish in excess of what the possessor thereof can process, utilize, or transport from the fishing grounds.

Area Restrictions

Commercial fishermen may not set gear that interferes with the free passage of fish within 500 feet of the mouth of any inlet or pass or within 500 feet of any water control structures.

Gear and other restrictions may vary in state wildlife management areas, refuges, and other areas to protect important habitat and reduce conflicts with other users.

Commercial fishing is prohibited in coastal national wildlife refuges.

Operational Restrictions

Commercial fishermen must land black drum whole with heads and tails attached to assist enforcement agents in easily identifying the fish. However, fish may be gilled and gutted prior to landing.

Fishing Gear Interactions

It is illegal for any person to knowingly and intentionally use or employ any net to encircle a vessel or to otherwise knowingly and intentionally use or employ any vessel or fishing gear to interfere with the legal fishing of another. It is also illegal for any person to knowingly and intentionally use or employ any vessel or recreational gear to interfere with the legal commercial fishing of another.

Packaging

The Secretary of the LDWF has the authority to adopt rules and regulations to establish standards for the packaging of seafood in Louisiana for wholesale or retail sale. These standards may govern the quality, contents, and weight of all seafood packaged in this state. The Louisiana Seafood Promotion and Marketing Board may make recommendations to the Secretary for standards for the packaging of seafood.

Shipments containing fish shall be plainly marked, the tags or certificates to show the date and names of the consignor and the consignee, with an itemized statement of the number of pounds of fish and the names of each kind contained therein.

Bills of lading issued by a common carrier for such shipments shall state the number of packages which contain fish, and the date and names of the consignor and consignee, with an itemized statement of the number of pounds of fish and the names of each kind contained therein.

Recreational

Licensing

Residents and nonresidents 16 years of age and older must have basic and saltwater fishing licenses to harvest black drum recreationally.

Legal Gear and Gear Requirements

Recreational fishermen typically use hook and line gear to catch black drum. Recreational fishermen may not use any of the following to take black drum (and other saltwater finfish):

- Crossbows
- Gill nets
- Spears
- Poisons
- Stupefying substances or devices
- Explosives
- Guns
- Tree-topping devices
- Any instrument or device capable of producing electric current to shock fish
- Snagging devices.

Size and Possession Limits

Black drum must be between 16 and 27 inches total length to be kept. Each licensed fishermen may keep five black drum per day. Only one of these five may be more than 27 inches total length.

Area Restrictions

Restrictions vary in state wildlife management areas, refuges, and other areas as well as coastal national wildlife refuge.

Operational Restrictions

Recreational fishermen must land black drum with their head and tail fins intact to assist in identification of the fish for enforcement purposes.

Fishing Gear Interactions

It is illegal for any person to knowingly and intentionally use or employ any vessel or recreational gear to interfere with the legal commercial fishing of another.

Other

Louisiana Seafood Promotion and Marketing Board

The Louisiana Seafood Promotion and Marketing Board (LSPMB) works to enhance the public image of commercial fisheries products, promote the consumption of these products, and assist the seafood industry, including commercial fishermen and wholesale and retail dealers, in market development to better use existing markets and help establish new markets.

Louisiana Wild Seafood Certification Program

LDWF established the Louisiana Wild Seafood Certification Program (LWSCP) to build a brand that guarantees the origin of Louisiana wild-caught seafood. Through strict chain of custody requirements, the program guarantees that all seafood products bearing the Certified Louisiana Wild Seafood logo were caught in Louisiana or Gulf waters by a licensed Louisiana fisherman, landed at a Louisiana dock, and processed and packaged by a Louisiana-based company. The program provides education for participants on best seafood handling and sanitation practices to ensure the utmost safety and quality. When a buyer sees this logo, they can be confident they are buying authentic Louisiana wild-caught seafood, a premium product known for fresh flavor, consistent quality, and sustainability, and that they are supporting local Louisiana fishing communities.

By branding and showcasing Louisiana seafood, LWSCP helps suppliers increase the value of their seafood products and remain competitive in seafood marketplace. LWSCP participants benefit from free program marketing support, such as:

- Market portal linking Certified Louisiana Wild Seafood suppliers with buyers
- Promotions through the program website, social media, and events including seafood festivals and industry conventions
- Free point-of-sale materials such as window clings, apparel, brochures, stickers, and decals
- Access to program partners including the LSPMB, Audubon GULF, NOAA Fisheries, Louisiana Sea Grant, and other in- and out-of-state partners who purchase and promote Certified Louisiana Wild Seafood.

Licensed Louisiana commercial fishermen are automatically eligible for the program; licensed Louisiana wholesale/retail seafood dealers must apply for and receive a permit to participate. They must also comply with all state and federal reporting requirements and have all legally required permits to operate their business.

Professionalism Programs

LDWF, in collaboration with Louisiana Sea Grant and the LSU AgCenter, developed Louisiana Fisheries Forward, a multi-year, multi-phase professionalism program for all sectors of Louisiana's commercial fishing industry, including fishermen, dock owners, processors,

and distributors. Launched in 2014, this program provides education and training essential for the continued economic success of the industry. This program delivers training videos and corresponding fact sheets on a number of topics such as how to be a commercial fisherman and seafood business finance and management as well as hands-on workshops, training days, and demonstrations to showcase new technology for vessel refrigeration/cooler systems, seafood freezing equipment, fuel efficiency equipment, and fishing/harvesting equipment and seafood handling and processing best practices.

Fisheries Outreach

Through outreach efforts, LDWF promotes public awareness and advises the public on stewardship and best practices in preserving the unique nature of the state's natural resources. Via a strong presence at recreational events, industry-related expos, workshops, seminars, and other state sponsored events, LDWF strives to foster a community sense of resource and habitat stewardship. At these events, LDWF distributes an assortment of printed materials which focus on fishing regulations, commercial and recreational fishing topics, as well as species profile brochures which highlight the life cycle and habitat requirements of black drum and other native Louisiana species. Through participation in events, distribution of educational materials, and other activities, LDWF reaches more than 200,000 Louisiana citizens each year.

Compliance

Reporting Methods and Requirements

Since 1999, LDWF has monitored harvest of black drum at the point of initial sale through Louisiana's trip ticket program. Under the program, wholesale/retail seafood dealers purchasing or accepting transfers of black drum from commercial fishermen must complete a commercial trip ticket at the time of purchase or transfer of the catch from the fisherman to the dealer. Fresh products license holders (commercial fishermen licensed to sell their catch directly to consumers) are also required to submit trip tickets.

When a commercial fisherman sells or transfers his catch to a wholesale/retail dealer, he must present his license for license verification and provide the dealer with information necessary to complete a commercial trip ticket. The dealer must record the sale or transfer on a three-part LDWF-issued trip ticket form or via the electronic reporting program and include the following information:

- Commercial fisherman's name and license number
- Wholesale/retail seafood dealer's name and license number
- Vessel registration or U.S. Coast Guard (USCG) documentation number
- Transaction date
- Gear used
- Primary location of where the black drum was caught (according to LDWF-issued trip ticket maps)
- Duration of the fishing trip
- Species identification
- Quantity and units of each species
- Size and condition of each species
- Unit price of each species
- Permit number for species requiring a permit to harvest.

The fisherman and dealer must sign each trip ticket attesting that the information is correct. The dealer retains one part of the trip ticket, provides the fisherman with one part, and submits one part to LDWF. If using the electronic trip ticket program, instead of a trip ticket form, the fisherman and dealer must fill out a signature log to sign the trip ticket. The signature log includes the trip ticket number, date, vessel name, fisherman's signature, and dealer's initials. By signing and initialing the signature log, the fisherman and dealer are attesting the information filled out electronically via the electronic trip ticket program is correct.

When a commercial fisherman sells his catch under a fresh products license, he must record all information required on the commercial trip ticket, using his fresh products license number in place of the dealer license number. The commercial fisherman must sign each trip ticket, as both the dealer and commercial fisherman, attesting that the information provided is correct.

On or before the 10th of each month, dealers and fresh products license holders must submit to LDWF all trip tickets from the previous month. A monthly submission sheet must accompany these trip tickets, certifying that the submitted trip tickets represent all of the dealer's transactions with commercial fishermen for that month. When using the electronic trip ticket program, dealers and fresh products license holders must submit the computer generated monthly submission sheet and the signature logs to LDWF on or before the 10th of the month.

Trip ticket records must be maintained for three years and are open to inspection by LDWF. Trip ticket information is confidential and is protected by both state and federal law to limit access to business-specific information. However, LDWF and approved contractors may analyze and compile individual trip information into reports to provide reliable information for monitoring harvest from locations across the state, while still protecting sensitive

information. LDWF enforces the trip ticket program; violation of statutes related to the program can result in citations written by LDWF or other law enforcement officials.

Recordkeeping Requirements

Wholesale/retail seafood dealers, retail seafood dealers, restaurants, and retail grocers must keep records of the following:

- The quantity and species of fish acquired, the date the fish were acquired, and the name and license number of the wholesale/retail seafood dealer or the out-of-state seller from whom the fish were acquired
- The quantity and species of fish sold, the date the fish were sold, and the name and license number of the person to whom the fish were sold. When sold to a consumer, the records must indicate the quantity, species, and date and shall state that the fish were sold to the consumer.

Enforcement

Through events, outreach materials, and other resources, LDWF informs commercial and recreational fishermen about programs, projects, and most importantly, relevant regulations to prevent illegal activities. LDWF's Law Enforcement Division is responsible for ensuring compliance with all commercial and recreational licensing and harvesting regulations through regular patrols and investigations. LDWF's Law Enforcement Division is also responsible for enforcing laws as provided for in the Constitution of Louisiana; Louisiana Revised Statutes, and numerous federal laws including the MSA, ESA, MMPA, and Lacey Act.

LDWF's Law Enforcement Division partners with NOAA Fisheries and USCG enforcement agents and officers to increase their enforcement capabilities and carry out their important mission in Louisiana's waters and beyond. Local parishes also assist in enforcement, primarily through the legal functions of each parish's district attorney. Local sheriff's offices sometimes assist LDWF's Law Enforcement Division as well. Local and state sanitarians and health department employees help enforce public health and safety related regulations.

Penalties

Classes of violations vary by legislative statute or Commission rule. Specific penalties for violations vary with the severity of the violation and include fines, jail time, loss of fishing license, and forfeiture of property. In addition, LDWF may seize any black drum in connection with the violation. Specific penalties are listed in Appendix XII.

A person who kills, catches, takes, possesses, or injures any aquatic life in violation of an applicable state statute or regulation or a federal statute or regulation is also liable to the state for the value of each aquatic life unlawfully killed, caught, taken, possessed, or injured. Civil restitution for black drum is currently assessed at $1.54 per pound (whole form weight). If the product is not in whole form, a conversion factor is applied to convert product form weight to whole form weight. For black drum, the conversion factor is 1.14 for gutted fish; 1.64 for gutted and headed, steaked, cleaned, or tubed fish; and 2.86 for meat (fillet, pieces, or chunks).

Current Issues and Management Options

ACHIEVING MANAGEMENT GOALS

Addressing current issues facing Louisiana's commercial and recreational black drum fisheries through options identified in this section or through stakeholder participation will advance these fisheries toward meeting long-term management goals.

This section identifies current issues facing Louisiana's commercial and recreational black drum fisheries, provides a description of each issue, and recommends options for future action to address these issues. Before implementing any recommendation, LDWF will evaluate the feasibility and potential impacts of the action on the resource and fisheries.

Market Conditions during Fall and Winter

There are conflicts between users of trotline and trawl gear within the commercial black drum fishery during late fall and winter (November through March) due to market conditions. Currently, it is legal to harvest finfish as bycatch with shrimp trawl gear during open shrimp seasons from waters open to shrimping and to target finfish with trawls during these same seasons. LDWF has historically extended the shrimp season into January in certain areas and kept some offshore state waters open to shrimping, which allows fishermen to target or incidentally catch black drum with shrimp trawl gear. Black drum are mainly harvested in shrimp trawls in the Barataria and Pontchartrain basins and adjacent offshore state waters during the fall and winter. With the combined landings from incidental catch of black drum in shrimp trawls, directed catch in fish trawls, and directed catch in the trotline fishery, more black drum enter the market during the winter. Increases in the volume of black drum landings at this time of year could influence black drum prices negatively as the resulting surplus of black drum could cause a decline in price per pound of black drum. Daily declines could be significant if there are large daily catches from either gear type. However, seafood demand is typically lower in fall and winter and prices may simply reflect demand. In addition, suppliers and restaurants depend on excess black drum from winter harvests once demand increases in the spring, especially during the Lenten season. Both trotline and trawl-caught black drum are necessary to supply the market as neither sector is able to fully supply the annual demand for black drum.

Options

- Review market dynamics during cold weather months (November through March) in relation to gear type, especially if line-caught fish are worth more than trawl-caught fish at the wholesale and retail level, the influence of large daily landings of black drum on price and supply in the short- and long-term, and if seafood demand shifts from fall to spring.
- Implement black drum trip limits for both commercial trawl and trotline gear to limit potentially large price fluctuations due to flooding the market.
- Specify finfish trawl gear in statute to allow directed trawling of finfish, including black drum. Legislation would establish relevant gear licenses, gear restrictions, and permits; gear restrictions should not include use of TEDs as they would limit catch to unprofitable amounts. The Commission would regulate seasons and areas for

finfish trawling based upon biological and technical data. Regulating finfish trawling could provide additional needed data on the extent of the use of trawl gear in the black drum fishery.

Harvesting Surplus Black Drum Biomass

The most recent black drum stock assessment indicates that extra biomass is available to expand harvest in both the commercial and recreational black drum fisheries. An increase in commercial quota and recreational limits would not impact the health of the stock. Currently, the commercial black drum fishery operates under a 3.25 million pound annual (September through August) quota for black drum between 16 and 27 inches (puppy drum). Commercial fishermen have fully harvested or slightly exceeded this quota in recent years. If the current quota is not increased, commercial fishing seasons may be forced to be closed due to quota constraints, separate from any biological need to close the fishery. In May 2018, LDWF presented numerous options to the Louisiana Finfish Task Force for increasing the overall quota of commercially harvested black drum, increasing the daily recreational bag limit, and adjusting size limits. At the time, the Louisiana Finfish Task Force chose to maintain status quo until a new stock assessment for black drum is completed in 2020.

Options

- Increase the commercial quota for puppy drum to at least 4.25 million pounds to allow fishermen to take advantage of the currently assessed surplus in the stock.
- Adjust both the commercial and recreational size limits to a minimum of 14 inches total length and a maximum of 30 inches total length.
- Increase the recreational daily bag limit to eight fish between 14 and 30 inches per person per day and one fish over 30 inches per person per day.

Gear Conflicts

LDWF receives complaints from crab trap and trotline fishermen in the Pontchartrain and Vermilion-Teche basins about trawling for black drum and other finfish and the associated displacement of crab traps and trotlines by trawl vessels. When fish trawling occurs in areas where fishermen are using trotlines and crab traps, it potentially limits the area available for those fishermen to place gear. Harvest of black drum and crabs in fish trawls can also temporarily reduce the amount of those species available in a local area to fishermen using other gear types.

Options

- Increase enforcement of regulations related to the destruction and displacement of gear in those basins during the times of year when there is significant fish trawling activity.
- Establish seasons and areas open to fish trawling so that other gear users are aware of potential conflict areas and can adjust placement of their gear and fishing activity accordingly.

Future Research and Data Needs

SCIENCE TO SUPPORT MANAGEMENT

Throughout the development of this fishery management plan, LDWF has identified several research needs that would provide data to address some of the issues and data gaps in the fishery or species biology.

Specific research needs are listed below. They are not listed in order of importance. The list includes aspects of the species or fisheries that have been noted for decades in addition to relatively recently identified issues.

- Evaluate bycatch and discards in the commercial trotline and trawl fisheries for black drum through proper scientific studies. Accurate descriptions of bycatch through a well developed study will help better characterize these commercial fisheries to provide data important for making informed management decisions.
- Conduct socioeconomic studies of the commercial black drum fishery including:
  - Market dynamics during cold weather months (November through March) in relation to gear type, especially if line-caught fish are worth more than trawl-caught fish at the wholesale and retail level, the influence of large daily landings of black drum on price and supply in the short- and long-term, and if seafood demand shifts from fall to spring.
  - Participation of black drum fishermen in other fisheries, operating costs, investment, and processing and marketing costs to help identify the health of the industry and impacts of regulatory changes on fishery participants.
  - Description of the marketing system, product forms, and value added estimates by various marketing sectors.
- Determine how coastal land loss and environmental changes could affect black drum

populations and availability.
- Study the impact of gear used in the commercial and recreational black drum fisheries on habitat.
- Determine the potential impacts of lost or abandoned fishing gear.
- Monitor for potential threats of invasive species to the black drum population.

Additional research needs are adapted from those listed in Leard et al. 1993, Luquet et al. 2001, and Davis et al. 2015.

- Directly collect age samples during the LDWF marine trammel net survey to allow a more accurate representation of survey age composition in future assessments. Only limited age data are currently available from the LDWF marine trammel net survey.
- Conduct fishery independent surveys on both the inshore and nearshore adult populations, including otolith ageing and validation techniques, to better characterize the adult stock size and provide more certainty in reference point estimates. Currently, the harvest of adult black drum only comprises a small fraction of the overall harvest so there are limited data available through fishery dependent methods.
- Investigate factors that influence year-class strength of black drum, including interannual variation in seasonal factors and the influence of environmental perturbations to elucidate causes of interannual variation in abundance as well as the species stock-recruitment relationship.
- Estimate black drum spawning frequency as a function of age and size.
- Ensure consistent fishery dependent and independent data sources through a comprehensive monitoring plan to fully understand the status of fishery.
- Collect meteorological and physical oceanographic data coupled with food web data to better understand the black drum stock and its habitat. With the recent trend toward ecosystem-based assessment models (Mace 2000, NMFS 2001), more data are needed linking black drum population dynamics to environmental conditions.
- Conduct tagging studies for insight into movements and behavior, e.g. escapement and growth rates needed to assist in determining the spawning stock biomass. The extent of migrations of large schools within their range is not known, and this is pointedly true for the medium-sized black drum prior to reaching maturity (ages 4 to 6 years) where they have largely disappeared from the fishery dependent landings information.
- Develop estimates of natural mortality and predation especially on early life stages.

Research Priorities, Funding, and Publication

LDWF prioritizes future research according to several factors, including whether or not it:

- Fits the agency's mission
- Can be adequately funded
- Can be reasonably expected to produce answers to specific management questions
- Can be reasonably undertaken without compromising other capabilities and efforts
- Has or will have the support of stakeholders
- Has or can engender cooperation with other researchers, managers, user groups, and/or the general public.

Research is typically funded through state license fees and federal, state, and private (nongovernmental organization) grants and programs. Funding is allocated based on priority as described above. While LDWF may not have funding for many of the topics listed above, outside funding sources may be available for other researchers to pursue some of these studies. Our hope is that by our including these research and data needs here, those outside funding sources may be more inclined to support some of the studies described above.

LDWF analyzes research and data and reports results in multiple formats, as appropriate. Ultimately, all information is publicly available (other than information linked to private enterprises, e.g. confidential landings data).

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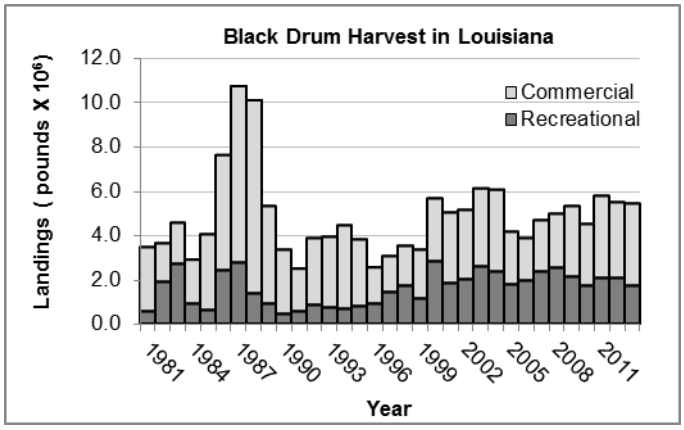
Appendices

Appendix I. Assessment of Black Drum *Pogonias cromis* in Louisiana Waters 2015 Report

Assessment of Black Drum *Pogonias cromis* in Louisiana Waters
2015 Report

Executive Summary

Landings of black drum in Louisiana have remained above 4 million pounds per year in the most recent decade with the exception of 2006. The highest harvests on record (over 10 million pounds) occurred in 1987 and 1988. After commercial regulations were enacted during the 1980s, black drum landings substantially declined. In the most recent years, recreational landings comprise approximately one third of the total Louisiana black drum harvest.



A statistical catch-at-age model is used in this stock assessment update to describe the dynamics of the of the Louisiana black drum stock from 1985-2013. The assessment model projects abundance at age from estimates of abundance in the initial year of the time-series and recruitment estimates in subsequent years. The model is fit to the data with a maximum likelihood fitting criterion. Minimum data requirements are fishery catch-at-age and an index of abundance. Landings are taken from the Louisiana Department of Wildlife and Fisheries Trip Ticket Program, National Marine Fisheries Service commercial statistical records, and the NMFS Marine Recreational Information Program. An index of abundance is developed from the LDWF marine trammel net survey. Age composition of fishery catches are estimated with age-length-keys derived from samples directly of the fishery and a von Bertalanffy growth function.

The conservation threshold established by the Louisiana Legislature for black drum is a 30% spawning potential ratio. Based on results of this assessment, the Louisiana black drum stock is currently neither overfished or experiencing overfishing. The current spawning potential ratio estimate is 36%.

Summary of Changes from 2010 Assessment

In prior assessments (LDWF 1997-2007, 2008, Blanchet 2010), yield and spawner-per-recruit models were used to estimate the impact of fishing pressure on potential yield and spawning potential of black drum in LA waters using fishing mortality rates estimates from an earlier untuned virtual population analysis (LDWF 1990). In this assessment, a statistical catch at age model is used to estimate annual fishing mortality rates and population size from 1985-2013. Direct comparisons between the earlier and current assessments are not included in this report.

Assessment of Black Drum *Pogonias cromis* in Louisiana Waters
2015 Report

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Table of Contents

1. Introduction

A statistical catch-at-age model is used in this assessment to describe the dynamics of the Louisiana (LA) black drum *Pogonias cromis* (BD) stock from 1985-2013. The assessment model projects abundance at age from estimates of abundance in the initial year of the time-series and recruitment estimates in subsequent years. The model is fit to the data with a maximum likelihood fitting criterion. Minimum data requirements are fishery catch-at-age and an index of abundance. Landings are taken from the Louisiana Department of Wildlife and Fisheries (LDWF) Trip Ticket Program, National Marine Fisheries Service (NMFS) commercial statistical records, and the NMFS Marine Recreational Information Program (MRFSS/MRIP). Abundance indices are developed from the LDWF marine trammel net survey. Age composition of fishery catches are estimated with age-length-keys derived from samples directly of the fishery (2002-2013) and a von Bertalanffy growth function (1985-2001).

1.1 Fishery Status

Commercial

Prior to the 1980s, the black drum fishery in LA was underutilized and had virtually no regulations associated with the fishery. From 1961 to 1980, LA BD harvest averaged approximately 0.4 million pounds. The growth of the commercial BD fishery in Louisiana was tied to the commercial fishery for red drum. In the late 1970s and early 1980s, the demand for red drum increased dramatically leading to large commercial red drum landings. In the 1980s, increased concern of overfishing of red drum led to regulations restricting the use of purse seines to the menhaden-type fishery and banning the use of spotter planes in the haul seine fishery. The increased demand and markets for red drum in the 1980s also led to an increase in black drum landings as they were harvested in the same gear and sold in the same markets. Subsequent bans on commercial red drum fishing led BD to become a suitable substitute and it remains so to the present.

The commercial BD fishery operates primarily within state inside waters (from the coastline inland to the saltwater line), outside territorial waters (from the coastline seaward to 3 miles), and some harvest occurs from federal waters of the EEZ.

Recreational

Recreationally harvested BD are typically a secondary target for LA anglers fishing for red drum or spotted seatrout. When BD are targeted or kept, anglers usually prefer smaller sized fish (under 5 lbs.). A variety of tackle are utilized to catch BD and anglers usually fish inshore or very near the coast. Recreational harvest estimates since 1981 show large variability in the amount of BD landed. Landings in recent years have been more consistent, but seem to demonstrate some cyclical variability.

1.2 Fishery Regulations

Commercial

The BD fishery in Louisiana was virtually unregulated until the 1980s. In 1989, regulations were established that set a minimum size limit of 16 inches total length (TL) and a maximum size limit of 27 inches TL for commercial harvesters, however some commercial harvest of BD is allowed over 27 inches. The 1989 regulations also established commercial quotas of 3.25 million pounds for 16-27 inch BD and 300,000 head (i.e., individuals) for BD >27 inches. A commercial bull drum permit was required for commercial harvest of BD>27 inches. That permit requirement was removed in the early 1990s when the LDWF Trip Ticket Program made it possible to monitor the harvest of the two quotas without requiring individual harvest reports. Authority for regulating gear lies with the Louisiana State Legislature. Act 1316 of the 1995 Regular Legislative Session (the Marine Resources Conservation Act of 1995) outlawed the use of "set" gill nets or trammel nets in saltwater areas of Louisiana, and restricted black drum harvest by the use of "strike" nets to the period between the third Monday in October and March 1 of the following year. A "Restricted Species Permit" was required in order to harvest black drum, and several criteria were established in order to qualify for that permit. After March 1, 1997, all harvest by gill or trammel nets was banned, and legal commercial gear to harvest black drum was limited to trawl, set lines and hook and line. Currently, the primary commercial fishing gears include baited trotlines and other set lines, otter trawls, skimmer nets and butterfly nets. The fishing year for commercial BD harvest is September 1 through August 31 in each year. The fishery remains an open access fishery.

Recreational

Regulations were implemented recreational harvesters by the Louisiana Wildlife and Fisheries Commission in 1989 that established a 16 inch minimum TL, a 27 inch maximum TL, and a 5 fish per person bag and possession limit with only one fish allowed over 27 inches. These regulations remain the current recreational limits.

1.3 Trends in Harvest

A comparison of LA commercial and recreational BD harvest (1985-2013) is presented in Table 1.

Commercial

The time-series of LA commercial BD harvest (1950-2013) is presented in Figure 1. Beginning in 1981, the commercial BD fishery in Louisiana experienced dramatic growth with landings reaching 2.89 million pounds in that year. Commercial harvest peaked in 1988 at 8.7 million pounds prior to the implementation of regulations in 1989. From 1981 through 1989 commercial BD landings averaged 4.25

million pounds, a ten-fold increase from the average commercial landings the previous 20 years. With the establishment of state quotas and harvest permits in 1989 coupled with market fluctuations, commercial BD landings dropped to an average of 2.95 million pounds for the years 1990 through 1995. Possible factors influencing harvest after 1989 were less fishing in the EEZ due to the red drum harvest moratorium, redirection of fishing effort to other species such as sheepshead and mullet, and decreasing demand for "bull" BD coinciding with the red drum moratorium (LDWF 1990). After the enactment of regulations on entanglement gears in 1995, BD landings averaged 2.80 million pounds from 1996 through 2013.

Currently both adult ("bull") and juvenile ("puppy") drum are harvested, often with similar gears. The market for adult drum has historically been more limited than the market for the juveniles due to the preference for the flavor and texture of the flesh of younger fish. Larger juvenile and adult fish tend to have high levels of a larval parasite in the flesh, making it less attractive and in some cases affecting the texture of the meat.

A summary of the months and areas where LA BD landings occur, and the primary commercial gears used in the fishery (2000-2013) are presented in Tables 3-5.

Recreational

The MRFSS/MRIP time-series of LA recreational BD harvest (1950-2013) is presented in Figure 2. Since 1981, recreational harvest has ranged from a low of 0.42 million pounds harvested in 1990 to a high of 2.78 million pounds harvested in 2000. Recreational harvest estimates have been less variable during the last decade, with recreational anglers harvesting an average of 2.10 million pounds for the years 2000 through 2013. During the last three years (2011-2013), recreational harvest has averaged 1.90 million pounds per year.

2. Data Sources

2.1 Fishery Independent

The LDWF fishery-independent marine trammel net survey is used in this assessment to develop an index of abundance for use in ASAP. Below is a brief description of this survey's methodology. Complete details can be found in LDWF (2002).

For sampling purposes, coastal Louisiana is currently divided into five LDWF coastal study areas (CSAs). Current CSA definitions are as follows: CSA 1 – Mississippi State line to South Pass of the Mississippi River (Pontchartrain Basin); CSA 3 – South Pass of the Mississippi River to Bayou Lafourche (Barataria Basin); CSA 5 – Bayou Lafourche to eastern shore of Atchafalaya Bay (Terrebonne Basin); CSA 6 – Atchafalaya Bay to western shore of Vermillion Bay (Vermillion/Teche/Atchafalaya Basins);

CSA 7 – western shore of Vermillion Bay to Texas State line (Mermentau/Calcasieu/Sabine Basins). The LDWF Marine Fisheries Section conducts routine standardized sampling within each CSA as part of a long-term comprehensive monitoring program to collect life-history information and measure relative abundance/size distributions of recreationally and commercially important species. These include the experimental marine gillnet, trammel net, and beach seine surveys.

In this assessment, only the fishery-independent (FI) marine trammel net survey is used. This survey is conducted with standardized design from October-March. Hydrological and climatological measurements are taken with each biological sample, including water temperature, turbidity, conductivity and salinity. Survey gear is a 750' long and 6' depth net, consisting of 3 walls constructed of nylon. The inner wall has 1 5/8'' bar mesh wall, and the two outer walls have 6'' bar mesh wall. All captured black drum are enumerated and a maximum of 50 randomly selected black drum are collected for length measurements. When more than 50 BD are captured, catch-at-size is derived as the product of total catch and the proportional subsample-at-size.

2.2 Fishery Dependent

Commercial

Commercial black drum landings are taken from the LDWF Trip Ticket Program and NMFS commercial statistical records (NMFS 2013a; Figure 1). Beginning in 2002, black drum landings derived from the LDWF Trip Ticket Program are further delineated into "juvenile" (<27 inches) and "bull" (≥27 inches) size categories (Table 2).

Annual size compositions of commercial harvest (Table 6) are derived from the Trip Interview Program (TIPS; 1994-2001) and the Fishery Information Network (FIN; 2002-2013). Due to the non-random nature BD FIN samples were collected (i.e., separate sampling goals for "juvenile" and "bull" BD), separate annual size compositions are developed to characterize "juvenile" and "bull" BD landings from 2002-2013. Size compositions of 1985-1991 commercial catches are derived from a historical database of length frequencies of commercial BD harvest from the multiple gears used in the fishery during that time (Russell et al. 1986, Russell et al. 1987). Due to the non-random nature these samples were collected, we pooled the information to develop two size compositions representing commercial catches from 1985-1988 (when purse seines were a component of the commercial fishery) and from 1989-1991 (after purse seines were banned). Efforts were not made in this assessment to correct for the historical commercial length composition samples not being collected proportional to the number harvested (see *Research and Data Needs* section). Because no size composition data are available between 1992 and 1993, we used the 1989-91 commercial size composition described above as a proxy.

Ages of commercial black drum landings are derived from a von Bertalanffy growth function (1985-2001) and otoliths collected from LDWF sampling effort (2002-2013; see *Catch at Age Estimation*).

Recreational

Recreational black drum landings (1985-2013, Figure 2) and corresponding size composition information (Table 7) are taken from the NMFS MRFSS/MRIP program (NMFS 2013b). Because recreational size composition samples were not taken proportional to recreational BD landings, size distributions are weighted by the estimated landings within each year/wave/mode. Landings are observed (Type A) and unobserved harvest (Type B1) estimates only. It's important to point out the recent change in estimation methodology for the MRFSS/MRIP survey. Catch estimates, starting in 2004, are now derived with MRIP estimation methods. Earlier estimates are derived with MRFSS estimation methods. In the prior assessment (Blanchet 2010), MRIP catch estimates were not available.

Ages of recreational black drum landings are derived from a von Bertalanffy growth function (1985-2001) and otoliths collected from LDWF sampling effort (2002-2013; see *Catch at Age Estimation*).

3. Life History Information

3.1 Unit Stock Definition

Black drum occur in estuaries and nearshore habitat along the Atlantic and Gulf Coasts from Nova Scotia southward through the GOM and Caribbean Sea to Argentina (GSMFC 1993). Most of the harvest, however, is taken in the GOM with the largest harvest occurring in LA waters (Figures 1 and 2).

Studies using mitochondrial DNA markers (Gold and Richardson 1998) have confirmed spatial homogeneity in black drum haplotype frequencies across the GOM, implying that BD may be considered one stock in the GOM. However, for purposes of this assessment and to remain consistent with the current statewide management strategy, the unit stock is defined as those BD occurring in LA waters.

3.2 Morphometrics

Weight-length regressions and total length (TL)-fork length (FL) conversions for LA BD were reported by Geaghan and Garson in GSMFC (1993). Beckman et al. (1988) found no significant differences between weight-length regression equation slopes comparing male and female BD. For the purpose of this assessment, the non-sex-specific formulation is used with weight calculated from size as:

$$W = 1.274\times10^{-5}(FL)^{3.036} \quad [1]$$

where W is total weight in grams and FL is fork length in mm. Fish with only TL measurements available are converted to FL from the following:

$$FL = 3.80 + \frac{TL}{1.03} \quad [2]$$

3.3 Growth

Beckman et al. (1988) found minor differences between male and female BD growth curves developed from LA-specific data and found the traditional three-parameter von Bertalanffy model inadequate in describing BD growth. For purposes of this assessment, we use a non-sex specific sloped-asymptote ('linear') von Bertalanffy growth function fit to LA BD data (Geaghan and Garson in GSMFC 1993) with size-at-age calculated from:

$$FL_a = (610 + 9.959a) \times (1 - e^{-0.6226(a-0.1229)}) \quad [3]$$

where FL_a is FL-at-age in mm and a is age in years.

3.4 Sex Ratio /Maturity/ Fecundity

Because only minor differences were found between male and female BD growth and sex ratios outside of the spawning season (Fitzhugh and Beckman 1987; Beckman et al. 1988), the sex ratio-at-age/size is assumed to be 50:50 for purposes of this assessment.

An age-specific maturity vector used in an earlier VPA analysis of LA black drum (Geaghan and Garson in GSMFC 1993) is employed in this assessment where no fish age-0 to 3 spawn, 33% of age-4 fish spawn, 66% of age-5 fish spawn, and 100% of fish greater than age-5 spawn.

Black drum are group-synchronous batch spawners. To realistically estimate annual fecundity, the number of eggs spawned per batch and the number of batches spawned per season must be known. Furthermore, batch fecundity and spawning frequency likely vary as a function of fish weight/size/age (Beckman et al. 1990). Estimates of batch fecundity are currently available as a function of fish body weight (Fitzhugh and Beckman 1987); however, spawning frequency estimates are not. Therefore, for purposes of this assessment, female spawning stock biomass is used as a proxy of total egg production. This may introduce bias if fecundity does not scale linearly with body weight (Rothschild and Fogarty 1989).

3.5 Natural Mortality

In the previous assessment (Blanchet 2010), the natural mortality rate was assumed constant across ages; however, an allometric relationship between natural mortality and fish size in natural ecosystems had been demonstrated (Lorenzen 1996). In this assessment, the lowest value of constant M from the previous assessment is assumed (M=0.1), but is allowed to vary with weight-at-age to calculate a declining natural mortality rate with age. Following SEDAR 12 (SEDAR 2006b), the estimate is rescaled

where the average mortality rate over ages vulnerable to the fishery is equivalent to the constant rate over ages as:

$$M_a = M \frac{nL(a)}{\sum_{a_c}^{a_{max}} L(a)} \quad [4]$$

where M is a constant natural mortality rate over exploitable ages a, a_{max} is the oldest age-class, a_c is the first fully-exploited age-class, n is the number of exploitable ages, and $L(a)$ is the Lorenzen curve as a function of age. The Lorenzen curve as a function of age is calculated from:

$$L(a) = W_a^{-0.288} \quad [5]$$

where -0.288 is the allometric exponent estimated for natural ecosystems (Lorenzen 1996) and W_a is weight-at-age.

3.6 Relative Productivity and Resilience

The key parameter in age-structured population dynamics models is the steepness parameter (h) of the stock-recruitment relationship. Steepness is defined as the ratio of recruitment levels when the spawning stock is reduced to 20% of its unexploited level relative to the unexploited level and determines the degree of compensation in the population (Mace and Doonan 1988). Populations with higher steepness values are more resilient to perturbation and if the spawning stock is reduced to levels where recruitment is impaired are more likely to recover sooner once overfishing has ended. Generally, this parameter is difficult to estimate due to a lack of contrast in spawning stock size (*i.e.,* data not available at both high and low levels of stock size) and is typically fixed or constrained during the model fitting process. Direct estimates of steepness are not available for black drum.

Rose et al. (2001) summarize steepness estimates for periodic, opportunistic, and equilibrium life history strategists for freshwater, pelagic, and anadromous fish stocks from a meta-analysis of Ransom Myers spawner-recruit datasets (http://www.mscs.dal.ca/~myers/welcome.html). In SEDAR 24-AW-06 (SEDAR 2010), the periodic strategist steepness estimates included in the Rose et al. (2001) meta-analysis are refined to include only marine demersal species (mean and median steepness= 0.77 and 0.80, respectively). For purposes of this assessment, we further refine the list of marine demersal species in SEDAR 24-AW-06 to only include species with similar life history characteristics as discussed below.

Productivity is a function of growth rates, natural mortality, age of maturity, and longevity and can be a reasonable proxy for resilience. We characterize the relative productivity of GOM BD based on life-history characteristics, following SEDAR 9 (SEDAR 2006a), with a classification scheme developed at the FAO second technical consultation on the suitability of the CITES criteria for listing commercially-exploited aquatic species (FAO 2001; Table 8). Each life history characteristic (von Bertalanffy growth

rate, age at maturity, longevity, and natural mortality rate) is assigned a rank (low=1, medium=2, and high=3) and then is averaged to compute an overall productivity score. Due to the non-typical von Bertalanffy growth function used in this assessment, the von Bertalanffy growth rate is taken from a traditional three-parameter model (Beckman et al. 1990). In this case, the overall productivity score is 1.25 for GOM black drum indicating low productivity. We further refine the list of marine demersal species in SEDAR 24-AW-06 to only include species with similar overall productivity scores (5 species: productivity score 1.0-1.5; mean and median steepness= 0.71 and 0.80, respectively).

4. Abundance Index Development

An index of abundance (IOA) was developed from the LDWF FI marine trammel net survey for use as a tuning index in ASAP. Stations not sampled regularly through time are excluded from index development. For purposes of this assessment, catch-per-unit effort (CPUE) is defined as the number of black drum caught per trammel net sample. To reduce unexplained variability in catch rates unrelated to changes in abundance, the IOA was standardized using methods described below.

A delta lognormal approach (Lo *et al.* 1992; Ingram *et al.* 2010) is used to standardize black drum catch-rates in each year as:

$$I_y = c_y p_y \quad [6]$$

where c_y are estimated annual mean CPUEs of non-zero black drum catches assumed as lognormal distributions, and p_y are estimated annual mean probabilities of black drum capture assumed as binomial distributions. The lognormal and binomial means and their standard errors are estimated with generalized linear models as least squares means and back transformed (e^x). The lognormal model considers only samples in which black drum are captured; the binomial model considers all samples. The IOA is then computed from equation [6] with variances approximated from a Monte Carlo resampling routine (2000 iterations) using the estimated least-squares means and standard errors.

Variables considered in model inclusion were:

Factor	Levels	Value
Year	29	1985-2013
Month	6	October-March
Area	5	CSA 1,3,5,6,7
Salinity	Continuous	--
Temperature	Continuous	--

January, February, and March samples are grouped with the previous year's October, November, and December samples for IOA development. This approximates survey timing with the endpoint of the model/calendar year.

To determine the most appropriate models, factors are selected using a forward step-wise approach where each factor is added to each sub-model individually and the resulting reduction in deviance per degree of freedom (Dev/DF) analyzed. The factor causing the greatest reduction in Dev/DF is then added to the base model. Criteria for model inclusion also include a reduction in Dev/DF ≥1% and a Chi-Square significance test ≤0.05. This procedure is then repeated until no factor met criteria for model inclusion. We assume no significant interaction terms with year in this model and consider only the main effects.

The resulting sub-models are as follows:

$$c \sim Year + Area + Salinity \quad [7]$$

$$p \sim Year + Area \quad [8]$$

Sub-models are estimated with the SAS generalized linear modeling procedure (PROC GENMOD; SAS 1994). Sample sizes, proportion positive samples, nominal CPUE, standardized index, and coefficients of variation are presented (Table 9, Figure 3). For assessment modeling purposes, where age-0 BD are not included in the population model, age-0 individuals are removed from the IOA by multiplying the standardized IOA by the proportion of the annual age composition > age-0 (see *Catch at Age Estimation* below).

5. Catch at Age Estimation

Age-length-keys (ALKs) are developed to estimate the annual age composition/catch-at-age of commercial/recreational harvest and survey catches as described below.

5.1 Fishery

Black drum in LA exhibit a protracted spawning season, with spawning primarily occurring across a four month window from February through May (Beckman et al. 1988). The midpoint of this season (April 1st) is typically assumed as a biological birthday. However, for purposes of this assessment, BD ages are assigned based on the calendar year by assuming a January 1st birthday, where BD spawned the previous year become age-1 on January 1st and remain age-1 until the beginning of the following year.

1981-2001: Probabilities of age a given length l for recreational and commercial black drum landings are computed from:

$$P(a|l) = \frac{P(l|a)}{\sum_a P(l|a)} \quad [9]$$

where the probability of length given age is estimated from a normal probability density as:

$$P(l|a) = \frac{1}{\sigma_a\sqrt{2\pi}} \int_{l-d}^{l+d} exp\left[-\frac{(l-l_a)^2}{2\sigma_a^2}\right] dl \quad [10]$$

where length bins are 1 inch FL intervals with midpoint l, maximum $l + d$, and minimum $l - d$ lengths. Mean fork length-at-age l_a is estimated from Equation [3]. The standard deviation in length-at-age is approximated from $\sigma_a = l_a CV_l$, where the coefficient of variation in length-at-age is assumed constant (in this case 0.10). To approximate changes in growth and vulnerability to the fishery through the year, mean l_a is calculated at the mid-point of the calendar/model year. The resulting fishery $P(a|l)$ matrix used in age assignments of 1985-2001 landings is presented in Table 10.

2002-2013: Annual fleet-specific f (i.e., commercial and recreational) probabilities of age given length are computed from:

$$P(a|l)_{yf} = \frac{n_{layf}}{\sum_a n_{layf}} \quad [11]$$

where n_{layf} are annual fleet-specific black drum sample sizes occurring in each length/age bin (Tables 11 and 12). Due to the non-random nature commercial size and age information were collected during FIN BD sampling, probabilities of age given length are calculated separately for "juvenile" (< 27 inches) and "bull" BD (≥27 inches) and coupled with the distinct size frequency distributions and reported landings of "juvenile" and "head" drum described in the *Data Sources* section (Table 2 and Table 6) for catch-at-age estimation (i.e., equation [12] below). For length bins with limited sample sizes, i.e., $\sum_a n_{layf}$< 5 for length bins ≤ 21 inches and $\sum_a n_{layf}$ < 10 for length bins >21 inches, the $P(a|l)$ for that length interval is taken from equation [9].

Annual fleet-specific fishery catch-at-age is then taken as:

$$C_{ayf} = \sum_l C_{lyf} P(a|l)_{yf} \quad [12]$$

where C_{lyf} are annual fleet-specific fishery catch-at-size in FL, and $P(a|l)_{yf}$ are taken from either equation [9] or [11]. Due to the non-random nature commercial size and age information were collected during FIN BD sampling, catch-at-size is developed separately for "juvenile" (< 27 inches) and "bull" BD (≥27 inches). For modeling purposes, catches > age-10 are summed into a plus group. Resulting annual fleet-specific fishery catch-at-age and corresponding mean weights-at-age are presented (Tables 13-16).

5.2 Survey

Probabilities of age given length for BD catches of the LDWF marine trammel net survey are computed from equation [9]. To approximate survey timing (i.e., a December 31st midpoint), mean l_a is calculated at the end of the calendar/model year relative to January 1st . Resulting survey $P(l|a)$ is presented (Table 17).

Annual survey catch-at-age is then taken from equation [10] with annual survey catch-at-size substituted for fishery catch-at-size. Survey catch-at-size is derived using only those samples included in abundance index development. Annual survey catch-at-size and resulting survey age compositions are presented (Tables 18 and 19).

6. Assessment Model

Previous LDWF black drum stock assessments (LDWF 1997-2007, 2008, Blanchet 2010) estimated the impact of fishing pressure with a yield and spawner-per-recruit model using fishing mortality estimates from an earlier untuned virtual population analysis (LDWF 1990). In this assessment, a statistical catch-at-age model is used to describe the dynamics of black drum occurring in LA waters. Direct comparisons between the earlier and current assessments are not included in this report.

The Age-Structured Assessment Program (ASAP3; NOAA Fisheries Toolbox, http://nft.nefsc.noaa.gov) is used to describe the dynamics of the LA black drum stock from 1985-2013. ASAP is a statistical catch-at-age model that allows internal estimation of a Beverton-Holt stock recruitment relationship and MSY-related reference points. Minimum data requirements are fishery catch-at-age and a tuning index. ASAP forward calculates abundance at age from estimates of abundance in the initial year of the time-series and recruitment estimates in subsequent years. The model is fit to the data with a maximum likelihood fitting criterion.

An overview of the basic model equations and their estimation, as applied in this assessment, are provided below. Specific details and full capabilities of ASAP can be found in the technical documentation (ASAP3 2012; NOAA Fisheries Toolbox 2013).

6.1 Model Configuration

Mortality

Fishing mortality is assumed separable by age a year y and fleet f as:

$$F_{ayf} = v_{af} Fmult_{yf} \quad [13]$$

where v_{af} are age and fleet-specific fishery selectivities and $Fmult_{yf}$ are annual fleet-specific apical fishing mortality rates. Apical fishing mortalities are estimated in the initial year and as deviations from the initial estimates in subsequent years.

Age and fleet specific fishery selectivities are modeled with double logistic functions as:

$$v_{af} = \left(\frac{1}{1+e^{-(a-\alpha_f)/\beta_f}}\right)\left(1 - \frac{1}{1+e^{-(a-\alpha 2_f)/\beta 2_f}}\right) \quad [14]$$

Total mortality for each age and year is estimated from the age-specific natural mortality rate M_a and estimated annual fleet-specific fishing mortalities as:

$$Z_{ay} = M_a + \sum_f F_{ayf} \quad [15]$$

For reporting purposes, annual fishing mortalities are averaged by weighting by estimated population numbers at age N_{ay} as:

$$F_y = \frac{\sum_a F_{ay} N_{ay}}{\sum_a N_{ay}} \quad [16]$$

Population Abundance

Abundance-at-age in the initial year of the time series and recruitment in subsequent years are estimated and used to forward calculate the remaining numbers at age from the age and year specific total mortality rates as:

$$N_{ay} = N_{a-1,y-1} e^{-Z_{a-1,y-1}} \quad [17]$$

Numbers in the plus group A are calculated from:

$$N_{Ay} = N_{A-1,y-1} e^{-Z_{A-1,y-1}} + N_{A,y-1} e^{-Z_{A,y-1}} \quad [18]$$

Spawning Stock Biomass

Annual spawning stock biomass (of females only) is calculated from:

$$SSB_y = \sum_{i=1}^{A} N_{ay} W_{SSB,a} \left(\frac{p_{mat,a}}{2}\right) e^{-Z_{ay}(0.33)} \quad [19]$$

where $W_{SSB,a}$ are spawning stock biomass weights-at-age, $\frac{p_{mat,a}}{2}$ is the proportion of mature females-at-age assuming a 50:50 sex ratio-at-age, and $-Z_{ay}(0.33)$ is the proportion of total mortality occurring prior to spawning on April 1st.

Stock Recruitment

Expected recruitment is calculated from the Beverton-Holt stock recruitment relationship, reparameterized by Mace and Doonan (1988), with annual lognormal deviations as:

$$\hat{R}_{y+1} = \frac{\alpha SSB_y}{\beta + SSB_y} + e^{\delta_{y+1}} \quad [20]$$

$$\alpha = \frac{4\tau(SSB_0/SPR_0)}{5\tau - 1} \text{ and } \beta = \frac{SSB_0(1-\tau)}{5\tau - 1}$$

where SSB_0 is unexploited female spawning stock biomass, SPR_0 is unexploited female spawning stock biomass per recruit, τ is steepness, and $e^{\delta_{y+1}}$ are annual lognormal recruitment deviations.

Expected Catch

Expected fishery catches by age, fleet, and year are estimated from the Baranov catch equation as:

$$\hat{C}_{ayf} = N_{ay}F_{ayf}\frac{(1-e^{-Z_{ay}})}{Z_{ay}} \quad [21]$$

Expected fishery age compositions are then calculated from $\frac{\hat{\hat{C}}_{ayf}}{\sum_a \hat{C}_{ayf}}$. Expected yields for each age, year, and fleet are computed as $\sum_a \hat{C}_{ayf}\overline{W}_{ayf}$, where $\overline{W}_{ayf}$ are observed mean catch weights.

Survey Catch-rates

Expected survey catch-rates for each age and year are computed from:

$$\hat{I}_{ay} = q\sum_a N_{ay}(1 - e^{-Z_{ay}(1.0)})v_a \quad [22]$$

where v_a are estimated age-specific survey selectivities, q is the estimated catchability coefficient, and $-Z_{ay}(1.0)$ is the proportion of the total mortality occurring prior to the time of the survey (December 31st midpoint). Survey selectivities are modeled with a double logistic function as:

$$v_a = \left(\frac{1}{1+e^{-(a-\alpha)/\beta}}\right)\left(1 - \frac{1}{1+e^{-(a-\alpha 2)/\beta 2}}\right) \quad [23]$$

Expected survey age composition is then calculated as $\frac{\hat{I}_{ay}}{\sum_a \hat{I}_{ay}}$.

Parameter Estimation

The number of parameters estimated is dependent on the length of the time-series, number of selectivity blocks modeled, and number of tuning indices used. Parameters are estimated in log-space and then back transformed. In this assessment, 122 parameters are estimated:

1. 24 selectivity parameters (4 parameters per selectivity block: 3 blocks for the commercial fishery, 2 blocks for the recreational fishery, and 1 block for the survey)
2. 58 apical fishing mortality rates (Fmult in the initial year and 28 deviations in subsequent years for 2 fleets)
3. 29 recruitment deviations (1985-2013)
4. 9 initial population abundance deviations (age-2 through 10-plus)
5. 1 survey catchability coefficient
6. 1 stock-recruitment parameter (virgin stock size).

The model is fit to the data by minimizing the objective function:

$$-ln(L) = \sum_i \lambda_i(-ln\, L_i) + \sum_j(-ln\, L_j) \quad [24]$$

where – $ln(L)$ is the entire negative log-likelihood , lnL_i are log-likelihoods of lognormal estimations, λ_i are user-defined weights applied to lognormal estimations, and lnL_j are log-likelihoods of multinomial estimations.

Negative log-likelihoods with assumed lognormal error are derived (ignoring constants) as:

$$-ln(L_i) = 0.5 \sum_i \frac{[ln(obs_i) - ln(pred_i)]^2}{\sigma^2} \quad [25]$$

where obs_i and $pred_i$ are observed and predicted values; standard deviations σ are user-defined CVs as $\sqrt{ln(CV^2 + 1)}$.

Negative log-likelihoods with assumed multinomial error are derived (ignoring constants) as:

$$-ln(L_j) = -ESS \sum_{i=1}^{A} p_i\, ln(\hat{p}_i) \quad [26]$$

where p_i and $\hat{p}_i$ are observed and predicted age composition. Effective sample-sizes ESS are used to create the expected numbers $\hat{n}_a$ in each age bin and act as multinomial weighting factors.

6.2 Model Assumptions/Inputs

Model assumptions include: 1) the unit stock is adequately defined and closed to migration, 2) observations are unbiased, 3) errors are independent and their structures are adequately specified, 4) fishery and survey vulnerabilities are dome-shaped, 5) abundance indices are proportional to absolute abundance, and 6) natural mortality, fecundity, growth and sex ratio at size/age do not vary significantly with time. Lognormal error is assumed for catches, abundance indices, the stock-recruitment relationship, apical fishing mortality, selectivity parameters, initial abundance deviations, and catchability. Multinomial error is assumed for fishery and survey age compositions.

A base model was defined with an age-10 plus group, the steepness parameter fixed at 0.75, three commercial fishery selectivity blocks, two recreational selectivity blocks, and one survey selectivity block. Input levels of error and weighting factors are described below.

For the commercial fleet, three selectivity blocks are modeled that correspond to the following time-periods of consistent regulation: 1) 1985-1988 (no regulations), 2) 1989-1996 (commercial MLL implemented and purse-seines banned), and 3) 1997-2013 (gill and trammel nets banned). Within the recreational fleet, two selectivity blocks are modeled that correspond to the following time-periods of

consistent regulation: 1) 1985-1988 (no regulations) and 2) 1989-2013 (recreational MLL and creel limit implemented).

Input levels of error for fishery landings were specified with CV's of 0.2 for each year of the time-series; annual recruitment deviations were specified with CV's of 0.5. Due to model estimation problems (i.e., hessian matrix unable to invert), both fleets' apical fishing mortality rates in the first year were constrained with CVs of 1.0 to allow estimation stability. All lambdas for lognormal components included in the objective function were equally weighted (=1). Input effective sample sizes for estimation of fishery age compositions were specified as ESS=50 for years where annual ALKs were available (2002-2013) and down weighted to ESS=10 for years where the von Bertalanffy growth function was used (1985-2001). Input effective sample size for estimation of survey age compositions, where ages were also assigned from the von Bertalanffy growth function, were specified with ESS=10.

6.3 Model Results

Objective function components, weighting factors, and likelihood values of the base model are summarized in Table 20.

Model Fit

The base model provides an overall reasonable fit to the data. Predicted commercial and recreational catches match the observations well (Figures 4 and 5). However, some patterning of the residuals are apparent, where each fleets landings are overestimated in earlier years of the time-series and underestimated in more recent years. Predicted survey catch-rates match the data well with no strong pattern in residuals (Figure 6). Predicted fishery and survey age compositions provide adequate fits to the input age proportions (Figures 7-9). Survey age compositions, however, are generally underestimated for age-1 fish and overestimated for age-2 individuals.

Selectivities

Estimated fishery and survey selectivities are presented in Figure 10. Fishery estimates indicate full-vulnerability to the commercial fishery at age-2 during the 1985-1988 and 1989-1996 regulation blocks. After the commercial gill/trammel net ban (1997-2013), selectivity estimates indicate full-vulnerability to the commercial fishery at age-3. Recreational estimates indicate full-vulnerability at age-1 for the 1985-1988 regulation block and increased to age-2 after recreational regulations were implemented (1989-2013). Survey estimates indicate full vulnerability to the FI survey gear at age-1.

Abundance, Recruitment, and Spawning Stock

Stock size has varied over the time-series (Table 21). Stock size decreased from 6.8 million fish in 1985 to a minimum of 3.3 million fish in 1991. Since 1991, stock abundance has generally increased to its

highest peak of 16.6 million fish in 2012. The 2013 stock size estimate is 16.2 million fish in 2013, which is above the long-term mean of 9.5 million fish.

Recruitment has also varied over the time-series (Figure 11). Recruitment increased from a minimum of 0.9 million age-1 fish in 1990 to a maximum of 5.7 million individuals in 2007. In addition to 2007, recruitment peaks occurred in 2000-2001, 2009, and 2012. The 2013 estimate of recruitment (3.0 million age-1 fish) is above the long-term mean of 2.5 million fish.

Spawning stock biomass (SSB) estimates are presented in Figure 12. Estimates decrease from 38.6 million pounds in 1985 to a minimum of 8.2 pounds in 1996. After 1997, SSB increased to 40.7 million pounds estimated in 2013. The 2013 estimate is greater than the long-term mean of 21.7 million pounds.

Fishing Mortality

Estimated fishing mortality rates are presented in Table 22 (total apical, average, and age-specific) and Figure 13 (average only). Average rates are weighted by estimated population numbers at age. Average fishing mortality rates have varied over the time-series with an overall decreasing trend. The highest estimate of average F was in 1988 (0.43 yr^{-1}) when LA BD landings were at their peak. After 1988, average-F rates decreased to a minimum of 0.07 yr^{-1} in 2007 and have remained low.

Stock-Recruitment

No discernable relationship is observed between female SSB and subsequent age-1 recruitment (Figure 14). The steepness parameter was fixed at 0.75 in the ASAP base model run. The estimated virgin spawning stock biomass was 131.0 million pounds. Alternate runs with steepness values fixed at 1.0, 0.9, 0.8, and 0.7 are discussed in the *Model Diagnostics* Section below.

Parameter Uncertainty

In the ASAP base model, 122 parameters were estimated. Asymptotic standard errors for the recruitment time-series are presented in Figure 11. Markov Chain Monte Carlo (MCMC) derived 95% confidence intervals (CI) for the median female spawning stock biomass and average F rates are presented in Figures 12 and 13. Uncertainty surrounding average F has decreased over time. Uncertainty around SSB has increased over time.

6.4 Management Benchmarks

The conservation standard established by the LA Legislature for black drum (RS 56:325.4: http://www.legis.la.gov/Legis/Law.aspx?d=105210) is a 30% spawning potential ratio (SPR; Goodyear 1993). Methodology used in this assessment to estimate equilibrium yield, female spawning stock biomass, escapement rates, and fishing mortality rates that lead to a 30% SPR are described below.

When the stock is in equilibrium, equation [19] can be solved, excluding the year index, for any given exploitation rate as:

$$\frac{SSB}{R}(F) = \sum_{i=1}^{A} N_a W_{SSB,a} \left(\frac{p_{mat,a}}{2}\right) e^{-Z_a(0.33)} \quad [27]$$

where total mortality at age Z_a is computed as $M_a + v_a Fmult$; vulnerability at age v_a is taken by rescaling the current F-at-age estimate (geometric mean 2011-2013) to the maximum. Per recruit abundance-at-age is estimated as $N_a = S_a$, where survivorship at age is calculated recursively from $S_a = S_{a-1}e^{-Z_a}$, $S_1 = 1$. Per recruit catch-at-age is then calculated from the Baranov catch equation [21], excluding the year index. Yield per recruit (Y/R) is then taken as $\sum_a C_a \overline{W}_a$ where $\overline{W}_a$ are mean fishery weights at age from the last three years of the assessment (2011-2013).

Equilibrium spawning stock biomass SSB_{eq} is calculated by substituting SSB/R estimated from equation [27] into the Beverton-Holt stock recruitment relationship as $\alpha \times SSB/R - \beta$. Equilibrium recruitment R_{eq} and yield Y_{eq} are then taken as $SSB_{eq} \div SSB/R$ and $Y/R \times R_{eq}$. Fishing mortality is averaged as $\sum_a F_a N_a / \sum_a N_a$. Equilibrium SPR is then computed as the ratio of SSB/R when F>0 to SSB/R when F=0.

Annual escapement rates (i.e., proportion of non-fully mature black drum that survive) are calculated from:

$$E_y = e^{-(F_{1y}+F_{2y}+F_{3y}+F_{4y}+F_{5y})} \quad [28]$$

where F_{1y} – F_{5y} are the total annual age 1-5 fishing mortality rates estimated from the ASAP base model run. Equilibrium escapement rates are calculated from equation [28] excluding the year index and equilibrium F-at-age. The time-series of annual escapement rate estimates is presented (Figure 15). Annual escapement rates varied from 0.35 year^{-1} in 1985 and to a low of 0.03 year^{-1} in 1988. After 1988, escapement increased to an average of 0.55 year^{-1} in the most recent years.

As reference points to guide management, we estimate the equilibrium average fishing mortality rate, female spawning stock biomass, escapement rate, and yield that lead to a 30% SPR ($F_{30\%}$, $SSB_{30\%}$, $E_{30\%}$, and $Y_{30\%}$; Table 23). Also presented are a plot of the stock recruitment data, equilibrium recruitment, and diagonals from the origin intersecting R_{eq} at the minimum and maximum SSB estimates of the time-series, corresponding with a minimum equilibrium SPR of 14% and a maximum of 37% (Figure 16). The current estimate of equilibrium SPR is 36%.

6.5 Model Diagnostics

Sensitivity Analysis

A series of sensitivity runs are used to explore uncertainty in the base model's configuration as follows:

1. steepness parameter h fixed at 1.0, 0.9 ,0.8 and 0.7 (models 1-4)
2. fishery yields up-weighted ($\lambda\times$ 10; model 5)
3. survey catch-rates up-weighted ($\lambda\times$ 20; model 6)

Current conditions are taken as the geometric mean (SSB, F, Yield, and E) of the last three years of the assessment (2011-2013). Reference point estimates from all but one of the sensitivity runs indicate the stock is currently above $SSB_{30\%}$ and the fishery is currently operating below $F_{30\%}$ (Table 24). Model 6 (i.e., survey catch-rates up-weighted), however, suggests that over-fishing is currently occurring. With the exception of model-6, estimates of $F_{30\%}$, $SSB_{30\%}$, $E_{30\%}$, and $Y_{30\%}$, from each sensitivity run were similar in magnitude (0.11 $year^{-1}$, 24.1-32.4 million pounds, 0.45-0.46 $year^{-1}$, and 4.9-6.5 million pounds, respectively).

Retrospective Analysis

A retrospective analysis was conducted by sequentially truncating the base model by a year (terminal years 2009-2013 only). Retrospective estimates of $F/F_{30\%}$, $SSB/SSB_{30\%}$, recruitment, and age-10+ stock numbers are presented in Figure 17, where $SSB_{30\%}$ and $F_{30\%}$ are computed from the full base run. Terminal year estimates from each retrospective differ from the full base run. Terminal year $F/F_{30\%}$ estimates indicate positive bias, where estimates generally decrease as more years are added to the model. Terminal year recruitment estimates indicate minimal negative bias. Terminal year $SSB/SSB_{30\%}$ estimates also indicate negative bias, where estimates generally increase as more years are added to the model. Furthermore, $SSB/SSB_{30\%}$ and $F/F_{30\%}$ estimates in earlier years of the time-series show a large retrospective bias. This bias is likely due to the large retrospective bias observed in age-10+ stock numbers up until the early 2000s (Figure 17; bottom graphic).

7. Stock Status

The history of the LA black drum stock relative to $F/F_{30\%}$ and $SSB/SSB_{30\%}$ is presented in Figure 18. Given the established conservation standard of 30% SPR, fishing mortality rates exceeding $F_{30\%}$ ($F/F_{30\%}$ >1.0) are defined as overfishing; spawning stock sizes below $SSB_{30\%}$ ($SSB/SSB_{30\%} < 1.0$) are defined as the overfished condition. Given the uncertainty evident in the terminal year of the assessment (see *Model Diagnostics* section), current conditions (i.e., SSB and F rates) are derived as the geometric mean of the last three years of the ASAP base model run (2011-2013).

Overfishing Status

Using results of the ASAP model presented in this assessment, the current estimate of $F/F_{30\%}$ is <1.0 (0.68), suggesting the stock is currently not undergoing overfishing. However, model estimates suggest that overfishing did occur in earlier years of the time-series.

Overfished Status

Using results of the ASAP model presented in this assessment, the current estimate of $SSB/SSB_{30\%}$ is >1.0 (1.30), suggesting the stock is currently not in an overfished state. However, model estimates suggest the stock was considered overfished for the majority of the time-series.

Control Rules

As specified in RS 56:325.4 , if the annual LDWF black drum stock assessment indicates current SPR<30%, the department shall close the season within two weeks for a period of at least one year, or provide management options that provide estimates that the spawning potential ratio will have at least a fifty percent chance of recovery to a thirty percent ratio within ten years or some other appropriate recovery period based on the biology of the stock of the fish, environmental conditions, and the needs of the fishing communities..

8. Research and Data Needs

As with any analysis, the accuracy of this assessment is dependent on the accuracy of the information of which it is based. Below we list additional recommendations to improve future LA stock assessments of black drum.

Only limited age data are available from the LDWF marine trammel net survey. Ages of survey catches in this assessment were assigned from a von Bertalanffy growth function. Age samples collected directly from the survey in question would allow a more accurate representation of survey age composition in future assessments.

The harvest of adult black drum currently comprises only a small fraction of the overall harvest. However, fishery independent surveys that characterize both the inshore and nearshore adult population would allow additional tuning indices in future modeling efforts that could better characterize adult stock size and provide more certainty in reference point estimates.

Historical commercial black drum size compositions were not sampled proportional to the harvest. Future assessment efforts should explore weighting schemes at the finest scale possible to reduce this sampling bias.

Factors that influence year-class strength of black drum are poorly understood. Investigation of these factors, including inter-annual variation in seasonal factors and the influence of environmental

perturbations such as the Deepwater Horizon oil spill, could elucidate causes of inter-annual variation in abundance, as well as the species stock-recruitment relationship.

Estimates of black drum spawning frequency as a function of age/size are needed.

Fishery-dependent data alone is not a reliable source of information to assess status of a fish stock. Consistent fishery-dependent and fishery-independent data sources, in a comprehensive monitoring plan, are essential to understanding the status of fishery. A new LDWF fishery-independent survey methodology was implemented in 2013. This methodology should be assessed for adequacy with respect to its ability to evaluate stock status, and modified if deemed necessary.

With the recent trend toward ecosystem-based assessment models (Mace 2000; NMFS 2001), more data is needed linking black drum population dynamics to environmental conditions. The addition of meteorological and physical oceanographic data coupled with food web data may lead to a better understanding of the black drum stock and its habitat.

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10. Tables

Table 1: Annual Louisiana commercial and recreational black drum *Pogonias cromis* landings (pounds x 10^3) derived from NOAA-Fisheries commercial statistical records, LDWF trip ticket program, and MRFSS/MRIP. Recreational landings are A+B1 harvest only.

Year	Harvest		%_Recreational	%_Commercial
	Commercial	Recreational		
1985	3,421	594	14.8	85.2
1986	5,226	2,367	31.2	68.8
1987	8,021	2,726	25.4	74.6
1988	8,757	1,360	13.4	86.6
1989	4,406	898	16.9	83.1
1990	2,876	421	12.8	87.2
1991	1,914	537	21.9	78.1
1992	3,014	824	21.5	78.5
1993	3,178	709	18.2	81.8
1994	3,739	649	14.8	85.2
1995	2,999	779	20.6	79.4
1996	1,619	895	35.6	64.4
1997	1,643	1,389	45.8	54.2
1998	1,782	1,686	48.6	51.4
1999	2,200	1,120	33.7	66.3
2000	2,844	2,782	49.5	50.5
2001	3,195	1,780	35.8	64.2
2002	3,118	1,999	39.1	60.9
2003	3,517	2,571	42.2	57.8
2004	3,761	2,302	38.0	62.0
2005	2,377	1,729	42.1	57.9
2006	1,937	1,909	49.6	50.4
2007	2,365	2,308	49.4	50.6
2008	2,427	2,498	50.7	49.3
2009	3,175	2,124	40.1	59.9
2010	2,794	1,680	37.6	62.4
2011	3,715	2,014	35.2	64.8
2012	3,448	2,016	36.9	63.1
2013	3,712	1,668	31.0	69.0

Table 2: Annual Louisiana commercial black drum *Pogonias cromis* landings showing juvenile, in weight (pounds x 10^3), and head drum, in numbers (x 10^3) from 2002 to 2013 derived from LDWF trip ticket program.

Year	Commercial	
	Juvenile	Head Drum
2002	2,865	16.5
2003	3,396	7.6
2004	3,529	14.9
2005	2,194	11.9
2006	1,845	5.6
2007	2,240	8.2
2008	2,280	11.8
2009	2,955	12.8
2010	2,728	4.3
2011	3,623	6.5
2012	4,108	0.9
2013	3,676	7.6

Table 3. Annual percent contribution by gear of Louisiana commercial black drum landings from the LDWF Trip Ticket Program, 2000-2013.

% Commercial Landings by Gear						
YEAR	TROT LINES	HAND LINES	OTTER TRAWL, FISH	OTTER TRAWL, SHRIMP	SKIMMER NETS	OTHER
2000	59.2	8.6	4.5	19.5	2.6	3.0
2001	52.3	2.7	7.1	30.6	4.9	0.9
2002	55.6	5.6	5.0	24.4	7.5	1.3
2003	62.9	6.4	8.6	17.2	3.6	0.9
2004	72.1	8.8	2.7	11.8	3.8	0.5
2005	81.9	4.2	3.3	8.2	2.0	0.3
2006	84.4	1.4	4.8	4.9	3.9	0.5
2007	78.6	4.2	2.4	10.7	3.3	0.7
2008	79.4	9.2	1.1	6.5	3.1	0.6
2009	80.9	5.0	3.6	4.2	5.5	0.8
2010	81.4	2.9	4.6	3.0	6.4	1.7
2011	78.7	9.4	4.6	1.7	1.7	3.8
2012	80.8	8.8	3.5	4.3	1.4	1.1
2013	74.8	9.9	6.3	1.3	2.2	5.4

Table 4: Annual percent contribution by month of Louisiana commercial black drum landings from the LDWF Trip Ticket Program, 2000-2013.

% Commercial Landings by Month												
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	8.4	9.8	19.6	7.3	3.9	5.2	6.7	6.1	7.0	8.4	9.1	8.4
2001	16.6	14.0	13.9	7.7	4.4	4.1	4.9	5.9	6.1	8.8	5.0	8.7
2002	12.6	15.9	13.7	9.2	5.3	4.5	5.7	5.7	5.4	6.7	7.0	8.5
2003	9.3	10.6	15.5	9.3	5.1	6.2	6.6	6.9	6.3	8.0	7.1	9.2
2004	11.7	13.1	13.0	7.3	6.3	4.9	6.8	6.6	5.9	6.5	7.5	10.5
2005	14.3	9.9	17.0	8.7	11.4	7.5	6.5	7.9	1.9	2.2	3.8	8.9
2006	7.1	6.1	12.6	6.6	7.2	8.8	8.1	9.4	7.7	7.3	11.0	8.1
2007	14.0	12.0	14.3	5.6	6.1	6.5	6.2	7.0	5.7	5.3	8.0	9.3
2008	14.6	10.7	9.1	9.0	7.9	7.4	5.1	5.5	3.0	8.0	5.6	14.0
2009	11.6	6.7	9.9	6.7	6.8	8.0	6.2	8.3	5.9	7.1	11.5	11.3
2010	10.4	12.4	11.8	10.0	7.9	6.4	2.5	5.9	5.8	6.4	9.7	10.7
2011	13.2	6.1	5.8	6.6	6.9	8.2	7.9	8.3	7.6	10.3	8.2	10.9
2012	8.3	8.7	8.1	7.6	11.0	8.7	9.8	6.2	6.8	8.8	9.1	6.9
2013	14.4	8.3	11.6	8.2	6.9	6.4	6.6	6.1	7.8	8.2	7.3	8.3

Table 5: Annual percent contribution by area of Louisiana commercial black drum landings from the LDWF Trip Ticket Program, 2000-2013.

% Commercial Landings by Area														
Basin/Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
ATCHAFALAYA/VERMILION-TECH	9.5	12.0	19.3	31.4	37.9	47.5	44.6	32.1	42.6	33.9	42.0	34.8	35.2	33.9
BARATARIA	31.5	38.3	35.7	31.5	22.2	17.4	27.0	36.5	22.4	11.8	7.5	7.7	8.6	10.6
CALCASIEU RIVER	24.4	16.7	9.3	7.6	14.6	14.4	15.9	16.3	13.7	20.4	12.4	23.2	23.7	18.1
LAKE PONTCHARTRAIN	4.8	5.2	6.9	5.4	2.7	4.1	1.1	2.2	8.8	19.4	24.7	22.5	20.7	20.7
LOUISIANA GRID 13	8.8	3.5	8.1	0.9	2.5	3.7	1.9	0.4	0.0	0.1	0.3	0.1	0.1	0.4
LOUISIANA GRID 14	1.3	0.6	0.0	0.0	0.0	0.5	1.8	1.6	0.3					
LOUISIANA GRID 15	0.2	3.0	0.2	0.0	0.1	0.3	0.1		0.2			0.4		
LOUISIANA GRID 16		0.1												
LOUISIANA GRID 17	0.1	0.1												
MERMENTAU RIVER	0.0	0.1												
MISSISSIPPI COAST	0.1													
MISSISSIPPI RIVER	7.8	9.7	10.9	16.9	11.5	4.4	2.4	5.4	10.2	9.6	5.4	4.7	4.7	6.1
TERREBONNE	11.4	10.8	9.5	6.1	8.5	7.8	5.3	5.5	1.8	4.8	7.7	6.5	7.1	10.2
UNKNOWN AREA FISHED	0.1													

Table 6: Annual size frequency samples of Louisiana commercial black drum *Pogonias cromis* landings derived from historical data collections (Russell et al.1986 and 1987; 1985-1991), the Trip Interview Program (TIPS; 1994-2001), and the Fishery Information Network (FIN; 2002-2013). Shaded area represents "juvenile" (<27 inches) and "bull" (≥27 inches) black drum samples from the FIN sampling program, where annual size distributions are developed separately to characterize landings of BD <27 inches and those ≥ 27 inches.

Commercial, 1985-2013																						
FL_in	1985-1988	1989-1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
5																						
6	3																					
7	6	3																				
8	4	20																				
9	1	54																				
10	6	128																				
11	33	203																				
12	24	188																				
13	36	183	1											1		1		4			1	1
14	117	550	1	2		1				4	2	1	1	3	1	6	2	18		1	2	3
15	196	633	21	106	4	26			5	21	5	8	2	16	10	26	32	41	6	17	14	9
16	679	1,164	49	242	29	27	6	13	17	63	23	28	14	48	31	57	48	119	22	34	42	17
17	582	676	50	247	17	36	17	30	31	83	21	36	32	72	37	82	80	227	36	62	61	37
18	823	1,127	34	201	24	37	18	8	57	93	20	32	35	90	44	129	96	186	49	113	88	39
19	487	313	42	132	24	40	27	8	77	67	14	28	33	73	73	163	125	161	62	141	92	51
20	552	271	29	123	19	39	12	6	42	60	23	29	31	80	71	120	134	106	54	127	94	27
21	267	184	21	74	15	21	2	1	28	37	21	36	23	39	55	106	79	74	45	109	127	50
22	270	344	12	42	12	24	4	1	10	15	14	42	16	49	26	85	83	41	53	94	113	68
23	198	131	8	27	12	20	3		7	6	11	30	19	39	29	75	58	19	38	121	90	64
24	534	127	6	19	19	16	9		11	2	8	17	24	40	25	58	54	23	24	105	67	21
25	1,106	63	3	4	15	14	6		9		6	11	18	25	24	87	60	35	33	88	53	26
26	909	55	3	4	15	13	1		1		2	15	14	12	11	80	49	43	27	76	38	9
27	1,290	138			17	9	1				3	10	2	21	5	79	55	47	6	31	34	8
28	984	111	1	4	14	3	4				2	3	1	15	9	34	33	29	5	14	12	10
29	1,255	205		2	10	2	2					2	1	8	5	31	24	16		7	7	4
30	652	156	3	1	15	3	4					2		5	2	25	6	7		8	4	6
31	596	178	3	7	20	6	2				1			12		6	4	8		5		6
32	231	86	6	3	22	1					1	1		8	3	3	5	5		5		5
33	207	79	6	7	18	6	5				2			3	2	2	4	1		4		3
34	92	35		3	9	3	1				2	1		4	1	3	1	2		1		
35	85	32	4	2	6									4		1	7	4		4		
36	37	12	5	1	3	1								2		2				5	2	
37	47	6	6		3	2								3							1	
38	12		6	2	3	1	1									1				2	1	
39	8	2	4	1	3															1		
40			1																	1		
41					1																	
42			2																			
43				1																		
Totals	12,329	7,457	327	1,257	349	351	125	67	295	451	181	332	266	672	464	1,262	1,039	1,216	460	1,176	943	464

Table 7: Annual size distributions of Louisiana recreational black drum *Pogonias cromis* harvest taken from MRFSS/MRIP (NOAA; 1985-2013).

Recreational, 1985-2013																												
FL_in	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
4	0.00		0.01	0.00																									
5			0.01																				0.00						
6	0.01													0.01		0.00													
7	0.01	0.08	0.00			0.02		0.01		0.01		0.02				0.01													
8	0.15	0.12	0.07	0.02	0.03	0.03		0.04	0.01			0.01	0.02		0.00	0.00							0.00						
9	0.14	0.04	0.11	0.03	0.14	0.07		0.03	0.03		0.00	0.02	0.05		0.03		0.01			0.00			0.00	0.01					
10	0.13	0.09	0.14	0.09	0.03	0.06	0.01	0.01	0.06	0.03	0.01	0.02	0.04	0.01	0.00	0.01	0.01	0.00		0.00			0.00	0.00		0.00			
11	0.05	0.09	0.04	0.13	0.08	0.04	0.06	0.03	0.03	0.02	0.03	0.08	0.01	0.00	0.01	0.00	0.01	0.01		0.00		0.01	0.01	0.02				0.02	0.00
12	0.18	0.10	0.07	0.09	0.09	0.01	0.06	0.03	0.04	0.01	0.03	0.06	0.00	0.01	0.01		0.01	0.01	0.01	0.00		0.00	0.00	0.00	0.03		0.00	0.01	0.01
13	0.04	0.10	0.05	0.07	0.06	0.01	0.16	0.06	0.07	0.03	0.01	0.05	0.03	0.04	0.04	0.01	0.03	0.01	0.01			0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.01
14	0.07	0.08	0.08	0.07	0.06	0.04	0.08	0.13	0.05	0.08	0.03	0.04	0.06	0.03	0.02	0.01	0.04	0.04	0.01	0.00	0.02	0.01	0.01	0.02	0.01	0.03	0.02	0.01	0.03
15	0.03	0.05	0.08	0.12	0.07	0.05	0.14	0.12	0.14	0.13	0.12	0.07	0.12	0.07	0.08	0.05	0.06	0.16	0.08	0.09	0.10	0.06	0.05	0.09	0.06	0.17	0.10	0.05	0.12
16	0.04	0.04	0.06	0.05	0.05	0.09	0.10	0.14	0.10	0.15	0.17	0.12	0.13	0.18	0.21	0.12	0.18	0.19	0.13	0.19	0.15	0.17	0.13	0.20	0.25	0.20	0.18	0.19	0.24
17	0.01	0.03	0.02	0.05	0.04	0.06	0.03	0.08	0.09	0.11	0.25	0.15	0.14	0.15	0.18	0.17	0.11	0.16	0.13	0.22	0.19	0.12	0.15	0.17	0.18	0.16	0.14	0.18	0.25
18	0.02	0.01	0.01	0.03	0.07	0.13	0.03	0.06	0.11	0.14	0.11	0.11	0.11	0.12	0.14	0.15	0.12	0.11	0.10	0.13	0.11	0.08	0.14	0.14	0.20	0.14	0.20	0.11	0.14
19	0.00	0.03	0.01	0.04	0.01	0.14	0.04	0.03	0.09	0.08	0.13	0.05	0.09	0.10	0.12	0.13	0.13	0.06	0.09	0.14	0.14	0.12	0.09	0.09	0.07	0.05	0.10	0.05	0.06
20	0.04	0.00	0.07	0.02	0.05	0.06	0.07	0.03	0.07	0.09	0.03	0.09	0.07	0.09	0.08	0.12	0.10	0.07	0.09	0.04	0.06	0.05	0.08	0.06	0.04	0.09	0.06	0.09	0.04
21	0.00	0.01		0.03		0.06	0.03	0.02	0.04	0.01	0.01	0.06	0.05	0.06	0.02	0.09	0.06	0.06	0.07	0.06	0.05	0.06	0.05	0.05	0.02	0.03	0.06	0.08	0.02
22	0.02	0.01	0.03	0.01	0.04		0.03	0.02	0.04	0.04	0.02	0.01	0.04	0.04	0.03	0.05	0.06	0.04	0.05	0.02	0.04	0.07	0.05	0.02	0.03	0.01	0.02	0.06	0.02
23	0.01	0.02	0.02	0.02	0.02	0.04	0.01	0.02	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.03	0.02	0.01	0.05	0.03	0.03	0.03	0.03	0.01	0.01	0.03	0.02	0.03	
24	0.01	0.00	0.01	0.02	0.00	0.04	0.00	0.02	0.01	0.04	0.01			0.00	0.00	0.01	0.02	0.02	0.03	0.01	0.02	0.05	0.01	0.01	0.01	0.01	0.03	0.04	0.02
25	0.01	0.01	0.01	0.02	0.01		0.04		0.00					0.01	0.00		0.00	0.00	0.03	0.01	0.01	0.03	0.03	0.01	0.00	0.01	0.01	0.00	0.00
26		0.00		0.00	0.04	0.02	0.02	0.00	0.01	0.01			0.00		0.00	0.01	0.00	0.01	0.03	0.00	0.01	0.01	0.03	0.02	0.02	0.01	0.02	0.01	
27	0.01	0.00			0.00		0.02	0.01	0.01			0.00		0.00		0.00	0.00	0.00	0.01	0.01	0.01	0.06	0.02	0.01	0.01	0.01	0.00	0.00	0.02
28	0.00	0.01		0.00	0.00			0.00							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.01	0.01	0.00	0.00	0.01	0.01
29	0.00	0.00			0.01		0.02	0.01		0.00				0.01	0.00		0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.00	0.01	0.00
30	0.01	0.00	0.00	0.01				0.00	0.01				0.00			0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.02	0.01	0.00	0.02	0.01	0.02	
31	0.00	0.02	0.02	0.00	0.01			0.01	0.00		0.00	0.01	0.00	0.00			0.00	0.00	0.00	0.00		0.00	0.01		0.01	0.00	0.01	0.01	0.01
32	0.01	0.01				0.01	0.02	0.01	0.00	0.00		0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.02	0.00			0.01	
33		0.01	0.00		0.04	0.00	0.02	0.00	0.01	0.00	0.00		0.00	0.01		0.00	0.00	0.00	0.01	0.00	0.01		0.00	0.00	0.00	0.01	0.00		
34	0.00	0.00	0.01	0.00				0.00					0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01		0.00	0.00	0.01		0.00	0.01	0.01	0.00
35		0.00		0.05		0.01	0.02	0.01		0.00	0.00		0.01	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00		0.00			0.00
36		0.01	0.03	0.00				0.00	0.01		0.00	0.00		0.01	0.00		0.00	0.00	0.01		0.00	0.00	0.01	0.00		0.00		0.00	0.00
37	0.01		0.02		0.03			0.00	0.00			0.00	0.00	0.01				0.00	0.00	0.00	0.01	0.00	0.01		0.00	0.00			
38		0.00	0.02	0.01		0.00		0.00	0.00			0.00		0.00				0.00		0.00	0.00	0.00	0.00				0.00		0.00
39	0.01			0.01	0.02			0.01		0.02	0.01			0.00				0.00			0.01			0.00					0.00
40								0.00						0.00			0.00	0.00		0.00	0.00							0.00	
41								0.00																					
42																				0.00	0.01				0.01				
43								0.01												0.00				0.00	0.00				
44																			0.01										
45								0.00										0.00											

Table 8: FAO proposed guideline for indices of productivity for exploited fish species.

Parameter	***Productivity***			***Species***	
	Low	*Medium*	*High*	*Black drum*	***Score***
M	*<0.2*	*0.2 - 0.5*	*>0.5*	***0.1***	*1*
K	*<0.15*	*0.15 - 0.33*	*>0.33*	***0.05***	*1*
tmat	*>8*	*3.3 - 8*	*<3.3*	***5***	*2*
tmax	*>25*	*14 - 25*	*<14*	***50***	*1*
Examples	*orange roughy, many sharks*	*cod, hake*	*sardine, anchovy*	***Black Drum Productivity Score = 1.25 (low)***	

Table 9: Annual sample sizes, observed percent positive samples, nominal CPUE, index of abundance, and corresponding coefficients of variation derived from the LDWF fishery-independent marine trammel net survey. Nominal CPUE and the index of abundance have been normalized to their individual long-term means for comparison.

Year	*n*	*% Positive*	*Nominal CPUE*	*Index*	*CV*
1985	*85*	*16*	*0.25*	*0.41*	*0.47*
1986	*95*	*23*	*0.27*	*0.46*	*0.40*
1987	*186*	*20*	*1.71*	*0.73*	*0.29*
1988	*171*	*13*	*0.46*	*0.25*	*0.37*
1989	*207*	*17*	*0.16*	*0.25*	*0.29*
1990	*196*	*21*	*0.53*	*0.60*	*0.26*
1991	*218*	*22*	*2.64*	*0.75*	*0.26*
1992	*229*	*22*	*2.18*	*0.64*	*0.24*
1993	*236*	*17*	*0.73*	*0.41*	*0.28*
1994	*220*	*20*	*0.86*	*0.62*	*0.27*
1995	*220*	*26*	*1.78*	*0.98*	*0.23*
1996	*222*	*30*	*2.17*	*1.29*	*0.22*
1997	*225*	*25*	*1.14*	*0.87*	*0.24*
1998	*228*	*34*	*1.50*	*1.48*	*0.22*
1999	*221*	*29*	*2.97*	*1.74*	*0.23*
2000	*215*	*33*	*1.48*	*2.01*	*0.22*
2001	*225*	*36*	*1.15*	*1.20*	*0.21*
2002	*223*	*29*	*0.59*	*0.95*	*0.23*
2003	*228*	*27*	*1.46*	*0.87*	*0.23*
2004	*228*	*32*	*0.55*	*0.87*	*0.22*
2005	*221*	*38*	*0.51*	*1.52*	*0.21*
2006	*223*	*39*	*0.66*	*1.24*	*0.21*
2007	*232*	*31*	*0.29*	*0.92*	*0.22*
2008	*225*	*39*	*0.81*	*1.73*	*0.20*
2009	*228*	*36*	*0.48*	*1.10*	*0.22*
2010	*225*	*28*	*0.46*	*1.04*	*0.23*
2011	*229*	*34*	*0.48*	*1.45*	*0.21*
2012	*223*	*41*	*0.37*	*1.64*	*0.20*
2013	*263*	*34*	*0.38*	*0.97*	*0.20*

Table 10: Probabilities of age given length used in age assignments of 1985-2001 Louisiana black drum *Pogonias cromis* fishery landings.

FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+
10	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.85	0.14	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.47	0.47	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00
17	0.10	0.76	0.10	0.02	0.01	0.00	0.00	0.00	0.00	0.00
18	0.01	0.74	0.16	0.04	0.02	0.01	0.01	0.00	0.00	0.01
19	0.00	0.59	0.24	0.08	0.03	0.02	0.01	0.01	0.01	0.01
20	0.00	0.39	0.30	0.13	0.06	0.04	0.02	0.02	0.01	0.03
21	0.00	0.20	0.31	0.17	0.10	0.06	0.04	0.03	0.02	0.07
22	0.00	0.08	0.25	0.19	0.12	0.09	0.06	0.05	0.04	0.12
23	0.00	0.02	0.17	0.18	0.14	0.10	0.08	0.06	0.05	0.20
24	0.00	0.00	0.09	0.14	0.13	0.11	0.09	0.08	0.06	0.29
25	0.00	0.00	0.04	0.10	0.11	0.10	0.09	0.08	0.07	0.40
26	0.00	0.00	0.02	0.06	0.08	0.09	0.09	0.08	0.08	0.51
27	0.00	0.00	0.01	0.03	0.05	0.07	0.07	0.07	0.07	0.62
28	0.00	0.00	0.00	0.01	0.03	0.05	0.05	0.06	0.06	0.73
29	0.00	0.00	0.00	0.01	0.02	0.03	0.04	0.04	0.05	0.82
30	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.03	0.03	0.89
31	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.94
32	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.97
33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99
34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99
35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00

Table 11: Annual length-at-age samples used in age assignments of commercial black drum *Pogonias cromis* landings 2002-2013. Probabilities of age given length are calculated separately for those individuals <27 inches ("juvenile") and those ≥ 27 inches ("bull). Shaded areas represent size bins where probabilities of age given length used in commercial age assignments are taken from Table 10.

Commercial - 2002											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
13											
14			2								2
15		5									5
16		16	7								23
17		11	7	2							20
18		3	13	2		1	1				20
19		1	10	1	2						14
20			13	5	3	2					23
21			12	4	2	1	1				20
22			4	4	5	1					14
23			2	5	3	1					11
24			1	1	3	2					7
25			2	1	1	2					6
26					1	1					2
27						2	1				3
28					1		1				2
29											
30											
31										1	1
32										1	1
33										2	2
34										2	2
35											
Total		36	73	25	21	13	4			6	178

Commercial - 2003											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
13											
14			1								1
15		3	5								8
16	4	1	20	2							27
17		2	27	7							36
18		2	19	8	2		1				32
19		1	11	13	3						28
20		1	12	11	3		1				28
21		1	8	18	6	1					34
22		1	3	23	10		4	1			42
23			1	16	5	6	2				30
24				6	4	2	4	1			17
25			1	1	3	2	4				11
26			1	1	2	1	7	2	1		15
27						1	7	1	1		10
28							2		1		3
29		1								1	2
30		1								1	2
31											
32										1	1
33											
34										1	1
35											
Total	4	14	109	106	38	13	32	5	3	4	328

Commercial - 2004											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
13											
14		1									1
15		1	1								2
16		6		8							14
17		5	7	16	3	1					32
18		5	6	18	5						34
19		2	4	22	3		1	1			33
20			5	21	3	1					30
21		1	1	14	5		1	1			23
22			3	7	5	1					16
23				3	12	2	2				19
24			1	3	11	3	4	2			24
25					3	5	3	6	1		18
26					3	2	3	4	1	1	14
27								1	1		2
28										1	1
29										1	1
30											
31											
32											
33											
34											
35											
Total		21	28	112	53	15	14	15	3	3	264

Table 11 (continued):

Commercial - 2005											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
13	1										1
14	2	1									3
15		7	4								11
16	6	13	19	2	1						41
17		18	27	3	9	1					58
18	1	18	26	4	18	3	1				71
19		14	13	12	14	3	1				57
20		21	19	3	16	8	1	1	1		70
21		4	7	5	10	3	1				30
22		1	2	7	15	12	1			1	39
23			5	6	14	5	2				32
24			2	4	9	12	3		2		32
25					3	9	6	5	1		24
26					1	4	1	1	4		11
27				1		3	1	2	6	6	19
28						2	1			12	15
29									2	6	8
30							1			4	5
31								1	1	1	3
32										8	8
33										3	3
34										4	4
35										4	4
36										2	2
37										3	3
38											
Total	10	97	124	47	110	65	20	10	17	54	554

Commercial - 2006											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
13											
14		1									1
15	1	9									10
16		14	11	3		1					29
17	4	13	16	4							37
18	1	10	24	8		1					44
19		22	20	24	4	3					73
20		16	25	18	6	4	1		1		71
21		4	13	22	4	9	2	1			55
22		1	3	11		8			2	1	26
23			2	14	2	6	4	1			29
24				8	1	11	1	2		2	25
25				5	1	11	4	2	1		24
26						3	4	1	1	1	10
27								2		3	5
28						1	2		1	5	9
29								1		4	5
30										2	2
31											
32										3	3
33										2	2
34										1	1
35											
36											
37											
38											
Total	6	90	114	117	18	58	18	10	6	24	461

Commercial - 2007											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
13											
14			2								2
15	2	9	3	1							15
16		25	7	3	1	1					37
17	1	35	7	4	2		1				50
18		58	8	5	4		2	1			78
19		50	16	15	1	1	1				84
20		29	25	11	5		1	1			72
21		3	28	13	4	2	1				51
22		6	22	11	6	1	3		1		50
23			11	9	17	4	8		1		50
24			3	17	7		7	2	1	1	38
25					20	2	20	8	1	2	53
26				3	7	5	16	16	5	6	58
27					1	1	11	16	6	18	53
28					1		2	3	1	16	23
29									2	1	3
30										12	12
31										1	1
32										3	3
33										1	1
34										2	2
35										1	1
36										1	1
37											
38										1	1
Total	3	215	132	92	76	17	73	47	18	66	739

Table 11 (continued):

Commercial - 2008											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
13											
14			1								1
15		19		1							20
16		16	6	6	1	1					30
17		13	24	5							42
18		10	37	4	3						54
19		7	67	9							83
20		3	77	6		3	1				90
21			37	13	1	2					53
22			19	31	7	3		1			61
23			5	19	5	3	3	2			37
24			1	9	15	15		6	3		49
25			1	5	13	12	5	12	8	1	57
26				2	2	6	2	16	9	6	43
27					2	1	7	11	16	16	53
28						1	1	3	7	2	14
29								1	4	15	20
30										5	5
31										3	3
32										3	3
33										3	3
34										1	1
35										7	7
36											
37											
38											
Total		68	275	110	49	47	19	52	47	62	729

Commercial - 2009											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
13		1	1								2
14		2	3								5
15		4	15								19
16		15	43								58
17		7	99	4	1						111
18		2	90	7			1				100
19		1	70	19	1						91
20			29	24			1				54
21			13	25	1						39
22			3	13	4						20
23			2	9	2	1					14
24				4	6	3				1	14
25				1	2	4	6	1	3	2	19
26					2	1	4	1	5	5	18
27					2		4	1	3	18	28
28							1		2	12	15
29										11	11
30										4	4
31										2	2
32										2	2
33										1	1
34											
35										2	2
36											
37											
38											
Total		32	368	106	21	9	17	3	13	60	629

Commercial - 2010											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
13											
14											
15		1	1	1							3
16	1	1	9	4							15
17			13	8	1						22
18		1	8	23	2						34
19			4	27	3						34
20			1	29	2						32
21			2	21	4					1	28
22			2	15	12						29
23			1	14	7	5	1				28
24				1	1	2	1	1			6
25				2	6	3	4	3	1	1	20
26					1	4	1	6		2	14
27							1			3	4
28										2	2
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
Total	1	3	41	145	39	14	8	10	1	9	271

Table 11 (continued):

Commercial - 2011											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
13											
14											
15		4	5	2							11
16		7	10	3	2						22
17		2	28	3	5						38
18		17	45	9	15						86
19		3	66	13	28						110
20		1	53	14	28	1					97
21			23	20	28	2					73
22		1	11	17	34	2					65
23		1	7	28	48	3					87
24			1	24	49	6	3				83
25			2	11	26	6	5	1	3	2	56
26				3	25	7	8	5		1	49
27				2	5	3	1	1	6	5	23
28					1			1		9	11
29							1	1		4	6
30								1		7	8
31										4	4
32										4	4
33										4	4
34											
35										4	4
36										4	4
37											
38										2	2
39										1	1
40										1	1
Total		36	251	149	294	30	18	10	9	52	849

Commercial - 2012											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
13			1								1
14				1		1					2
15	1	5		4	1						11
16		15	6	4							25
17		18	13	8	1	1					41
18		16	26	19	2	1					64
19		1	18	40	5	4					68
20		1	15	41	4	4	1				66
21		1	13	58	9	8					89
22			8	41	17	19	1				86
23				32	20	19	1				72
24				14	12	25	6	1			58
25				2	7	25	5	5		3	47
26					1	10	6	4	4	5	30
27				1		4	5	3	1	8	22
28						2	1			4	7
29										3	3
30										3	3
31											
32											
33											
34											
35											
36										2	2
37										1	1
38										1	1
39											
40											
Total	1	57	100	265	79	123	26	13	5	30	699

Commercial - 2013											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
13	1										1
14		2									2
15	1	6									7
16	1	11	1	1							14
17		24	2		2						28
18		16	12	1							29
19		31	4	1							36
20		16	1		1						18
21		13	7	5	16	2	3				46
22		3	8	3	26	8	7	1			56
23		2	5	4	29	6	11				57
24			5	2	8	1	3	1			20
25			1	1	9	2	10	3			26
26					4	.	1	3			8
27				1		2	3	1	1	1	9
28						3	1	3	1	3	11
29							1	1		2	4
30									1	6	7
31										6	6
32										5	5
33										3	3
34											
Total	3	124	46	19	95	24	40	13	3	26	393

Table 12: Annual length-at-age samples for age assignments of recreational black drum *Pogonias cromis* landings 2002-2013. Shaded areas represent size bins where probabilities of age given length used in recreational age assignments are taken from Table 10.

Recreational - 2002											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
13											
14											
15	1	2	1	1							5
16	1	8	10	4							23
17		7	10	1	2						20
18		7	3	1		5					16
19			3	1	2	3					9
20		1	1	6		1					9
21				1	1	1					3
22		1	1	1		1					4
23			1		1						2
24			1		1	2					4
25				1							1
26											
27											
28											
29											
30											
31											
32											
33											
34											
35											
Total	2	26	31	17	7	13					96

Recreational - 2003											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
10				1							1
11											
12	1										1
13	1										1
14	1		3								4
15	3	1	7								11
16	1	5	10	3	2						21
17	1	1	9	5	1						17
18			9	4	1		3				17
19		3	10	6	4		1				24
20			8	4	2						14
21		1	3	4			2				10
22			1	4			1				6
23			1	1							2
24			1	1			1				3
25				1		1					2
26											
27							1				1
28				1							1
29											
30											
31											
32										1	1
33										1	1
34											
35										2	2
Total	8	11	62	35	10	1	9			4	140

Recreational - 2004											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
13		1									1
14	2	1									3
15	4	12	1	1							18
16	4	11		5							20
17	2	5	8	12	5						32
18		5	3	11	2						21
19		3	2	8	5						18
20			3	5	3			1			12
21		2		3	3	1					9
22			1		1	1					3
23					2	1					3
24					1	1					2
25					1	1		2			4
26				1				2			3
27						1					1
28											
29											
30											
31											
32											
33											
34										1	1
35											
Total	12	40	18	46	23	6		5		2	152

Table 12 (continued):

Recreational - 2005											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
12											
13											
14	1		1								2
15	1	7	3		1						12
16	1	8	12	2	2						25
17		9	10	1	1						21
18		6	14		3		1				24
19		2	11	2	4						19
20		1	1	2	5				1		10
21			2	4	4						10
22			2	1	1						4
23				1	1	1					3
24						2					2
25					1	1					2
26					1	2					3
27						1					1
28								1			1
29											
30											
31						1				1	2
32											
33											
34										1	1
35										1	1
36										2	2
37											
Total	3	33	56	13	24	8	1	1	1	5	145

Recreational - 2006											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
12											
13	2										2
14	1										1
15	3	1	2								6
16	3	4	5	1							13
17	4	4	6								14
18		3	5	5							13
19	1	6	5	3							15
20		4	6	8		1					19
21		1	2	4	1						8
22		1	2			3					6
23				1				1			2
24				1		1					2
25			1	1		3	1				6
26											
27								1		2	3
28											
29											
30											
31										1	1
32										1	1
33											
34										1	1
35											
36											
37											
Total	14	24	34	24	1	8	1	2		5	113

Recreational - 2007											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
12	1	1									2
13	1										1
14	2		1								3
15	7	24	1	1							33
16	5	41	15								61
17		29	5	5	2	1					42
18	2	26	17	8	5	1					59
19	1	7	8	6	2						24
20		6	8	9	2		2				27
21		1	3	5	3		1				13
22			7	4	2		1				14
23			3	3	2			1			9
24							3				3
25					1				1		2
26								1		1	2
27										2	2
28									1	2	3
29										4	4
30											
31											
32										2	2
33										1	1
34										2	2
35										1	1
36										1	1
37										1	1
Total	19	135	68	41	19	2	7	2	2	17	312

Table 12 (continued):

Recreational - 2008											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
10	2										2
11	2										2
12											
13											
14	2	2									4
15		54	7								61
16	1	73	12	1							87
17		57	28	2							87
18	1	26	25	3	2	2					59
19		13	20	7							40
20		7	16	5	2	2					32
21		2	9	4	1	2					18
22		2	4		2						8
23			1	1	2		1				5
24				2	1	2			1		6
25						2		2			4
26					1	1	1	1	1		5
27									3	2	5
28								4	2		6
29										1	1
30									1	5	6
31										1	1
32											
33										3	3
34										4	4
35										4	4
36										2	2
37										2	2
38										1	1
39											
40											
41											
42										1	1
43											
Total	8	236	122	25	11	11	2	7	8	26	456

Recreational - 2009											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
10											
11			1								1
12											
13	2				1						3
14	2		1								3
15	5	16	25								46
16	13	24	60	1		1					99
17	2	11	71	2							86
18		8	76	7							91
19		5	43	5							53
20		1	35	10							46
21		1	16	11	1						29
22			3	8	4						15
23			3	7			1				11
24			3	6	1		1				11
25					2	1			1		4
26			1		1				1	1	4
27									1	2	3
28										3	3
29										4	4
30										5	5
31										1	1
32										1	1
33										7	7
34										1	1
35										2	2
36										2	2
37										2	2
38										1	1
39											
40											
41											
42											
43										1	1
Total	24	66	338	57	10	2	2		3	33	535

Table 12 (continued):

Recreational - 2010											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
11											
12		1									1
13		3									3
14		2	1	1							4
15		35	3	4							42
16	1	34	15	12							62
17		17	12	21				1			51
18		11	11	25	1			1			49
19		4	10	33							47
20		3	4	19	2						28
21			2	12	1						15
22		1		11	1						13
23				6	1						7
24				1	3		1	1			6
25						1	1	1			3
26					1					2	3
27					1			1			2
28										2	2
29										7	7
30										6	6
31										0	
32										1	1
33										2	2
34										2	2
35											
36										1	1
37										1	1
Total	1	111	58	145	11	1	2	5	0	24	358

Recreational - 2011											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
11	1										1
12	1	1									2
13	4	1									5
14	1	1									2
15	4	18	15								37
16	5	29	26	1	1						62
17	4	40	54	2							100
18		19	28	3	1						51
19		9	21	4	1						35
20		1	16	3	4						24
21			8	1	6						15
22		1	5	2	6						14
23			3	1	1						5
24					4	3					7
25					1	1	2	1	1	1	7
26					4		1	1	1	1	8
27					1			1		2	4
28							1			4	5
29							1			3	4
30											
31										3	3
32											
33										3	3
34										1	1
35											
36											
37											
Total	20	120	176	17	30	4	5	3	2	18	395

Table 12 (continued):

Recreational - 2012											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
11		1									1
12											
13		2									2
14		4									4
15	2	29	8								39
16	1	37	22	2							62
17		32	23	8							63
18		22	21	19							62
19		6	10	15							31
20		1	11	10	1						23
21			5	10	2						17
22			1	16	1	1					19
23				3	1	3					7
24				1		2	1				4
25						2	1		1		4
26					1		3		1	2	7
27						1	2		1	3	7
28										2	3
29									1	5	6
30										1	1
31										4	4
32											
33										3	3
34											
35											
36										1	1
37											
38											
39										1	1
40										1	1
Total	3	134	101	84	6	9	7		4	24	372

Recreational - 2013											
FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Total
11											
12											
13	1	1	1								3
14	2	4									6
15	1	9	3								13
16	5	34	4	1							44
17	2	23	6	4							35
18		17	10	6	1						34
19		8	5	2	1						16
20		3	8	8	2						21
21		3	5	9	6						23
22				2	1						3
23		1	3	1	2	2					9
24			1	1	1	1	2			1	7
25					2	2	2	3		4	13
26							6	2		3	11
27						1	2	3		6	12
28							1	1		7	9
29										6	6
30		1								7	8
31										4	4
32										7	7
33										1	1
34											
35										1	1
36											
37										1	1
38											
39											
40											
Total	11	104	46	34	16	6	13	9		48	287

Table 13: Annual commercial black drum catch-at-age and yield (pounds).

Commercial Catch-at-age											
Year	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Yield (lbs)
1985	20,653	52,894	21,624	15,702	14,601	14,128	13,712	13,273	12,799	148,496	3,417,824
1986	31,545	80,789	33,027	23,983	22,302	21,579	20,943	20,273	19,548	226,809	5,220,309
1987	48,419	124,004	50,694	36,812	34,231	33,122	32,146	31,118	30,005	348,131	8,012,694
1988	52,862	135,383	55,346	40,190	37,372	36,162	35,095	33,973	32,758	380,077	8,747,953
1989	276,435	263,538	72,057	32,036	19,865	14,849	12,284	10,742	9,701	120,934	4,401,945
1990	180,423	172,006	47,030	20,910	12,966	9,692	8,017	7,011	6,332	78,931	2,873,057
1991	120,094	114,491	31,304	13,918	8,630	6,451	5,336	4,667	4,215	52,539	1,912,380
1992	189,113	180,291	49,295	21,917	13,590	10,159	8,403	7,349	6,637	82,733	3,011,441
1993	199,407	190,104	51,979	23,110	14,330	10,712	8,861	7,749	6,998	87,236	3,175,355
1994	74,378	200,571	66,106	28,427	15,930	10,572	7,761	6,054	4,913	87,188	3,708,755
1995	129,822	337,089	97,809	39,108	20,842	13,279	9,388	7,047	5,482	35,592	2,995,848
1996	8,640	28,944	12,586	7,632	5,814	4,929	4,406	4,053	3,790	62,697	1,613,279
1997	29,588	84,326	36,570	19,558	12,897	9,613	7,671	6,359	5,386	42,680	1,641,234
1998	9,591	102,036	36,695	17,062	10,847	8,108	6,588	5,602	4,892	50,863	1,779,538
1999	88,031	400,528	86,749	27,126	12,151	6,809	4,339	2,970	2,114	5,942	2,199,659
2000	33,388	297,423	120,295	51,921	28,874	18,927	13,619	10,311	8,021	30,552	2,843,677
2001	110,130	427,110	138,620	53,661	27,036	16,305	10,941	7,795	5,738	17,801	3,195,361
2002	6,669	126,617	241,803	86,923	58,887	27,123	12,673	4,984	4,425	33,607	3,157,145
2003	10,171	24,197	218,093	213,907	76,560	24,477	48,741	8,492	2,539	3,035	3,504,430
2004	6,374	46,524	65,469	271,033	127,892	36,712	34,351	34,411	5,745	12,836	3,725,842
2005	8,964	87,633	112,700	42,516	99,945	53,667	14,916	6,010	7,828	9,801	2,398,000
2006	5,553	71,753	91,505	93,511	14,487	45,929	13,303	5,914	4,336	7,725	1,932,412
2007	4,316	134,100	83,521	57,327	43,287	9,330	34,721	16,331	5,503	9,933	2,358,379
2008	879	51,751	194,787	72,482	26,727	24,707	6,977	20,474	12,470	10,461	2,453,351
2009	2,407	40,360	434,633	119,443	21,596	9,763	15,799	2,792	11,622	20,699	3,142,291
2010	6,877	4,039	68,608	248,367	69,464	23,363	12,929	19,518	3,638	17,636	2,782,714
2011	522	27,395	187,438	111,205	218,605	21,555	13,157	5,289	3,205	6,831	3,733,042
2012	3,335	67,294	111,294	284,250	80,464	114,489	19,341	9,518	4,071	8,242	4,120,563
2013	9,679	246,026	85,646	32,132	157,398	34,722	58,000	9,836	1,440	12,187	3,796,170

Table 14: Annual mean weights at age (pounds) of commercial black drum landings.

Commercial Mean Weight-at-age										
Year	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+
1985	2.20	3.66	5.46	7.81	9.35	10.28	10.92	11.41	11.82	14.87
1986	2.20	3.66	5.46	7.81	9.35	10.28	10.92	11.41	11.82	14.87
1987	2.20	3.66	5.46	7.81	9.35	10.28	10.92	11.41	11.82	14.87
1988	2.20	3.66	5.46	7.81	9.35	10.28	10.92	11.41	11.82	14.87
1989	1.82	3.38	4.60	5.77	6.85	7.89	8.86	9.74	10.57	15.94
1990	1.82	3.38	4.60	5.77	6.85	7.89	8.86	9.74	10.57	15.94
1991	1.82	3.38	4.60	5.77	6.85	7.89	8.86	9.74	10.57	15.94
1992	1.82	3.38	4.60	5.77	6.85	7.89	8.86	9.74	10.57	15.94
1993	1.82	3.38	4.60	5.77	6.85	7.89	8.86	9.74	10.57	15.94
1994	2.43	3.59	4.68	5.43	5.98	6.46	6.94	7.48	8.11	23.77
1995	2.45	3.49	4.50	5.18	5.64	6.00	6.32	6.65	7.01	14.60
1996	2.37	3.74	5.31	6.86	8.09	9.06	9.87	10.60	11.29	18.35
1997	2.33	3.79	5.15	6.24	7.04	7.63	8.12	8.55	8.96	14.42
1998	2.80	3.81	4.74	5.92	6.95	7.77	8.47	9.11	9.73	15.71
1999	2.75	3.35	3.94	4.29	4.48	4.60	4.68	4.74	4.79	4.92
2000	2.60	3.94	4.74	5.41	5.91	6.27	6.54	6.75	6.93	7.48
2001	2.48	3.66	4.51	4.96	5.21	5.36	5.46	5.55	5.62	5.82
2002	1.74	2.81	4.56	5.89	6.42	6.48	6.88	9.74	9.89	13.20
2003	2.42	3.67	3.85	5.79	6.79	8.26	8.86	9.44	11.29	16.84
2004	1.99	3.32	4.43	4.55	6.86	8.45	8.74	9.28	10.72	12.89
2005	2.39	3.76	3.97	5.45	5.56	7.24	7.93	9.58	9.92	17.40
2006	2.84	3.75	4.24	5.67	5.81	7.43	8.72	8.90	8.18	12.94
2007	2.01	3.84	5.25	5.88	7.66	7.84	8.85	9.98	9.99	13.02
2008	1.74	2.99	4.62	6.04	7.79	8.28	9.02	9.94	10.64	14.22
2009	1.40	2.64	3.58	5.42	7.84	9.33	9.49	10.56	10.70	12.72
2010	2.23	3.05	3.87	5.10	6.85	9.33	9.48	10.34	9.41	9.62
2011	1.74	3.47	4.44	6.56	7.10	8.93	10.13	10.79	10.25	15.85
2012	1.78	3.10	4.30	5.53	6.85	7.84	9.19	10.08	10.88	10.76
2013	1.92	4.04	5.46	6.46	7.10	7.44	7.92	9.35	11.76	13.47

Table 15: Annual recreational black drum catch-at-age and yield (pounds).

Recreational Catch-at-age											
Year	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Yield (lbs)
1985	212,214	17,111	7,110	3,789	2,422	1,764	1,393	1,156	989	12,811	621,337
1986	573,503	74,404	20,873	10,176	6,644	5,083	4,251	3,744	3,405	59,200	2,315,747
1987	273,530	42,389	17,265	9,123	5,684	3,998	3,045	2,440	2,024	46,649	1,836,973
1988	284,279	66,137	20,876	10,445	6,710	4,904	3,853	3,157	2,654	45,185	1,900,529
1989	115,108	28,370	9,859	5,200	3,509	2,687	2,199	1,868	1,622	25,465	951,043
1990	47,721	40,705	14,751	6,582	3,837	2,618	1,947	1,520	1,218	8,292	510,823
1991	58,990	19,479	7,229	3,786	2,520	1,921	1,571	1,336	1,162	12,609	498,634
1992	107,612	47,278	12,415	5,791	3,579	2,578	2,030	1,686	1,448	22,930	1,016,249
1993	107,033	71,886	22,581	9,295	5,058	3,294	2,381	1,828	1,453	11,991	861,765
1994	49,764	51,661	14,720	6,054	3,366	2,220	1,608	1,225	959	7,651	593,351
1995	76,236	106,543	23,757	8,109	3,991	2,423	1,651	1,198	901	5,670	794,771
1996	127,514	102,842	30,495	11,857	6,052	3,716	2,554	1,878	1,441	10,000	985,694
1997	138,510	128,137	38,104	15,129	7,815	4,807	3,290	2,400	1,824	17,093	1,336,506
1998	102,482	166,447	50,151	19,892	10,363	6,467	4,497	3,333	2,569	29,210	1,882,932
1999	104,014	158,219	41,764	15,698	8,080	5,037	3,504	2,594	1,989	10,180	1,246,489
2000	106,346	311,047	109,896	46,718	25,257	16,093	11,317	8,425	6,484	33,366	2,934,209
2001	112,124	177,882	60,894	26,451	14,682	9,577	6,882	5,233	4,117	28,491	1,977,460
2002	109,748	141,315	130,318	43,653	20,125	25,787	5,960	4,641	3,716	25,993	2,081,893
2003	34,867	34,653	179,666	90,043	37,009	8,961	25,292	6,596	5,767	62,250	3,006,032
2004	41,227	136,355	67,838	153,238	56,090	5,459	4,285	5,356	2,912	32,274	2,398,062
2005	9,832	74,359	112,351	25,710	41,487	3,679	4,537	2,650	4,098	30,073	1,746,551
2006	59,796	71,979	95,212	49,593	12,371	11,245	8,681	7,506	6,546	45,401	2,018,327
2007	24,996	131,189	72,484	50,160	24,200	7,214	9,640	4,443	4,192	56,922	2,401,730
2008	33,281	251,918	141,075	33,003	11,429	12,411	4,312	3,927	3,606	48,392	2,675,993
2009	50,226	67,601	316,310	40,082	6,941	3,084	2,904	1,995	2,005	27,842	2,272,807
2010	12,017	139,989	64,908	130,171	7,863	2,935	2,713	4,862	2,355	30,648	1,816,268
2011	26,706	136,359	208,067	24,734	28,914	4,042	3,647	3,295	2,985	28,765	2,106,622
2012	20,521	124,367	116,750	99,530	11,411	5,360	3,630	3,278	2,993	36,318	2,151,855
2013	42,477	245,042	80,788	43,996	10,466	2,817	3,351	4,007	1,212	20,272	1,803,276

Table 16: Annual mean weights at age (pounds) of recreational black drum landings.

Recreational Mean Weight-at-age										
Year	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+
1985	0.91	3.53	5.21	6.12	6.82	7.44	8.05	8.66	9.30	19.60
1986	1.04	3.28	4.78	6.08	7.12	8.08	9.00	9.89	10.75	18.89
1987	1.08	3.48	5.20	6.05	6.57	7.01	7.46	7.99	8.61	24.36
1988	1.28	3.39	4.90	6.09	6.87	7.42	7.89	8.35	8.84	22.03
1989	1.12	3.50	5.02	6.30	7.24	7.94	8.52	9.04	9.57	21.57
1990	1.20	3.75	4.74	5.61	6.25	6.70	7.06	7.37	7.67	14.35
1991	1.62	3.46	5.07	6.23	7.18	7.92	8.52	9.07	9.59	16.33
1992	1.59	3.22	4.70	5.86	6.67	7.36	8.02	8.71	9.42	22.77
1993	1.55	3.55	4.59	5.27	5.80	6.26	6.69	7.11	7.55	16.67
1994	1.90	3.46	4.51	5.35	5.94	6.34	6.64	6.88	7.09	21.53
1995	1.99	3.33	4.07	4.71	5.16	5.48	5.73	5.94	6.16	17.40
1996	1.49	3.50	4.49	5.00	5.32	5.61	5.92	6.29	6.75	15.07
1997	1.63	3.49	4.53	5.08	5.37	5.59	5.81	6.11	6.52	17.61
1998	2.08	3.51	4.52	5.09	5.46	5.77	6.08	6.42	6.84	20.65
1999	1.93	3.43	4.34	4.98	5.43	5.77	6.07	6.36	6.65	11.73
2000	2.21	3.68	4.71	5.31	5.68	5.96	6.21	6.46	6.73	11.45
2001	1.98	3.61	4.73	5.42	5.87	6.23	6.56	6.90	7.29	15.03
2002	1.93	3.49	3.61	4.21	4.99	4.60	7.03	7.34	7.67	15.47
2003	1.91	3.49	3.78	4.60	5.08	8.62	5.90	9.30	9.65	19.48
2004	2.39	2.98	4.12	3.72	4.28	7.48	7.85	7.09	8.64	21.00
2005	2.00	2.98	3.58	5.06	4.61	8.45	7.15	9.13	7.50	22.45
2006	2.43	3.63	4.01	5.06	8.08	8.24	8.95	9.27	9.55	12.74
2007	1.87	3.16	4.38	5.04	5.73	7.97	8.06	10.97	11.34	17.66
2008	1.31	2.99	3.97	5.14	6.57	6.58	9.83	10.31	10.80	18.14
2009	1.87	2.85	3.41	5.55	7.77	8.04	10.81	12.44	12.62	19.20
2010	1.79	2.67	3.44	3.98	6.60	9.70	10.20	7.16	11.16	16.70
2011	2.07	3.06	3.71	5.13	5.90	9.44	9.77	10.09	10.43	14.86
2012	1.37	2.93	3.80	5.11	6.95	8.58	9.67	10.17	10.70	16.04
2013	2.14	2.95	3.52	4.14	5.55	9.58	10.52	11.09	9.78	17.28

Table 17: Probabilities of age given length for age assignments of black drum catches from the LDWF fishery-independent marine trammel net survey.

FL_in	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.89	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.95	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.91	0.08	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.79	0.17	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00
18	0.56	0.32	0.07	0.02	0.01	0.01	0.00	0.00	0.00	0.00
19	0.27	0.46	0.14	0.05	0.03	0.02	0.01	0.01	0.00	0.01
20	0.08	0.46	0.21	0.09	0.05	0.03	0.02	0.01	0.01	0.03
21	0.02	0.35	0.24	0.13	0.08	0.05	0.04	0.03	0.02	0.06
22	0.00	0.21	0.23	0.15	0.10	0.07	0.05	0.04	0.03	0.11
23	0.00	0.10	0.19	0.16	0.12	0.09	0.07	0.06	0.05	0.18
24	0.00	0.04	0.13	0.14	0.12	0.10	0.08	0.07	0.06	0.26
25	0.00	0.01	0.08	0.11	0.11	0.10	0.09	0.08	0.07	0.36
26	0.00	0.00	0.04	0.07	0.09	0.09	0.08	0.08	0.07	0.47
27	0.00	0.00	0.02	0.04	0.06	0.07	0.07	0.07	0.07	0.59
28	0.00	0.00	0.01	0.02	0.04	0.05	0.06	0.06	0.06	0.70
29	0.00	0.00	0.00	0.01	0.02	0.03	0.04	0.05	0.05	0.79
30	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.04	0.87
31	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.93
32	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.96
33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.98
34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99
35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00

Table 18: Annual black drum catch-at-size from the LDWF fishery-independent marine trammel net survey.

FL_in	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
4				1						1																			
5			1																		1								
6			1			1											1												
7		2	1			1	4	3	1			2	1	3	1						1	3	1	13	5				2
8	3	5	215	3	10	20	183	257	45	100	107	521	60	304	153	21	17	38	51	8	43	107	10	238	44	19	32	35	31
9	9	5	317	13	24	44	714	715	118	164	586	839	86	636	804	137	24	70	139	42	69	309	23	202	47	8	100	22	34
10	1	3	248	6	6	109	483	213	47	59	133	193	96	146	522	47	60	19	133	102	22	76	27	31	59	8	24	27	10
11	2	1	16	2		56	122	22	27	29	54	20	167	30	127	53	207	5	94	30	18	16	20	15	36	15	10	19	27
12	1	2	12	3	3	20	10	4	32	27	38	8	161	23	58	81	172	13	183	22	20	6	25	37	40	9	4	17	19
13	3	7	5	5	7	13	21	37	39	25	57	15	68	43	90	141	112	31	242	24	22	12	14	36	22	12	2	10	28
14	3	15	7	10	2	5	10	44	19	17	123	82	19	47	102	102	60	33	91	16	31	14	4	31	23	14	5	11	27
15	9	14	2	4	2	4	4	33	13	8	53	17	15	34	101	87	64	27	25	9	64	9	6	26	18	20	15	6	30
16	4	7	1	5	1	3	13	20	11	18	31	11	26	33	103	99	140	41	28	14	55	6	5	21	25	14	6	7	24
17	1	6	1	9	1	1	15	24	6	13	63	27	26	36	106	107	73	26	32	20	28	9	8	20	17	12	9	5	25
18	1	2		9		3	4	6	9	6	35	13	22	26	72	121	43	33	17	21	46	4	8	9	11	18	13	4	18
19			2	15	1		1	4	5	3	17	20	21	25	83	126	58	18	12	15	27	15	2	6	26	22	12	5	12
20				20	1	1		1	2	1	12	36	20	27	48	110	52	24	29	22	5	14	8	11	24	40	40	11	10
21				7	4			1			5	15	10	18	23	68	37	24	23	19	9	21	8	8	21	41	63	20	8
22				9	1			1			4	6	10	17	18	25	30	25	21	14	16	8	14	10	20	52	31	16	5
23			1	5							1	4	8	20	11	18	10	12	7	10	14	11	16	9	12	11	17	26	13
24	1		1	1	1	1						1		10	1	5	3	11	5	10	9	7	15	14	10	10	27	35	14
25	1												2	5	1	3		9	6	26	9	13	6	11	8	6	21	20	10
26													2	1	5	1		4	2	44	9	17	7	8	5	11	9	32	14
27	1	2													1		2	2	2	21	9	12	9	21	2	6	8	16	16
28	2	1			1			1					1	1		1	2	1	3	9	7	5	5	11	3	8	5	10	7
29	1				1								1	3		1	1	2	2	4	3	7	9	15	2	6	4	16	12
30					1									1			1	1		4	4	7	4	12	6	6	7	5	8
31					2											1	2	1	2	10	2	1	3	13	3	2	4	20	9
32								2				1				3	1	2	2	5	4	2	4	12	6	3	3	16	5
33			1		2	1				1			1	1	2	1		1	2	1	2	7	5	13	2	1	3	7	3
34	1							2				1	4	1		1		1	4		3	5		12	2	1	8	8	2
35		1		1			1	2								.	2	.	2			4	3	14	2		1	5	7
36											2					1	2	2			1	1	2	12		2		6	1
37																		1		1		2		5	1				1
38		1										1					1							2	1			2	2
39		1												1			1							1		1	1		
40																		1											1
41																					1								
Totals	44	75	831	129	71	283	1585	1392	374	471	1322	1833	827	1494	2431	1362	1176	479	1157	524	552	729	273	899	504	379	485	439	435

Table 19: Annual black drum survey age composition and sample sizes derived from the LDWF fishery-independent marine trammel net survey.

Year	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	n
1985	0.694	0.047	0.015	0.014	0.015	0.015	0.015	0.014	0.014	0.158	28
1986	0.826	0.055	0.009	0.004	0.004	0.004	0.004	0.004	0.004	0.086	57
1987	0.763	0.074	0.031	0.019	0.014	0.011	0.008	0.007	0.006	0.068	21
1988	0.408	0.261	0.121	0.062	0.037	0.025	0.018	0.014	0.010	0.045	101
1989	0.456	0.108	0.062	0.036	0.025	0.020	0.017	0.015	0.015	0.246	28
1990	0.847	0.067	0.019	0.010	0.006	0.005	0.004	0.003	0.002	0.038	34
1991	0.877	0.084	0.014	0.004	0.002	0.001	0.001	0.001	0.000	0.015	69
1992	0.855	0.074	0.016	0.006	0.003	0.002	0.002	0.001	0.001	0.040	175
1993	0.874	0.089	0.020	0.007	0.004	0.002	0.001	0.001	0.001	0.002	105
1994	0.868	0.089	0.018	0.006	0.003	0.002	0.001	0.001	0.001	0.012	94
1995	0.820	0.112	0.030	0.012	0.007	0.004	0.003	0.002	0.001	0.009	405
1996	0.633	0.179	0.072	0.035	0.020	0.013	0.009	0.007	0.005	0.028	250
1997	0.661	0.147	0.058	0.030	0.018	0.013	0.010	0.008	0.006	0.049	276
1998	0.580	0.160	0.075	0.043	0.028	0.021	0.016	0.013	0.010	0.056	350
1999	0.690	0.168	0.056	0.026	0.015	0.010	0.007	0.005	0.004	0.018	767
2000	0.594	0.206	0.078	0.037	0.021	0.014	0.010	0.008	0.006	0.026	1022
2001	0.667	0.158	0.061	0.030	0.018	0.012	0.009	0.007	0.005	0.034	711
2002	0.516	0.165	0.082	0.048	0.033	0.024	0.019	0.015	0.013	0.086	332
2003	0.749	0.091	0.042	0.023	0.015	0.011	0.009	0.007	0.006	0.048	562
2004	0.298	0.127	0.075	0.057	0.048	0.043	0.038	0.035	0.031	0.249	321
2005	0.575	0.132	0.054	0.033	0.025	0.020	0.017	0.015	0.013	0.116	379
2006	0.253	0.132	0.082	0.058	0.046	0.039	0.034	0.031	0.028	0.298	212
2007	0.251	0.103	0.082	0.064	0.051	0.043	0.038	0.034	0.030	0.304	169
2008	0.370	0.067	0.038	0.030	0.026	0.024	0.022	0.021	0.020	0.383	365
2009	0.424	0.167	0.088	0.053	0.036	0.028	0.022	0.019	0.016	0.149	277
2010	0.272	0.204	0.123	0.074	0.051	0.039	0.031	0.026	0.022	0.159	320
2011	0.156	0.198	0.134	0.087	0.063	0.048	0.039	0.033	0.028	0.214	316
2012	0.134	0.079	0.076	0.065	0.056	0.049	0.044	0.040	0.036	0.420	321
2013	0.444	0.096	0.048	0.036	0.030	0.027	0.024	0.023	0.021	0.252	312

Table 20: Summary of objective function components and likelihood values of the ASAP base model.

Objective function = 2215			
Component	Lambda	ESS	Obj_fun
Catch_Fleet_Total	2		807.93
Index_Fit_Total	1		22.92
Catch_Age_Comps		2978	685.84
Index_Age_Comps		524	247.88
Fmult_Year1_Total	2		1.63
Recruit_devs	1		448.65

Table 21: Annual black drum abundance-at-age and total stock size estimates from the ASAP base model.

Year	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10	Totals
1985	1,302,550	321,783	208,598	187,548	190,339	202,255	211,360	237,692	268,283	3,660,420	6,790,828
1986	1,800,650	860,455	204,325	144,296	137,816	146,120	160,503	171,847	197,020	3,379,310	7,202,342
1987	1,223,960	776,731	371,769	107,637	87,595	92,441	105,229	121,508	135,001	2,978,750	6,000,621
1988	1,349,300	524,744	262,569	157,361	53,914	49,739	57,723	70,594	86,239	2,417,070	5,029,254
1989	1,029,290	565,976	170,526	107,681	76,847	29,995	30,548	38,205	49,554	1,929,630	4,028,251
1990	870,933	568,542	180,662	67,723	51,847	43,196	19,038	21,253	28,483	1,628,160	3,479,837
1991	948,979	524,549	225,937	85,431	37,273	32,221	29,531	13,985	16,481	1,391,610	3,305,996
1992	1,464,060	632,115	267,946	130,036	54,602	25,897	23,910	23,022	11,320	1,209,280	3,842,188
1993	1,856,790	924,461	279,881	136,688	75,636	35,299	18,200	17,898	18,082	1,031,330	4,394,265
1994	1,955,610	1,213,400	446,958	153,276	83,966	50,952	25,578	13,933	14,290	894,125	4,852,087
1995	1,949,660	1,338,690	665,170	272,484	102,416	60,336	38,770	20,313	11,432	785,686	5,244,956
1996	1,853,210	1,380,750	795,789	430,629	190,413	76,044	47,003	31,307	16,862	693,327	5,515,333
1997	3,210,850	1,397,150	957,227	579,946	329,124	151,096	62,185	39,306	26,645	625,410	7,378,938
1998	2,944,350	2,534,370	1,042,990	677,713	423,837	251,057	119,980	51,024	33,099	572,956	8,651,376
1999	3,306,430	2,324,080	1,900,780	749,033	502,081	326,827	200,942	98,978	43,114	533,034	9,985,299
2000	4,529,970	2,636,490	1,787,690	1,379,240	557,968	388,846	262,697	166,499	84,004	508,385	12,301,789
2001	4,441,370	3,561,030	1,944,830	1,253,540	1,000,500	423,109	307,306	214,724	139,774	518,228	13,804,411
2002	1,536,600	3,533,310	2,714,780	1,394,080	923,870	768,309	337,903	253,431	181,626	577,754	12,221,663
2003	2,592,800	1,221,300	2,709,590	1,994,230	1,052,220	723,032	622,081	281,238	215,596	667,802	12,079,889
2004	2,097,960	2,038,410	903,736	1,917,350	1,459,190	803,416	574,303	510,229	236,618	771,592	11,312,804
2005	1,980,190	1,653,390	1,508,180	628,922	1,379,280	1,099,180	632,033	468,142	427,756	879,939	10,657,012
2006	3,128,670	1,574,950	1,273,620	1,118,180	478,770	1,086,810	894,482	527,902	399,191	1,149,110	11,631,685
2007	5,720,950	2,484,340	1,211,990	951,697	858,225	379,716	888,486	749,263	450,859	1,363,000	15,058,526
2008	2,037,440	4,535,220	1,897,590	894,851	722,638	674,873	308,438	740,819	637,869	1,594,470	14,044,208
2009	4,164,160	1,618,330	3,492,840	1,418,590	687,021	573,266	551,834	258,411	632,806	1,964,290	15,361,548
2010	2,358,170	3,318,930	1,255,160	2,608,020	1,086,260	543,867	468,200	462,198	220,814	2,289,130	14,610,749
2011	2,373,650	1,885,890	2,610,980	957,390	2,035,180	872,946	449,260	395,383	397,237	2,225,860	14,203,776
2012	5,171,340	1,894,210	1,469,500	1,961,390	736,959	1,617,850	715,227	377,169	338,430	2,318,620	16,600,695
2013	2,978,380	4,119,010	1,453,030	1,065,050	1,460,140	570,463	1,299,760	592,337	319,954	2,340,800	16,198,924

Table 22: Annual age-specific, apical, and average black drum fishing mortality rates estimated from the ASAP base model.

Year	Age_1	Age_2	Age_3	Age_4	Age_5	Age_6	Age_7	Age_8	Age_9	Age_10+	Fmult_total	Avg. F
1985	0.21	0.30	0.23	0.18	0.14	0.11	0.09	0.07	0.06	0.05	0.36	0.11
1986	0.64	0.68	0.50	0.37	0.28	0.21	0.16	0.13	0.10	0.08	0.87	0.32
1987	0.64	0.93	0.72	0.56	0.44	0.35	0.28	0.23	0.18	0.15	1.11	0.41
1988	0.66	0.97	0.75	0.59	0.46	0.37	0.29	0.24	0.19	0.16	1.15	0.43
1989	0.39	0.98	0.79	0.60	0.45	0.33	0.24	0.18	0.13	0.09	0.98	0.35
1990	0.30	0.77	0.61	0.47	0.35	0.26	0.19	0.14	0.10	0.07	0.77	0.29
1991	0.20	0.51	0.41	0.32	0.24	0.18	0.13	0.10	0.07	0.05	0.51	0.20
1992	0.25	0.66	0.54	0.41	0.31	0.23	0.17	0.13	0.09	0.07	0.66	0.29
1993	0.22	0.57	0.46	0.36	0.27	0.20	0.15	0.11	0.08	0.06	0.57	0.27
1994	0.17	0.44	0.36	0.27	0.21	0.15	0.11	0.08	0.06	0.04	0.44	0.24
1995	0.14	0.36	0.30	0.23	0.17	0.13	0.10	0.07	0.05	0.04	0.36	0.21
1996	0.08	0.21	0.18	0.14	0.11	0.08	0.06	0.05	0.03	0.02	0.21	0.12
1997	0.03	0.14	0.21	0.18	0.15	0.11	0.08	0.06	0.04	0.03	0.21	0.09
1998	0.03	0.13	0.19	0.17	0.14	0.10	0.07	0.05	0.04	0.03	0.20	0.10
1999	0.02	0.11	0.18	0.17	0.13	0.10	0.07	0.05	0.03	0.02	0.18	0.09
2000	0.04	0.15	0.22	0.19	0.15	0.12	0.08	0.06	0.04	0.03	0.22	0.11
2001	0.02	0.11	0.19	0.18	0.14	0.10	0.07	0.05	0.03	0.02	0.20	0.10
2002	0.02	0.11	0.17	0.15	0.12	0.09	0.07	0.05	0.03	0.02	0.17	0.11
2003	0.04	0.14	0.21	0.18	0.15	0.11	0.08	0.06	0.04	0.03	0.21	0.13
2004	0.03	0.14	0.22	0.20	0.16	0.12	0.09	0.06	0.04	0.03	0.23	0.12
2005	0.02	0.10	0.16	0.14	0.11	0.09	0.06	0.04	0.03	0.02	0.16	0.08
2006	0.03	0.10	0.15	0.14	0.11	0.08	0.06	0.04	0.03	0.02	0.16	0.07
2007	0.03	0.11	0.17	0.15	0.12	0.09	0.06	0.04	0.03	0.02	0.17	0.07
2008	0.03	0.10	0.15	0.14	0.11	0.08	0.06	0.04	0.03	0.02	0.15	0.08
2009	0.02	0.10	0.15	0.14	0.11	0.08	0.06	0.04	0.03	0.02	0.16	0.08
2010	0.02	0.08	0.13	0.12	0.09	0.07	0.05	0.04	0.02	0.02	0.13	0.07
2011	0.02	0.09	0.15	0.13	0.11	0.08	0.06	0.04	0.03	0.02	0.15	0.08
2012	0.02	0.11	0.18	0.17	0.13	0.10	0.07	0.05	0.03	0.02	0.19	0.08
2013	0.02	0.09	0.15	0.14	0.11	0.08	0.06	0.04	0.03	0.02	0.15	0.07

Table 23: Limit reference point estimates from the base model for the Louisiana black drum stock. Spawning stock biomass and yield units are pounds x 10^6. Fishing mortality and escapement (E) units are $year^{-1}$.

Reference Points		
Parameter	Derivation	Value/Estimate
SPR_{limit}	RS 56:325.4	30%
$F_{30\%}$	Equation 27 And SPR_{limit}	0.11
$SSB_{30\%}$	Equation 27 And SPR_{limit}	31.33
$E_{30\%}$	Equation 27 And SPR_{limit}	0.45
$Yield_{30\%}$	Equation 27 And SPR_{limit}	6.28

Table 24: Sensitivity analysis table. Current estimates are taken as the geometric mean of the last three years of the assessment (2011-2013).

Model run	negLL	$Yield_{30\%}$	$F_{30\%}$	$SSB_{30\%}$	$Esc_{30\%}$	$F_{current}/F_{30\%}$	$SSB_{current}/SSB_{30\%}$
Base Model (h=0.75)	2,215	6.28	0.11	31.33	0.45	0.68	1.30
1 (h=1.0)	2,208	4.86	0.11	24.06	0.46	0.78	1.43
2 (h=0.9)	2,209	5.46	0.11	27.04	0.45	0.74	1.36
3 (h=0.8)	2,211	6.04	0.11	30.05	0.45	0.70	1.32
4 (h=0.7)	2,215	6.49	0.11	32.43	0.45	0.61	1.30
5 (Yield lambda X 10)	9,463	6.33	0.11	31.62	0.45	0.65	1.37
6 (Survey lambda X 20)	1,669	3.73	0.11	18.75	0.45	1.02	1.12

11. Figures

Figure 1: Reported commercial black drum *Pogonias cromis* landings (pounds x 10^3) of the Gulf of Mexico derived from NOAA-Fisheries statistical records and the LDWF trip ticket program.

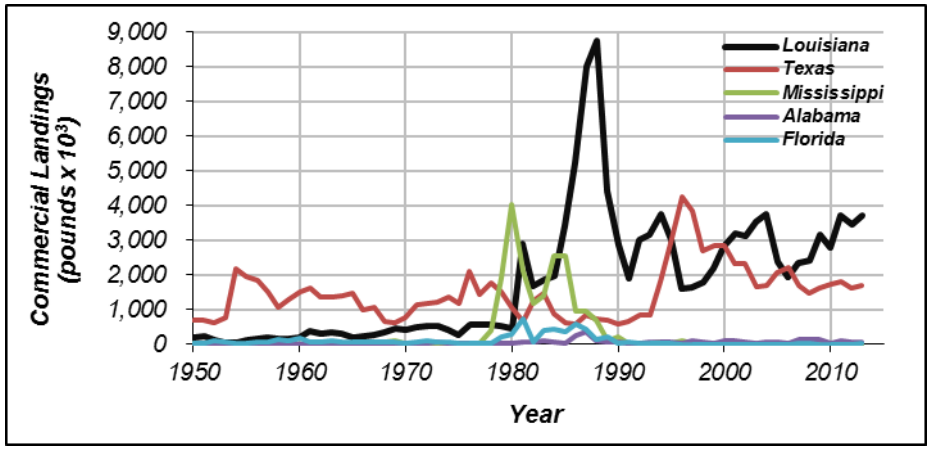


Figure 2: Estimated recreational black drum *Pogonias cromis* landings (pounds x 10^6) of the Gulf of Mexico derived from MRFSS/MRIP. Landings are A+B1 harvest only.

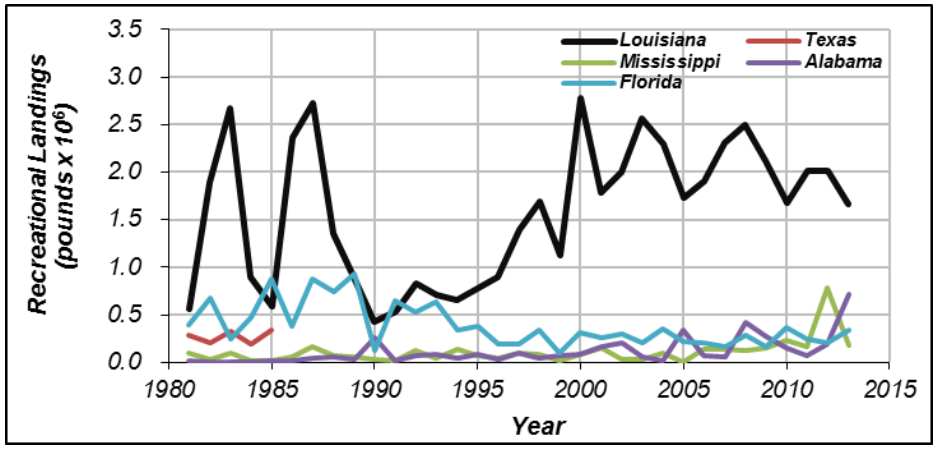


Figure 3: Standardized index of abundance, nominal catch-per-unit-effort, and 95% confidence intervals of the standardized index derived from the LDWF marine trammel net survey (top). Each time-series has been normalized to its individual long-term mean for comparison. Bottom graphic depicts annual observed proportion positive samples of black drum catches from the LDWF marine trammel net survey.

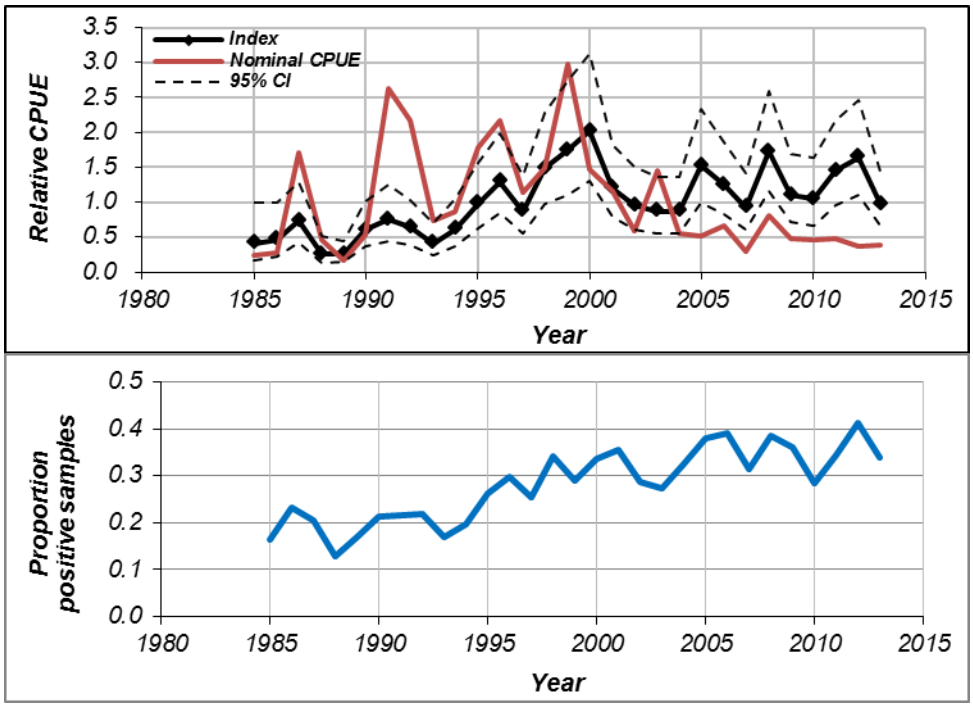


Figure 4: Observed and ASAP base model estimated commercial yield (top) and standardized residuals (bottom).

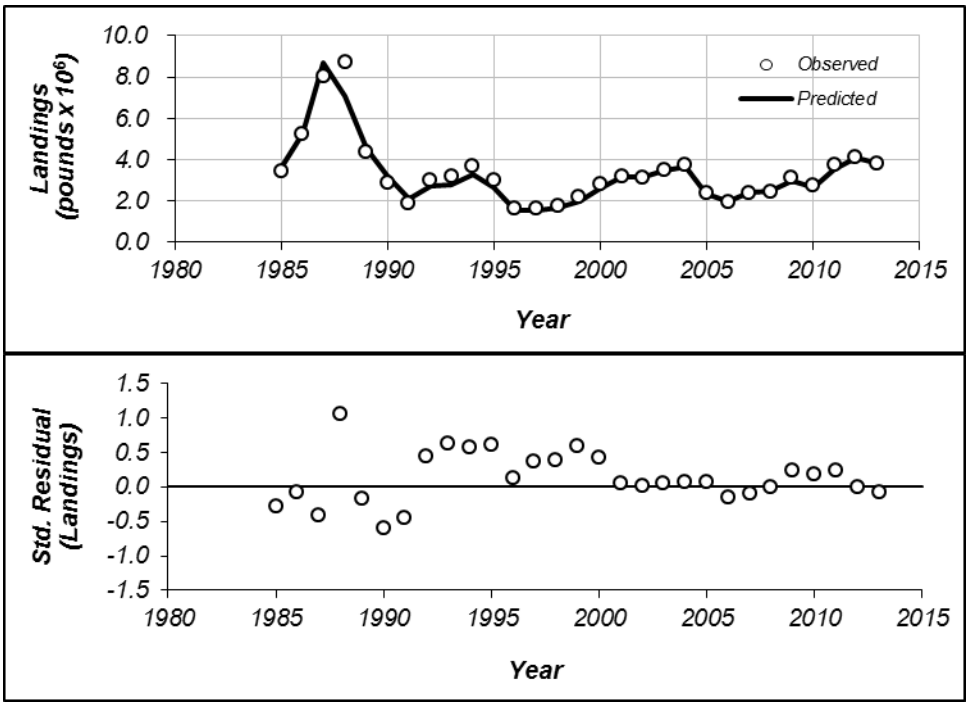


Figure 5: Observed and ASAP base model estimated recreational yield (top) and standardized residuals (bottom).

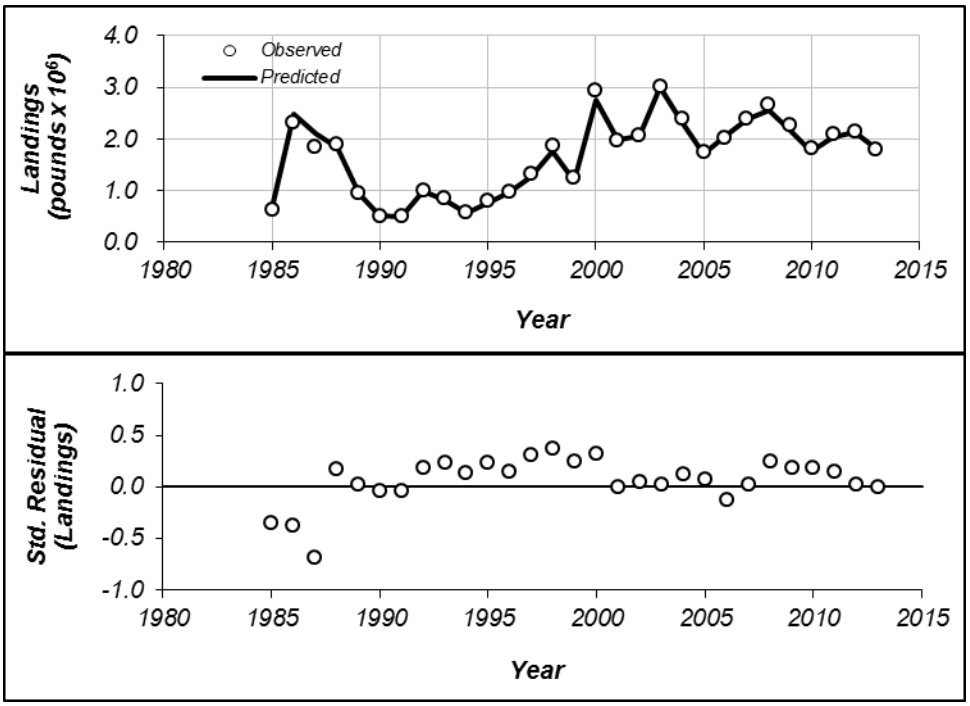


Figure 6: Observed and ASAP base model estimated survey CPUE (top) and standardized residuals (bottom).

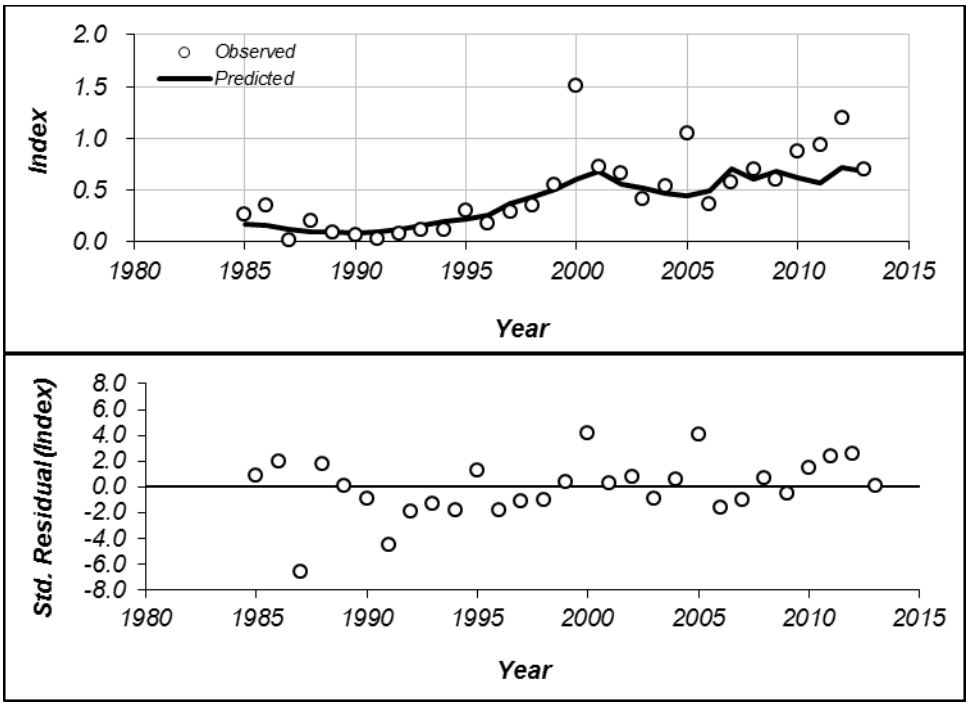


Figure 7: Annual observed (open circles) and ASAP estimated (bold lines) commercial black drum harvest age compositions.

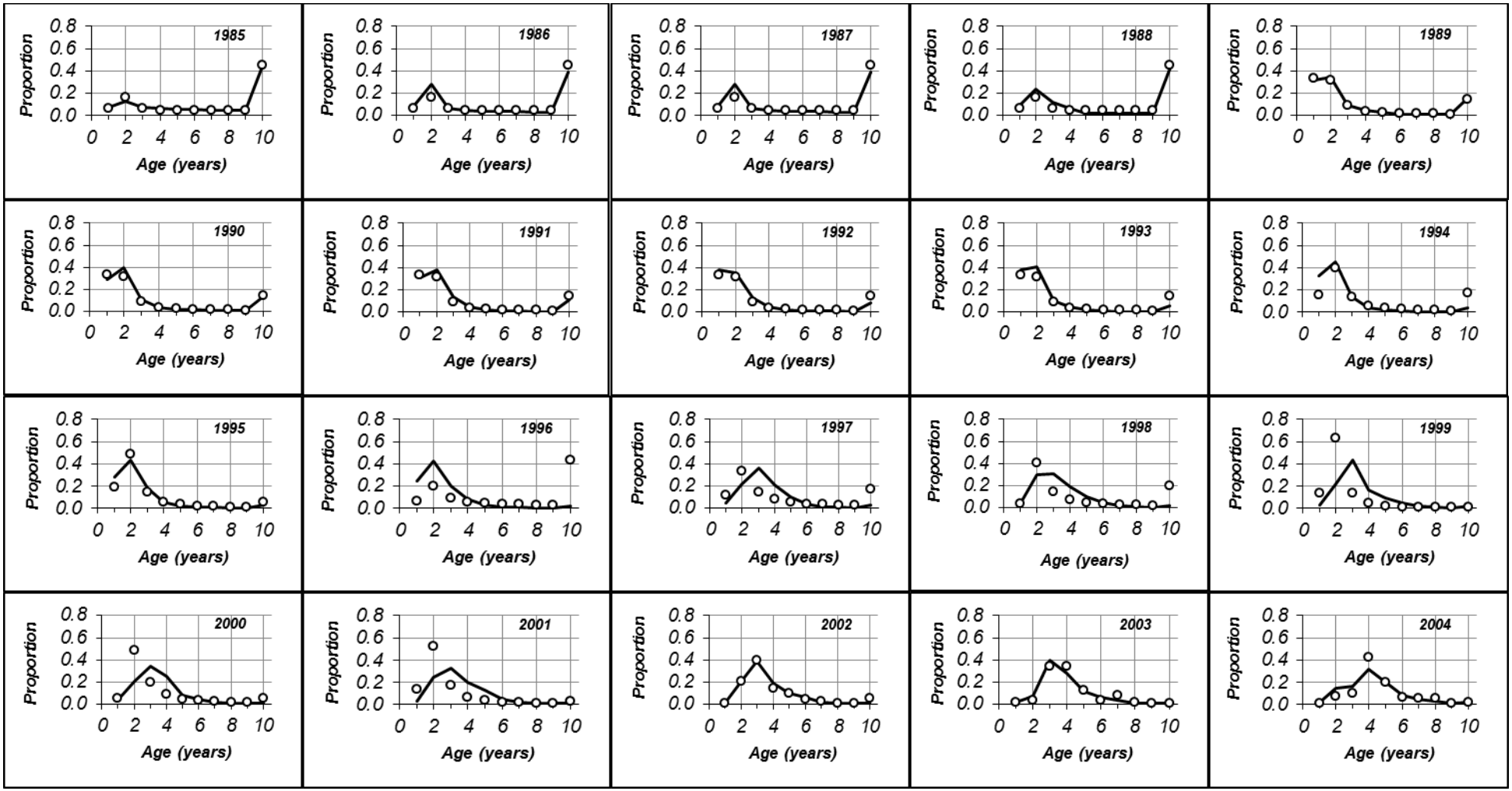


Figure 7 (continued):

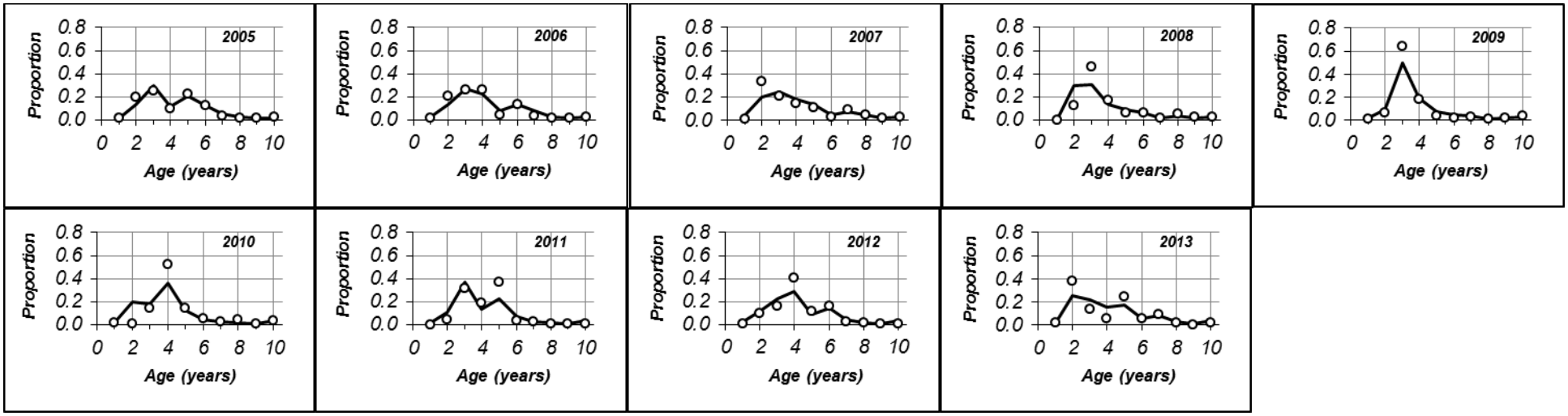


Figure 8: Annual observed (open circles) and ASAP estimated (bold lines) recreational black drum harvest age compositions.

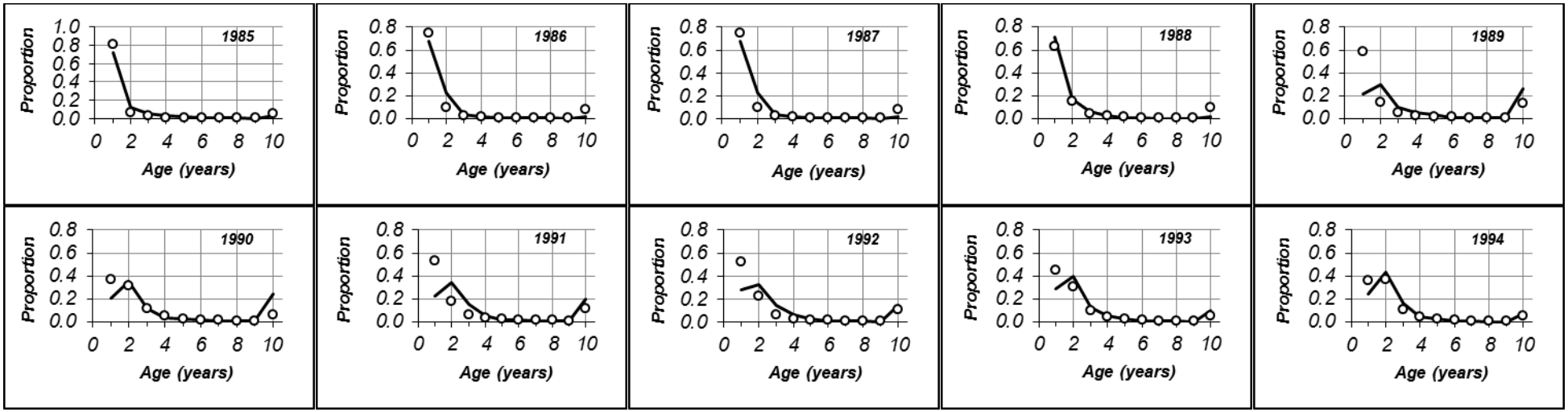


Figure 8 (continued):

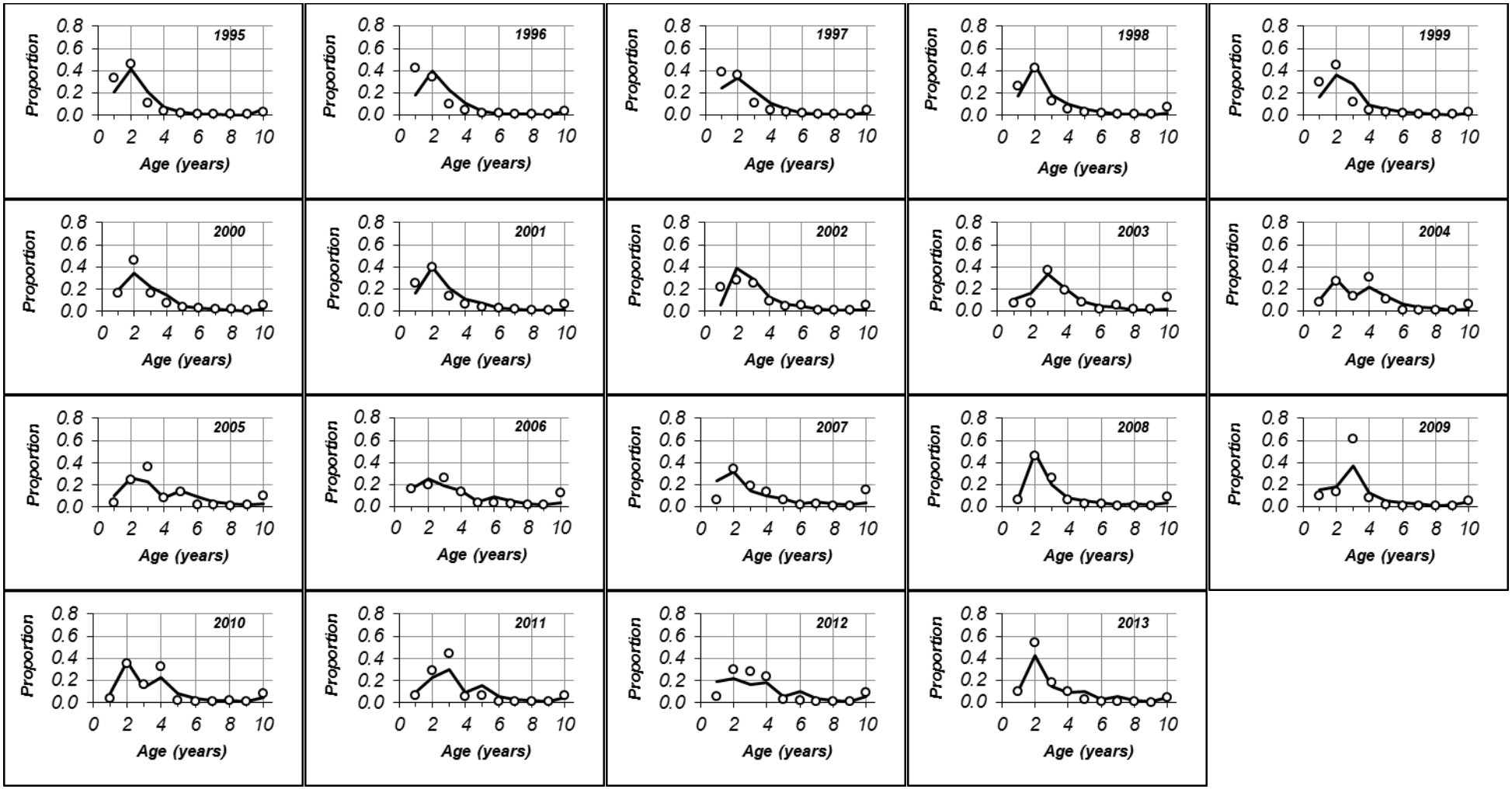


Figure 9: Annual observed (open circles) and ASAP estimated (bold lines) survey age compositions.

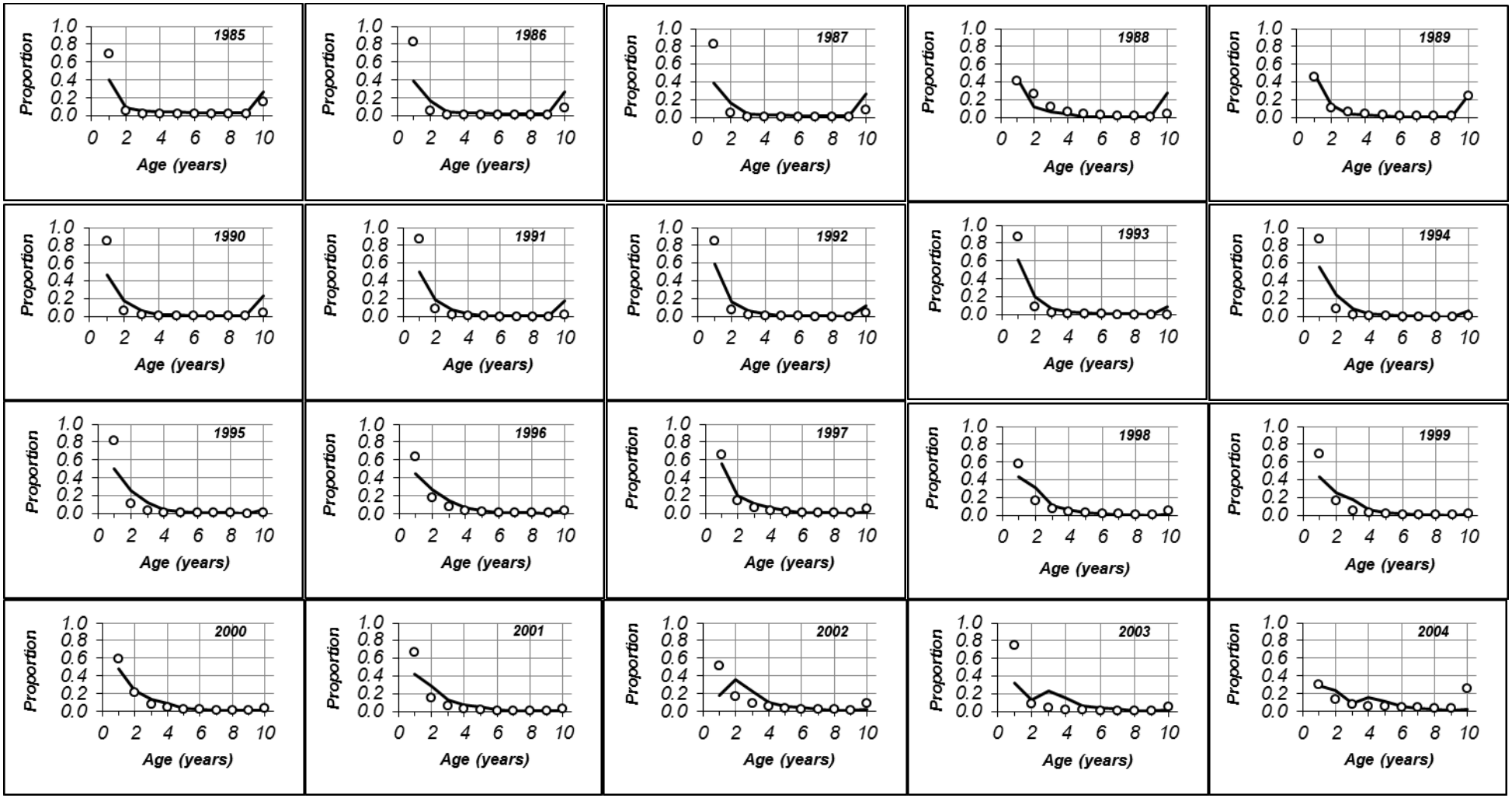


Figure 9 (continued):

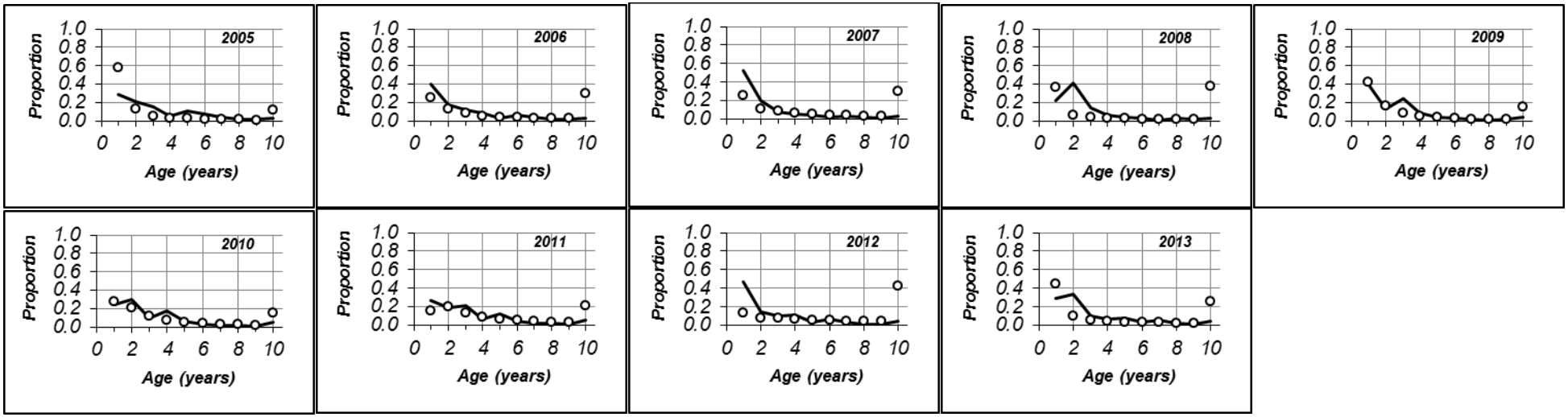


Figure 10: ASAP base model estimated commercial (top), recreational (middle), and survey (bottom) selectivities (ages 1-10+).

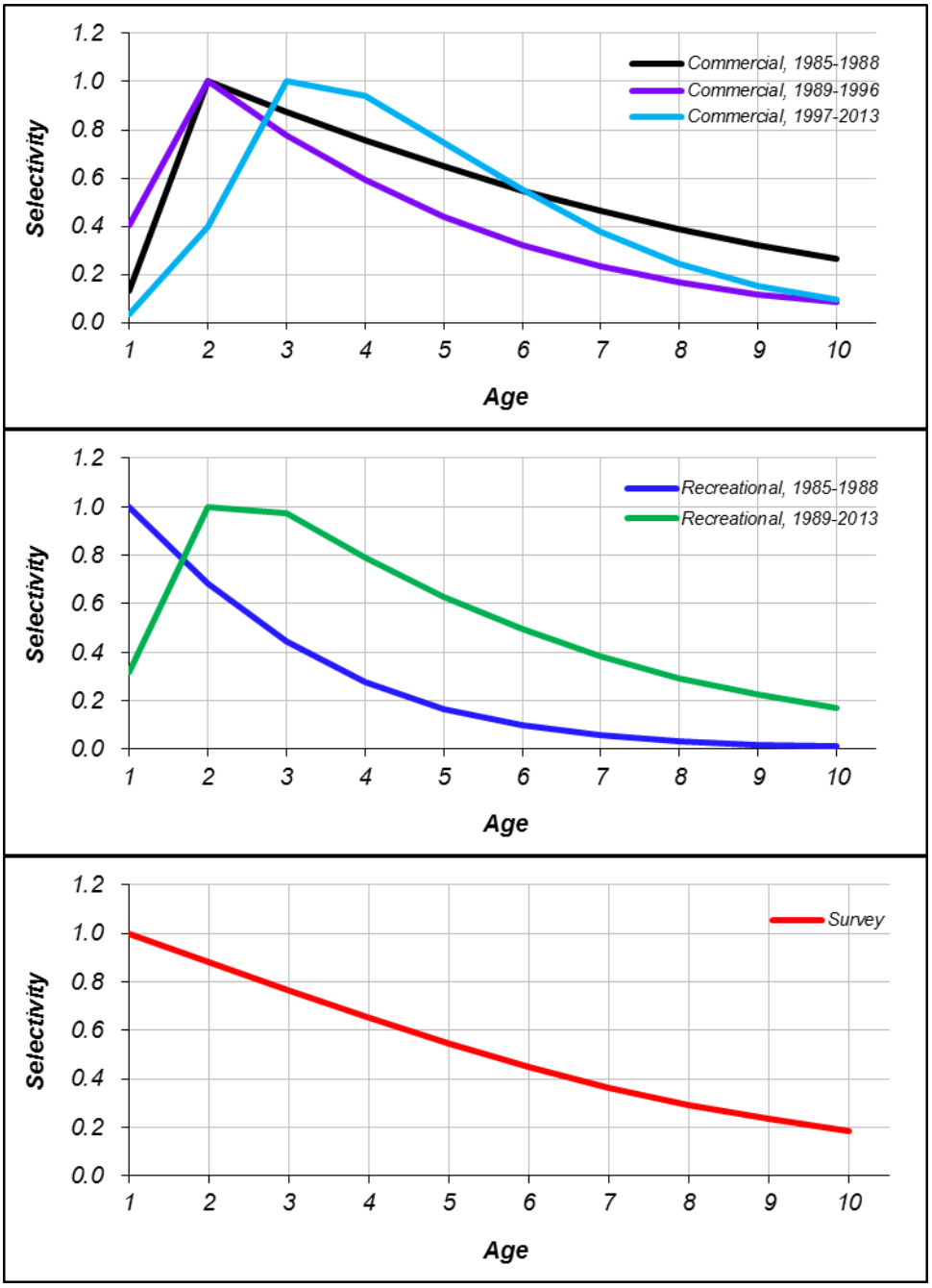


Figure 11: ASAP base model estimated recruitment. Dashed lines represent ±1 asymptotic standard errors.

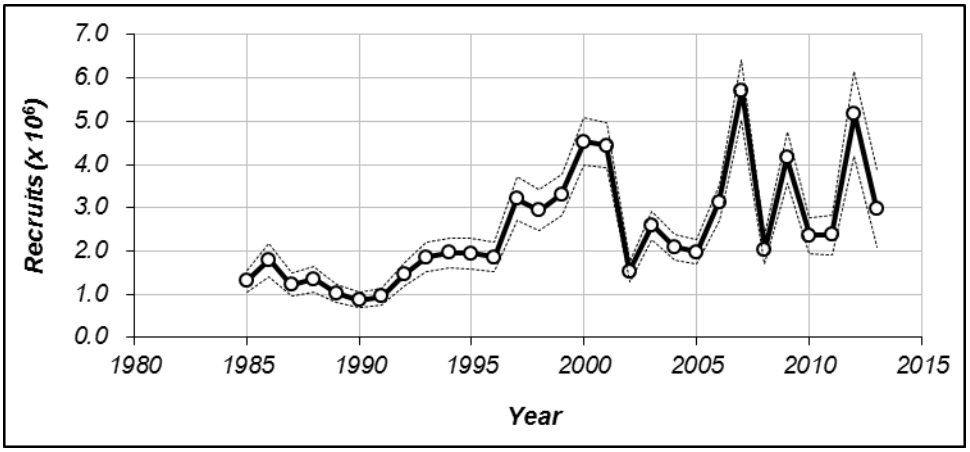


Figure 12: ASAP base model estimated spawning stock biomass (MCMC median). Dashed lines represent 95% MCMC derived confidence intervals.

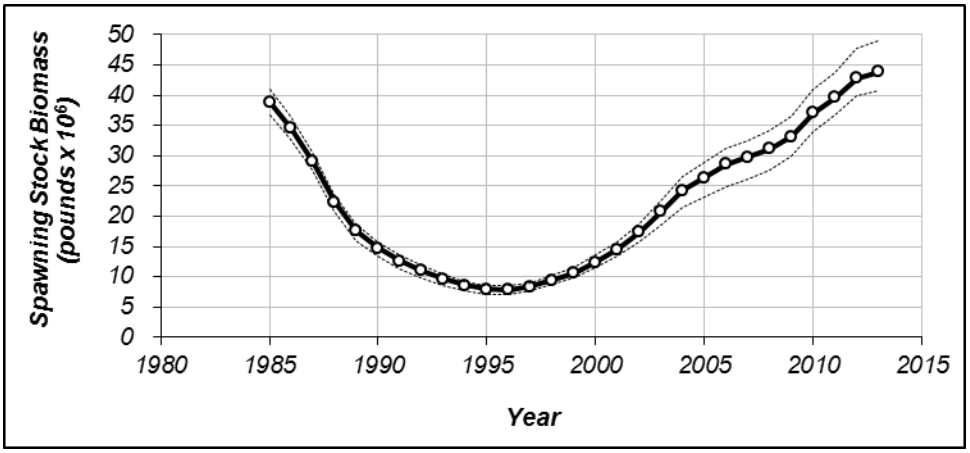


Figure 13: ASAP base model estimated average fishing mortality rates (MCMC median). Dashed lines represent 95% MCMC derived confidence intervals.

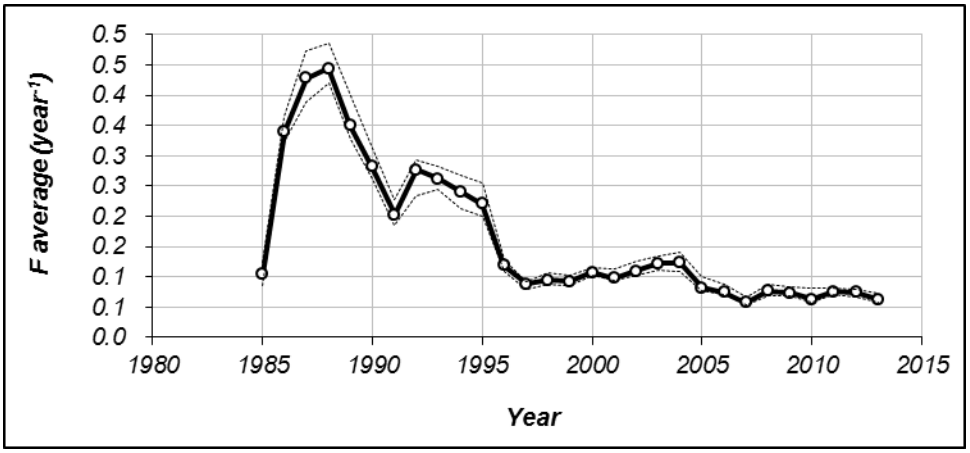


Figure 14: ASAP base model estimated age-1 recruits and spawning stock biomass. Arrows represent direction of the time-series. The yellow circle represents the most current data pair.

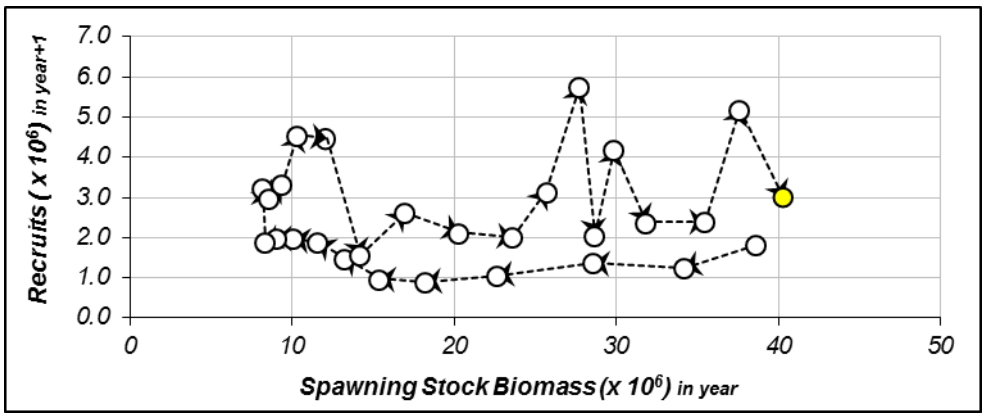


Figure 15: Time-series of black drum escapement rates (year^{-1}).

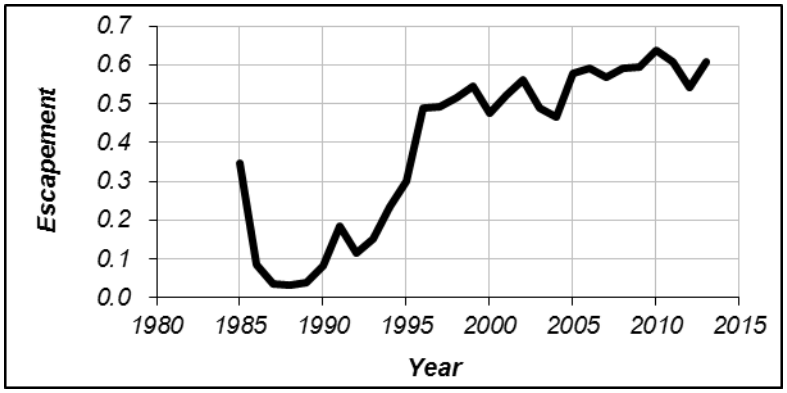


Figure 16: ASAP base model estimated age-1 recruits and spawning stock biomass (open circles). Equilibrium recruitment is represented by the bold line. Equilibrium recruitment per spawning stock biomass corresponding with the minimum and maximum spawning stock biomass estimates are represented by the slopes of the dashed diagonals (minimum spawning stock=14%SPR; maximum spawning stock=37%SPR). The yellow triangle represents the 2013 spawning stock biomass estimate.

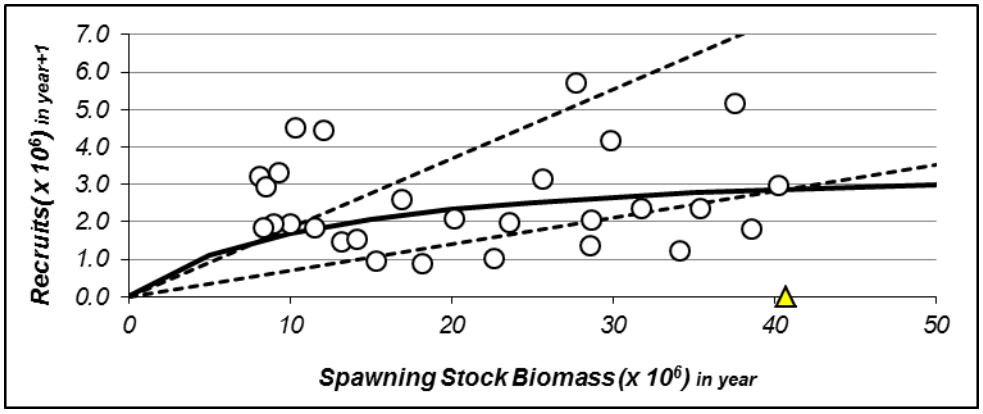


Figure 17: Retrospective analysis of ASAP base model. Top graphics depict estimated ratios of annual average fishing mortality to $F_{30\%}$ (dashed line) and spawning stock biomass to $SSB_{30\%}$ (dashed line). The two bottom graphics depict estimated age-1 recruits and age-10+ stock numbers.

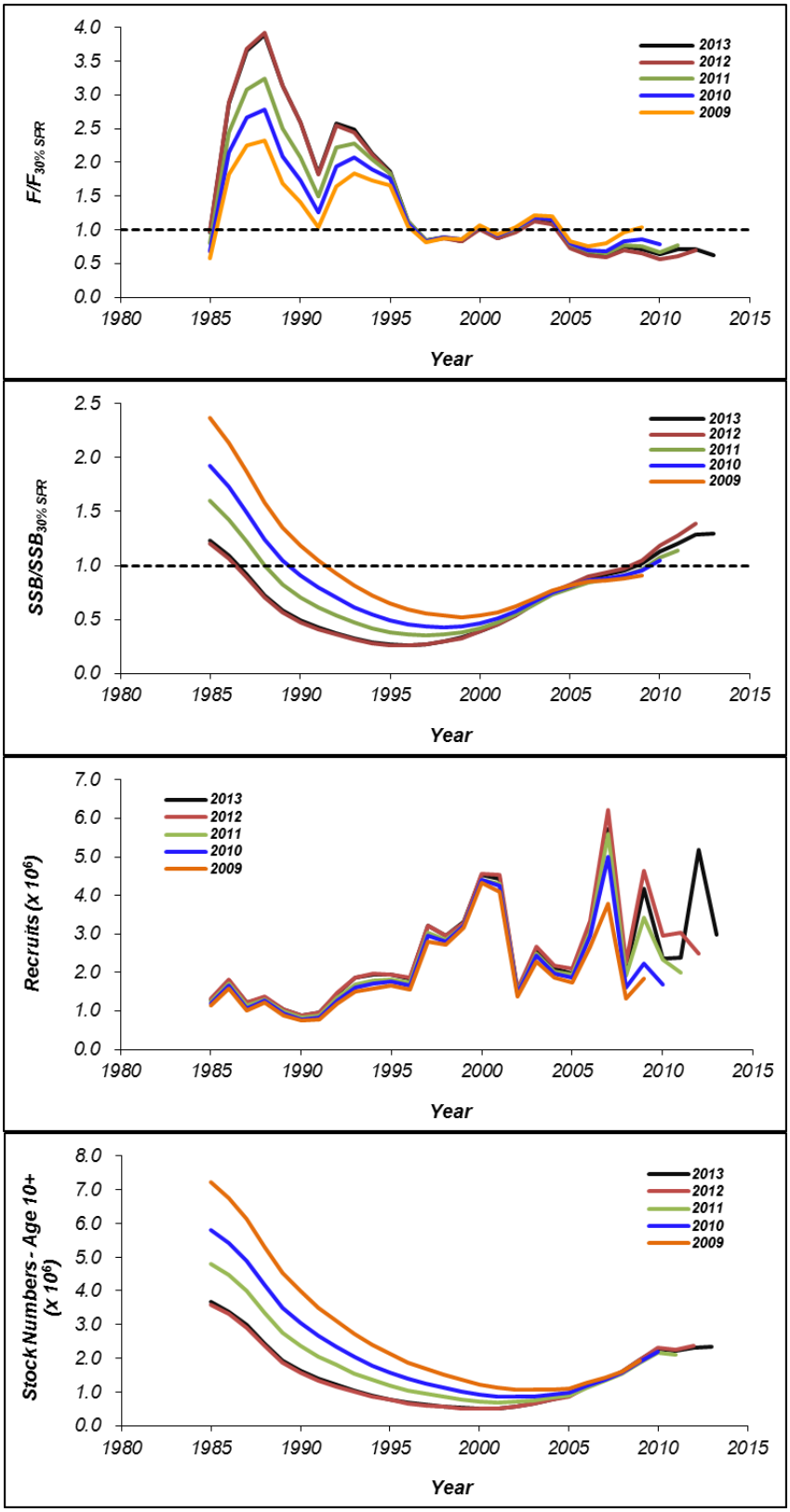
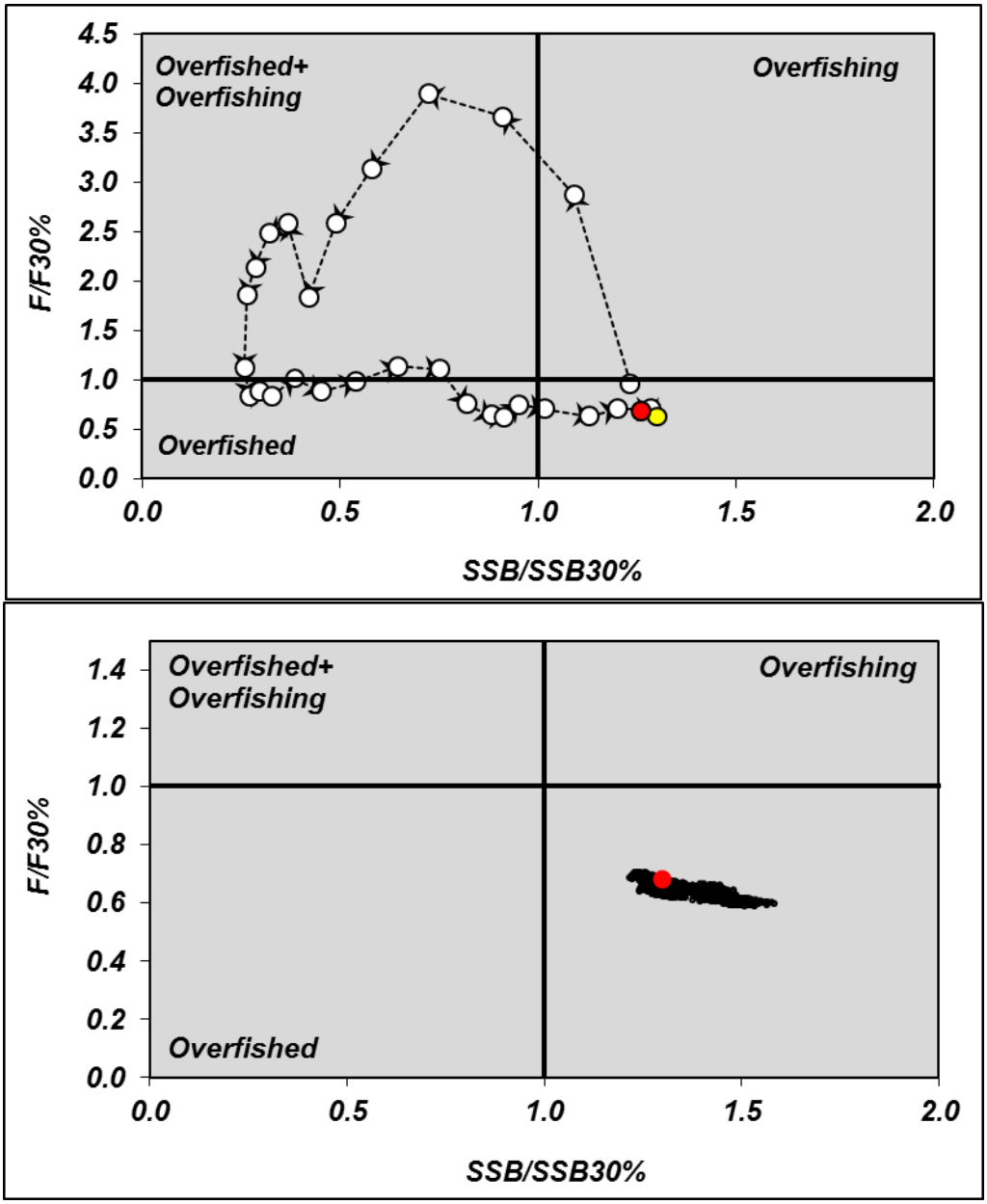


Figure 18: ASAP base model estimated ratios of annual average fishing mortality to $F_{30\%}$ and female spawning stock biomass to $SSB_{30\%}$. Arrows and dashed line represent direction of time-series. The yellow circle is the 2013 estimate; the red circle is current status (geometric mean of average F and SSB 2011-2013). Bottom graphic depicts current status and results of 2000 MCMC simulations relative to limit reference points.



Appendix II. LA R.S. 56:638.1-5. Fish Conservation, Management, and Sustainability: Legislative Intent, Findings, Purposes, Policy, and Fishery Standards

The legislative intent, findings, purposes, policy and standards for the conservation and management of all species of fish in Louisiana are defined in LA R.S. 56:638.1-5, which function similarly to those found in the federal MSA.

LA R.S. 56:638.1. Fish conservation, management, and sustainability; legislative intent

Recognizing that there are ever-increasing numbers of both sport and commercial fishermen utilizing the waters of the state for recreational and commercial pursuits resulting in conflicts over limited space and competition for the same fish, and acknowledging that both the sport and commercial fishing industries are vital to the economy of the coastal region and the entire state, the fishery standards for conservation, management, and sustainability of all species of fish are hereby declared to be fair and in the best interest of the state.

LA R.S. 56:638.2. Findings

The state of Louisiana recognizes that:

(1) Its fish resources are of great value and are renewable. These fish resources make many contributions to the state, including but not limited to the food supply, economy, and health of the state and recreational opportunities. With proper regulations of the harvest by fishermen, coupled with protection and enhancement of their freshwater, saltwater, and estuarine habitat, Louisiana's fish resources should be available to provide these benefits to the state indefinitely.

(2) As a consequence of increased fishing pressure or other factors and because of the limitations of fish conservation, management, and sustainability practices, certain stocks of fish may have been or will become overfished.

(3) The future productivity of renewable fish resources and their supporting habitats may be seriously jeopardized as a consequence of the continued loss of Louisiana coastal wetlands, or because of human actions affecting the functionality and value of the state's renewable fish resources and their supporting habitats.

(4) Both commercial and recreational fishing constitute a major source of employment and contribute significantly to the economy of the state. Many coastal areas are dependent upon such fishing and related activities and their economies have been damaged by pollution, habitat degradation, or overfishing.

(5) Fish resources are finite but renewable. If timely placed under sound management, the fisheries can be conserved and maintained so as to provide optimum and sustainable yields on a continuing basis.

(6) A strong state program for the wise conservation, management, and sustainability of the fish resources of Louisiana is necessary to maintain plentiful fish populations, to prevent overfishing, to rebuild reduced stocks, to ensure conservation, and to realize their full potential.

(7) The safe development or improvement of fisheries that are not fully or properly utilized by the Louisiana commercial and recreational fishermen and fishing industries should help to ensure that Louisiana benefits from the employment, food supply, recreation, and social and economic benefit that could be maintained or generated thereby, if pursued in such a fashion that is socially, scientifically, economically, anthropologically, and biologically sound for the state, the species, any related species, and their supporting habitats.

(8) A strong state program is necessary to advocate the importance of the functionality and value of Louisiana's waters and coastal wetlands as estuary and habitat for fish resources, the social and economic value of these resources to the state and the nation, and the need to actively seek to avoid any net loss of this functionality and value.

LA R.S. 56:638.3. Purposes

A. In order to implement the objectives and purposes of this Subpart, the commission shall:

(1) Take timely action to conserve, manage, protect, and sustain fish species.

(2) Promote the use of sound conservation, management, and sustainability principles in the regulation of commercial and recreational fishing.

(3) Actively advocate, on behalf of the fish constituency, improvement of or no net loss of the functionality and value of the fisheries' habitat and estuary.

(4) Provide for the preparation and implementation of fish management plans, including plans for habitats, estuaries, and their supporting ecosystems, in accordance with this policy that will prevent overfishing and will achieve and maintain plentiful fish populations to ensure, on a continuing basis, the optimum yield from each fishery while ensuring its sustainability.

(5) Recognize that fish populations are subject to both natural and man-induced increases and decreases, and that changes in harvest levels may need to be recommended. If changes are required, these increases and decreases should be distributed among all fishermen in a fair and equitable manner that considers among other factors historical usage, ensuring that no historical user groups will be arbitrarily excluded.

B. A sustainable fishery is one that is scientifically monitored and actively managed to be viable today and in the future, conserving fish and their environment and supporting the communities and economies that depend upon these resources.

LA R.S. 56:638.4. Policy

The policy of the state of Louisiana is hereby declared to be the following:

Stewardship of the state's renewable fish resources shall have as its utmost concern the continued health and abundance of the resource and its habitat, shall provide for optimum sustained benefits to the state, shall be responsive to the needs of interested and affected citizens, shall ensure the proper and fair utilization of these resources for the citizens of the state in present and future generations, shall preserve the state's exclusive right to manage the fisheries within or beyond its jurisdiction, shall be based on the best scientific and technical information available. In addition, such stewardship of the state's fish resources shall draw upon federal, state, and academic capabilities and promote efficiency in carrying out research, administration, management, and enforcement.

LA R.S. 56:638.5. Fishery standards

The commission shall adopt such rules and regulations consistent with the authority granted by this Chapter and in accordance with the Administrative Procedure Act, for the harvesting, conservation, management, and sustainability of all species of fish, in accordance with the following standards:

(1) Conservation, management, and sustainability measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield while maintaining healthy, plentiful stocks. In fact, every effort will be made at all times to prevent a harvest from exceeding the safe upper limit of harvests which can be taken consistently year after year without diminishing the stocks so that the stock is truly inexhaustible and perpetually renewable.

(2) Conservation, management, and sustainability measures shall be based upon the best scientific, economic, biological, anthropological, and sociological information available.

(3) To the extent practicable, an individual stock or unit of fish shall be managed as a unit throughout its range within the state's jurisdictional authority and interrelated stocks of fish and other renewable fish resources shall be managed in close coordination while considering their supporting habitats.

(4) If it becomes necessary to allocate or assign fishing privileges among various fishermen, such allocations to the extent practicable shall be:

(a) Fair and equitable to all such fishermen.

(b) Reasonably calculated to promote conservation.

(c) Carried out in such a manner that no particular individual, corporation, or other legal entity acquires an excessive share of such privileges.

(d) In the best interest of the citizens of Louisiana.

(5) Conservation, management, and sustainability measures shall, where practicable, promote efficiency in the

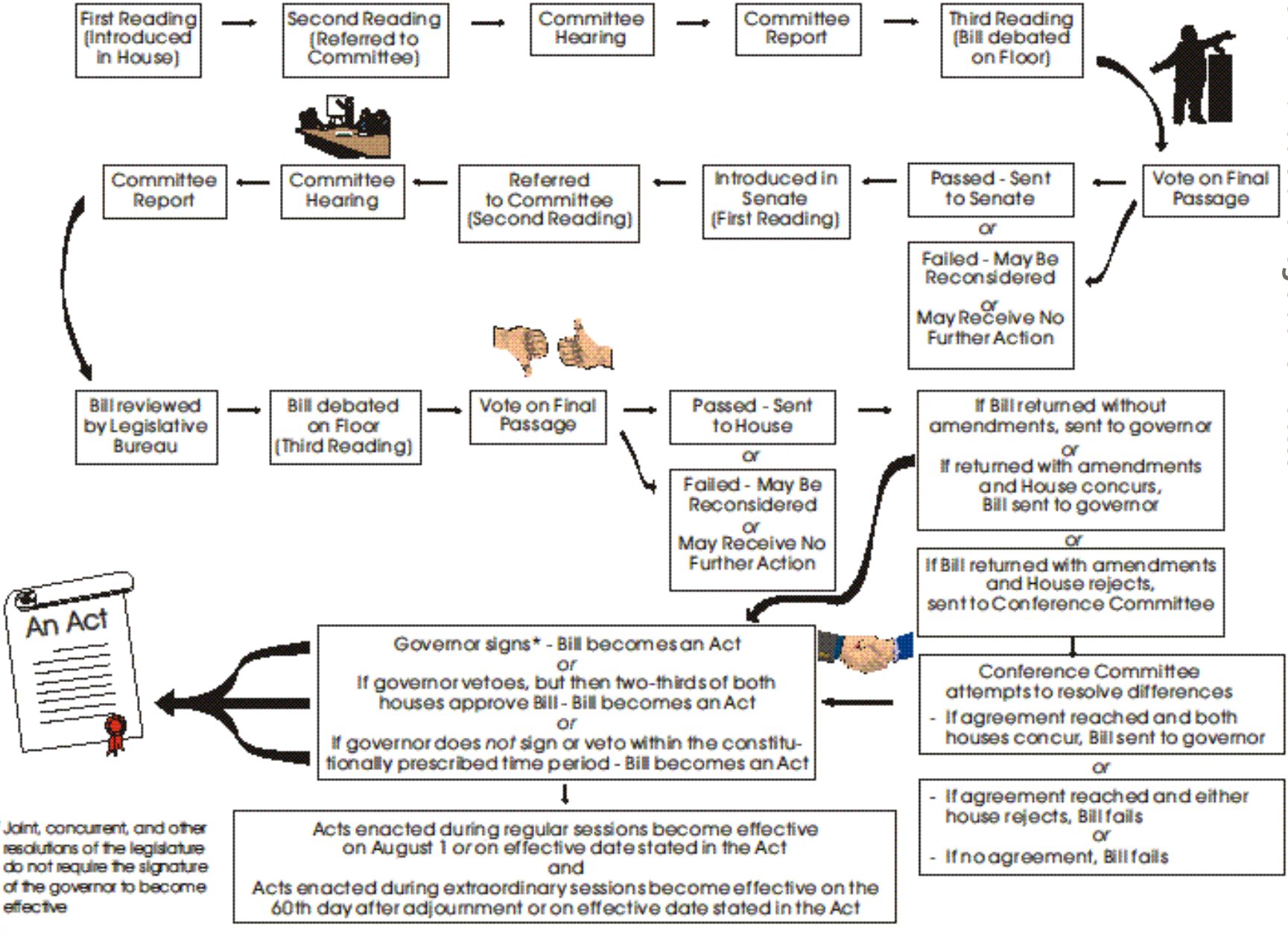
conservation, management, and sustainability of fish resources; except that no such measure shall have economic allocation as its sole purpose.

(6) Conservation, management, and sustainability measures shall, where practicable, minimize costs and avoid unnecessary duplication.

(7) Conservation, management, and sustainability measures may take into account and allow for variations among, and contingencies in, fisheries, resources, and catches.

Acts 1991, No. 708, §1; Acts 2014, No. 553, §1.

How a Bill Becomes a Law



Appendix IV. Authorities and Duties of the Louisiana Wildlife and Fisheries Commission

According to LA R.S. 56, the Commission's authorities and duties related to black drum include:

LA R.S. 56:2 Supervision and direction of the commission

The Commission has general control, management, supervision, and direction of itself. The Commission is a policy-making and budgetary-control board, with no administrative functions. The Commission has sole authority to establish definite management programs and policies, approve and accept all contracts at its discretion, make studies and investigations as it thinks necessary, formulate policies, and determine the wisdom and efficacy of its policies, plans, rules, regulations and proceedings.

LA R.S. 56:3 Ownership of fish

The ownership and title to all wild birds, and wild quadrupeds, fish, other aquatic life, the beds and bottoms of rivers, streams, bayous, lagoons, lakes, bays, sounds, and inlets bordering on or connecting with the Gulf of Mexico within the territory or jurisdiction of the state, including all oysters and other shellfish and parts thereof grown thereon, either naturally or cultivated, and all oysters in the shells after they are caught or taken therefrom, are and remain the property of the state, and shall be under the exclusive control of the Wildlife and Fisheries Commission except as provided in R.S. 56:4 (Authority of Department of Natural Resources over navigable water bottoms).

LA R.S. 56:6 Special powers and duties

The Commission, through its secretary, shall:

- Adopt rules and regulations for the comprehensive control of finfish
- Improve, enlarge, and protect the natural oyster reefs of the state
- Enforce all law relative to the protection, propagation, and sale of all species of fish in the state
- Have full power and control over all fish within the state's waters
- Assist in protecting all leases of private oyster bedding grounds in the enjoyment of their rights
- Promulgate rules and regulations to set seasons, times, places, size limits, quotas, daily take, and possession limits based upon biological and technical data for all fish
- Impose a fee for nonresident recreational fishing licenses
- Provide for a program of dissemination of fisheries information and education in Louisiana.

LA R.S. 56:22 Rules and regulations

The Commission may entirely prohibit the taking of any species of fish in any part of the state for not more than a three-year period.

LA R.S. 56:25 Fish and wildlife restoration and management projects

The Commission is authorized, empowered, and directed to perform acts as may be necessary to conduct and establish cooperative fish restoration projects as defined in the Dingell-Johnson Sport Fish Restoration Act, in compliance with said act and rules and regulations promulgated by the Secretary of Interior thereunder.

LA R.S. 56:40.2

The Commission shall adopt rules to establish guidelines for determining the value of injured or destroyed fish based upon recommendations of department staff and other relevant factors.

LA R.S. 56:301.5 Commission rules and regulations

The Commission may promulgate rules and regulations concerning any aspect of licensing not specifically provided for.

LA R.S. 56:313 Control of fisheries

The Commission has exclusive control of fish having a game or commercial value in the state.

LA R.S. 56:315 Sanctuaries and propagating places

The Commission may operate and maintain hatcheries, sanctuaries and propagating places for the protection and propagation of fish and may restrict fishing in any manner it deems advisable.

LA R.S. 56:325.1 Size and possession limits for recreational saltwater finfish

The Commission may set by rule daily take, possession, and size limits for saltwater finfish caught recreationally in Louisiana territorial waters, based on biological and technical data.

LA R.S. 56:325.4 Commercial taking of other saltwater finfish

The Commission shall monitor and evaluate the condition of black drum in Louisiana waters and establish management targets to ensure a sustainable population. A report of the status of the stock and an evaluation of management measures shall be submitted every five years to the legislature no later than March first of that year.

LA R.S. 56:326 Size and possession limits; commercial fish

The Commission shall have the authority to set seasons, regulate the type of gear used, and set possession limits for speckled trout and other estuarine fish in Calcasieu Lake, located in Calcasieu and Cameron Parishes, where it is clearly demonstrated that intense fishing competition exists, or if pollution levels exceed accepted standards, or if biological studies indicate the need.

LA R.S. 56:326.1 Size limits

The Commission shall have the authority to set size limits for all saltwater fish for which no limits have been set by law.

LA R.S. 56:326.3 Possession limits; size limits, seasons, quotas, times, and daily take limits

The Commission may set possession limits, quotas, places, seasons, times, size limits, and daily take limits based upon biological and technical data, for all saltwater finfish taken or possessed in Louisiana waters.

LA R.S. 56:326.4 Staggered and split seasons

The Commission may split, stagger or otherwise arrange seasons and quotas for fishing in such a manner as to maximize the availability of popular fish for serving in Louisiana restaurants throughout the year.

LA R.S. 56:327 Sale or purchase of freshwater or saltwater game fish prohibited; commercial sales and purchases, commercial license required; commercial fingerlings and certified mariculture and aquaculture fish excepted; penalties

The Commission shall hold public hearings to determine areas in which the saltwater fish resources of the state must be allocated between the competing sport and commercial interests and shall promulgate rules and regulations defining such areas and the manner in which the saltwater fish resources shall be allocated.

Appendix V. Authorities and Duties of the Secretary and the Louisiana Department of Wildlife and Fisheries

According to LA R.S. 56 and LAC 76, the Secretary and LDWF's authorities and duties related to black drum include:

LA R.S. 56:6.1 Emergency closures

The Secretary, in an emergency, may declare a closed season on any or all species of fish found or existing in the waters of the state or may restrict fishing in the closed season in any manner deemed advisable.

LA R.S. 56:17 Permits

The director may take fish of any kind in any manner or place for the purpose of science and cultivation and distribution and may grant permits to other persons for the same purpose.

LA R.S.56:301.4 Records; confidentiality

The Department shall draft regulations, prescribing procedures to preserve the confidentiality of all fishery dependent data, information, or statistics submitted or collected pursuant to the provisions of this Section (licensing), for approval by the Wildlife and Fisheries Commission and promulgation in accordance with the Administrative Procedure Act. These regulations shall provide for compliance with all procedures set forth by the United States Department of Commerce, or any of its agencies or instrumentalities, for the confidentiality of fishing statistics collected from individuals or firms by that department, its agencies, or instrumentalities.

LA R.S.56:313 Control of fisheries; duty of the department

The Department shall enforce the provisions of the law regulating fish having game or commercial value in the state. The Department through its authorized agents shall confiscate all fish taken, possessed, or transported, contrary to the provisions of LA R.S. 56:313

LA R.S. 56:318 Permits

The Department may take fish of any kind when, where, and in such manner as may be deemed necessary for scientific or educational purposes and for propagation and distribution.

The Secretary may issue permits to any persons to take fish for scientific or educational purposes or for propagation or distribution.

LA R.S. 56:327 Sale or purchase of freshwater or saltwater game fish prohibited; commercial sales and purchases, commercial license required; commercial fingerlings and certified mariculture and aquaculture fish excepted; penalties

The Secretary shall have authority to set seasons, regulate type of gear used, and set possession limits for estuarine fish where it is clearly demonstrated that intense fishing competition exists or if pollution levels exceed adopted standards or if biological studies indicate the need.

LA R.S. 56:431.1 Devices to protect oysters from predation

The Department may permit the use, with limitations, on leased acreage of devices to protect oysters from predation and shall promulgate rules and regulations for such a permit, with certain requirements.

LA R.S. 56:571 Experimental Gear

The Secretary may issue permits to persons who are interested in the development of new gear and equipment to harvest fish.

LA R.S. 56:579.1(B) Mariculture permits

The Secretary may issue permits for mariculture projects within the coastal zone and exempt permittees from statutory limitations to the kind, number or size of fish which may harvested or as to the method of harvesting or taking fish, seasons or other limitations.

LA R.S. 56:640.3 Right to fish

The Department shall recommend the elimination or restriction of any fishing gear currently in use or which may be used in recreational or commercial fisheries in implementing its management responsibilities or in response to any emergency situation. While elimination or restriction may have uneven impacts on different groups of fishermen, the proposed measures should be applicable to all people of the state. In addition to acquiring the best available biological data, the Department shall use all practicable means to collect all relevant social and economic data in support of such allocation decision making efforts.

LAC 76:331 Black Drum Size Limits, Daily Take, Possession Limits, and Quotas

A. 8. The Secretary of the Department of Wildlife and Fisheries shall, by public notice, close the commercial fishery(s) for black drum when the quota(s) has been met or is projected to be met. The closure shall not take effect for at least 72 hours after notice to public.

LAC 76:385 Management Targets for Selected Finfish Species

A. Policy. ... If data indicate that a stock is not meeting or is likely not to meet thresholds established in the assessment of the stock, the department shall provide, for the Louisiana Wildlife and Fisheries Commission's consideration, management options to ensure that a stock can remain within the management thresholds established for that particular stock.

	Alabama	Florida	Mississippi	Texas	Delaware	Maryland	New Jersey	North Carolina	Virginia
Licensing	Commercial Saltwater Fishing License ($121 resident, $241 nonresident); gear license (fee varies by type)	Saltwater Products License ($50 resident, $200 nonresident), Restricted Species Endorsement ($0)	Commercial Saltwater License ($100 resident, varies nonresident)	Commercial Finfish Fisherman's License ($360 resident, $1,440 nonresident)	Commercial Fishing License (fee not available)	Finfish Hook and Line License ($37.50) OR Finfish Harvester All Gears ($100)	Gear License (fee varies by type)	Standard Commercial Fishing License (fee not available)	Commercial Fisherman Registration License ($190); gear licenses (fee varies by gear type); Gill Net Permit; Black Drum Harvesting and Selling Permit
Seasons	None	None	None	None	Year-round until quota is reached	Year-round in Atlantic Ocean, closed in coastal bays	Not specific to black drum but specific to gear types/area	None	Year-round until quota is reached
Size Limits	None	14- to 24-inch slot limit	None	14- to 30-inch slot limit	16-inch minimum size limit	16-inch minimum size limit	16-inch minimum size limit	14- to 25-inch slot limit, one over 25 inches allowed	16-inch minimum size limit
Harvest Limits	None	500 pounds per person or vessel, whichever is less, per day	None	None	10,000 pounds per person or vessel, whichever is less, per day; 65,000 pound annual quota	1,500 pound annual limit	65,000 pound annual quota; 10,000 pound daily vessel limit	500 pound trip limit	120,000 pound annual quota; no more than one per day on hook and line, rod and reel, or handline
Gear Restrictions and Requirements	Allowable gear (in general): hook and line, rod and reel, cast net, trotline, spear, bow and arrow	Legal gear: hook and line, cast net, seine, spear, gig; prohibition on any multiple hook in conjunction with live or dead natural bait, snagging	Legal gear: hook and line, trotline, bow, spear, gig, cast net, brill net, small-mesh beach seine, trammel net, or gill net; area, size, mesh size, and material restrictions on nets and seines	Fishermen prohibited from using gill nets, trammel nets, strike nets, and seines; gear tags required on trotlines; must use circle hooks with natural bait and may fish no more than 20 trotlines at a time; trotlines prohibited in certain areas	Areas closed to gill nets, gill net mesh size restrictions	Restrictions on gill nets in certain areas and times	Yes	Nets, other commercial gear prohibited in certain areas/times; requirements for gill nets: mesh size, buoy markings, length; limits on finfish possession for trawlers; purse seines prohibited; permit required for pound nets, requirements for marking, stakes/buoys, reflective tape/devices, setting, escape panels	Restriction on gill nets and trotlines in certain areas and times; gill net mesh size and tending restrictions with exemptions for permitted fishermen

	Alabama	Florida	Mississippi	Texas	Delaware	Maryland	New Jersey	North Carolina	Virginia
Limited Entry	None	None	None	Yes; moratorium on the sale of licenses/license management program; buyback provision	None	Yes (for commercial fishing licenses)	Gill net limited entry program	None	Yes
Professionalism					None	Yes (apprenticeship program)	None	None	None
Other	None	A commercial fisherman may not use more than one vessel to harvest black drum	None	None	Dealer limit: may not accept more than 10,000 pounds of black drum from a commercial fisherman or vessel in a day	None	Dealer limit: may not accept more than 10,000 pounds of black drum from a commercial fisherman or vessel in a day	None	Black Drum Buyer Permit required for buyers

	Alabama	Florida	Mississippi	Texas	Delaware	Georgia	Maryland	New Jersey	North Carolina	South Carolina	Virginia
Licensing	Saltwater Fishing License ($23.35 resident, varies by state for nonresident)	Saltwater Fishing License ($17 resident, $47 nonresident)	Saltwater Fishing License ($10 resident, $30 nonresident)	Fishing License and Saltwater Fishing Endorsement (package $35 resident, $63 nonresident); Saltwater Trotline Tag for trotlines ($5)	General Fishing License ($8.50 resident, $20 nonresident)	Fishing License ($15 resident, $50 nonresident)	Chesapeake Bay and Coastal Sport Fishing License ($15 resident, $22.50 nonresident)	Fishing License ($22.50 resident, $34 nonresident)	Coastal Recreational Fishing License ($15 resident, $30 nonresident); Recreational Commercial Gear License to use commercial gear to harvest fish for personal consumption	Saltwater Recreational Fishing License ($10 resident, $35 nonresident); Gear License depending on the type of gear	Saltwater Recreational Fishing License ($17.50 resident, $25 nonresident); Gear License (fee varies by type)
Seasons	None	None	None	None	None	None	Year-round	None	None	None	None
Size Limits	None	14- to 24-inch slot limit, with one over 24 inches allowed	None	14- to 30-inch slot limit, with one over 52 inches allowed	16-inch minimum size limit	14-inch minimum size limit	16-inch minimum size limit	16-inch minimum size limit	14- to 25-inch slot limit, one over 25 inches is allowed	14- to 27-inch slot limit	16-inch minimum size limit
Harvest Limits	None	Five per person per day	None	Five per person per day	Three per person per day	15 per person per day	One per person per day; six per boat per day	Three per person per day	10 per person per day	Five per person per day	One per person per day
Gear Restrictions and Requirements		Legal gear: hook and line, cast net, seine, spear, gig; prohibition on any multiple hook in conjunction with live or dead natural bait, snagging	Legal gear: hook and line, trotline, bow, spear, gig, cast net brill net, small-mesh beach seine, trammel net, or gill net; area, size, mesh size, and material restrictions on nets and seines	Legal saltwater gear: nets (mainly bait only), gig, bow, pole and line, sail line, spear/ spear gun, trawl, trotline; restrictions include size, tagging, amount, construction/ design, placement/ location, and operation		No seines as gill nets, no gigs except for flounder	Legal gear for tidal waters: bait traps, hook and line/ rod and reel/ handlines, jugs, nets (cast, seine, dip, landing), bow/gig/ spear/spear gun, hand and noodling; restrictions/ requirements for marking, number of hooks, time/ area, size/ mesh size	Only handline or rod and reel, spearfishing		Legal gear: bush/pole lines, hook and line, gig (certain areas/times), cast nets, seines, and gill nets (license required; restrictions on size, marking, setting, and amount), trotlines (license required, restrictions on hooks, amount of lines, and marking)	Legal gear: rod-and-reel (hook and line), handline, spear or gig, cast net, or up to two eel pots; additional license required for gill net, dip net

Appendix VIII. Federal Management Institutions

The following list of federal management institutions was adapted from a similar list in Leard et al. (1993).

Black drum fisheries operate almost exclusively in state waters; landings occasionally come from federal waters. Federal agencies do not directly manage black drum, and the Gulf Council has not developed a fishery management plan for black drum. However, through their administration of laws, regulations, and policies, certain federal agencies may influence the black drum resource and fisheries and management thereof.

Regional Fishery Management Councils

Under the MSA, federal authorities are responsible for monitoring and managing fisheries resources in federal waters (from the seaward boundary of state waters to 200 nautical miles offshore). Federal management is based on fishery management plans developed by regional fishery management councils, including the Gulf Council. Each council prepares plans for each fishery requiring management within its geographical area of authority and amends such plans as necessary. Plans are implemented as federal regulation through the U.S. Department of Commerce (DOC). As there is no significant fishery for black drum in federal waters of the Gulf, the Gulf Council has not developed a management plan for black drum.

U.S. Department of Commerce

The Secretary of the DOC (Secretary of Commerce), acting through NOAA Fisheries, has the ultimate authority to approve or disapprove all fishery management plans prepared by regional fishery management councils. Where a council fails to develop a plan, or to correct an unacceptable plan, the Secretary of Commerce may do so.

NOAA Fisheries

NOAA Fisheries collects data and statistics on fisheries and fishermen. It performs research and conducts management authorized by international treaties. NOAA Fisheries has the authority to enforce the MSA and the Lacey Act and is the federal trustee for living and nonliving natural resources in coastal and marine areas under U.S. jurisdiction. NOAA Fisheries exercises no management jurisdiction with respect to black drum in the Gulf. It conducts some research and data collection programs and comments on all projects that affect marine fishery habitat.

NOAA's Office of Ocean and Coastal Resource Management

NOAA's Office of Ocean and Coastal Resource Management (OCRM), in conjunction with coastal states, administers the National Estuarine Research Reserve and National Marine Sanctuaries Programs as authorized under Section 315 of the Coastal Management Act of 1972. Under these programs, OCRM establishes protected areas which serve to provide suitable habitat for estuarine and marine species and serve as sites for research and education activities related to coastal management issues. These areas are managed under specific management plans that may include restrictions on harvest and use of marine and estuarine species. Such plans could directly affect harvest of black drum.

OCRM may also influence fishery management for black drum indirectly through administering the Coastal Zone Management Program and by setting standards and approving funding for state coastal zone management programs. These programs often affect estuarine habitat on which black drum depend.

Department of the Interior's National Park Service

Under the Department of the Interior (DOI), the National Park Service (NPS) may regulate fishing activities within park boundaries. Such regulations could affect black drum harvest if implemented within a given park area.

DOI's U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS) has little direct management authority over black drum. However, commercial fishing is prohibited in the USFWS's coastal national wildlife refuges. The USFWS may also affect the management of black drum through the Fish and Wildlife Coordination Act, under which USFWS and NOAA Fisheries review and comment on proposals for projects such as dredging, filling, and marine construction that could affect black drum and their habitat.

U.S. Environmental Protection Agency

Through its administration of the Clean Water Act (CWA) and the National Pollutant Discharge Elimination System (NPDES), the U.S. Environmental Protection Agency (EPA) provides protection for black drum and their habitat. The EPA may disapprove or add conditions to applications for permits to discharge pollutants into estuarine waters to protect these marine resources.

Under Section 312 of the CWA, the EPA regulates the equipment that treats or holds sewage (marine sanitation devices) and establishes areas in which the discharge of sewage from vessels is not allowed (No Discharge Zones, or NDZs) to help protect human health and the aquatic environment from disease-causing microorganisms that may be present in sewage from vessels and boats. An individual state can petition the EPA to officially designate an NDZ to: (1) to protect aquatic habitats where pumpout facilities are available, (2) to protect special habitats or species, and/or (3) to protect human drinking water intake zones. Once a designation is official, the state and the USCG, if applicable, enforce the limits of the NDZ. This means that the discharge of untreated and treated sewage is strictly forbidden and subject to fine if violated. Also, the USCG can board vessels in an NDZ to verify that they have adequate facilities.

The EPA and a local sponsor jointly administer the National Estuary Program. This program evaluates estuarine resources, local protection, and development of policies, and seeks to develop future management plans. Numerous user groups including industry, environmentalists, recreational and commercial interests, and policymakers provide input on these plans. The Barataria-Terrebonne estuarine complex in Louisiana became a National Estuary in 1990.

U.S. Army Corps of Engineers

Black drum populations may be influenced by the U.S. Army Corps of Engineers' (Corps) responsibilities pursuant to the CWA and Section 10 of the Rivers and Harbors Act. Under these laws, the Corps issues or denies permits to individuals and other organizations for proposals to dredge, fill, and construct in wetland areas and navigable waters. The Corps is also responsible for planning, construction, and maintenance of navigation channels and other projects in aquatic areas; these projects could affect black drum and their habitat.

U.S. Coast Guard

The USCG is responsible for enforcing fishery management regulations adopted by the DOC pursuant to management plans developed by the Gulf Council. The USCG also enforces laws regarding marine pollution and marine safety, and they assist commercial and recreational fishing vessels in times of need. Although no regulations have been promulgated for black drum in the EEZ, enforcement of laws affecting marine pollution and fishing vessels could influence black drum populations.

U.S. Food and Drug Administration

The U.S. Food and Drug Administration (FDA) directly regulates the harvest and processing of seafood through its administration of the Food, Drug, and Cosmetic Act and other regulations that prohibit the sale and transfer of contaminated, putrid, or otherwise potentially dangerous foods. The FDA reserves the right and authority to enforce the Food, Drug, and Cosmetic Act (FDCA) and other regulations if the states fail to do so.

Appendix IX. Federal Laws, Regulations, and Policies

The following federal laws, regulations, and policies may directly and/or indirectly influence the quality, abundance, and ultimately the management of black drum. This list was adapted from a similar list in Leard et al. (1993).

Fishery Conservation and Management Act of 1976 (later renamed the Magnuson Fishery Conservation and Management Act and then the Magnuson-Stevens Fishery Conservation Act), and subsequent reauthorizations

The MSA extended U.S. jurisdiction from 12 nautical miles offshore to 200 nautical miles and established regional fishery management councils. The MSA mandates the councils to prepare fishery management plans for important fishery resources within federal waters. These plans must comply with certain conservation and management requirements laid out in the MSA, including national standards for sustainable fisheries management. Congress has reauthorized the MSA twice, once in 1996 and again in 2007. The 1996 reauthorization strengthened requirements to prevent overfishing and rebuild overfished fisheries; added definitions for overfishing, overfished, and fishing communities; added three new national standards to address fishing vessel safety, fishing communities, and bycatch and also revised several existing standards; and addressed needs for improved fishery monitoring, enhanced research, greater consideration of fishing communities, identification of essential fish habitat, formation of constituent advisory panels, and analysis of fishing capacity, among other activities. The 2006 reauthorization featured a number of new requirements to prevent overfishing by establishing annual catch limits and accountability measures; promote market-based management strategies, including limited access privilege programs such as catch shares; strengthen the role of science through peer review, the councils' Scientific and Statistical Committees, and MRIP; and enhance international fisheries sustainability by addressing illegal, unregulated, and unreported fishing and bycatch.

Interjurisdictional Fisheries Act of 1986

The Interjurisdictional Fisheries Act (IJF) established a program to promote and encourage state activities in support of management plans, to promote and encourage management of interjurisdictional fisheries resources throughout their range, and to promote and encourage research in preparation for the implementation of the use of ecosystems and interspecies approaches to the conservation and management of interjurisdictional fisheries resources throughout their range. The enactment of this legislation repealed the Commercial Fisheries Research and Development Act.

Federal Aid in Sport Fish Restoration Act, commonly called the Dingell-Johnson Act or the Wallop-Breaux Act

The Federal Aid in Sport Fish Restoration Act (SFRA) provides funds to states, the USFWS, and the GSMFC to conduct research, planning, and other programs for enhancing and restoring marine sportfish populations.

Marine Protection, Research, and Sanctuaries Act of 1972 (Titles I and III) and the Shore Protection Act of 1988

The Marine Protection, Research, and Sanctuaries Act (MPRSA) provides protection of fish habitat through establishing and maintaining marine sanctuaries. The MPRSA and the Shore Protection Act (SPA) regulate ocean transportation and dumping of dredged materials, sewage sludge, and other materials. Criteria for issuing permits for such activities include considering effects of dumping on the marine environment, ecological systems, and fisheries resources.

Federal Food, Drug, and Cosmetic Act of 1938

The FDCA prohibits the sale, transfer, or importation of "adulterated" or "misbranded" products. Adulterated products may be defective, unsafe, filthy, or produced under unsanitary conditions. Misbranded products may have false, misleading, or inadequate information on their labels. In many instances, the FDCA also requires FDA approval for distribution of certain products.

Federal Water Pollution Control Act of 1948, the Clean Water Act of 1972, and amendments

The Federal Water Pollution Control Act (FWPCA) was the first major U.S. law to address water pollution. It was significantly amended in 1972 and became commonly known as the Clean Water Act (CWA). The CWA's NPDES program regulates point sources that discharge pollutants into waters of the United States. Any facility that discharges directly into U.S. waters must have an NPDES permit issued by the EPA. Discharges of pollutants into rivers and estuaries that empty into the Gulf can harm or kill marine fisheries resources and alter habitats. The EPA has authorized the Louisiana to implement its own NPDES program to monitor program compliance and control water pollution.

Section 404 of the CWA regulates the placement of dredged or fill material into wetlands, lakes, streams, rivers, estuaries and certain other types of waters to avoid and minimize losses to wetlands and other waters and to compensate for unavoidable loss through mitigation and restoration. The EPA and the Corps jointly administer Section 404. The Corps issues Section 404 permits and monitors compliance with the issued permits. Both the Corps and EPA are responsible for on-site investigations and enforcement of unpermitted discharges under Section 404. USFWS and NOAA Fisheries evaluate impacts of federally permitted projects on fish and wildlife.

The CWA prohibits discharge of oil or hazardous substances to U.S. waters or their adjoining shorelines in quantities that may be harmful to the public health or welfare or the environment. Owners and operators of non-transportation-related oil facilities must make and implement plans to prevent oil discharges. Some oil storage facilities and vessels must also prepare and submit plans for responding to discharges of oil and hazardous substances. If a facility or vessel discharges oil to navigable waters or adjoining shorelines, the owner/operator is required to follow certain federal reporting requirements. National and area response plans must also be developed. EPA regional personnel periodically conduct inspections to ensure compliance with these regulations.

International Convention for the Prevention of Pollution from Ships

The International Convention for the Prevention of Pollution from Ships (MARPOL) is the main international convention that covers prevention of pollution of the marine environment by ships from operational or accidental causes. MARPOL is divided into annexes, each of which regulates a particular group of ship emissions including oil and oily water, bulk noxious liquid substances, harmful substances carried by sea in packaged form, sewage, garbage, and air pollution. As a signatory to MARPOL, the United States implemented the Act to Prevent Pollution from Ships to comply with the provisions of this convention. The Marine Plastic Pollution Research and Control Act later amended the Act to Prevent Pollution from Ships.

Clean Vessel Act of 1992, as amended

Congress passed the Clean Vessel Act (CVA) to help reduce pollution from vessel sewage discharges. The CVA was created to provide a viable alternative to the overboard disposal of recreational boater sewage. All recreational vessels must have access to pumpouts funded under the CVA. The CVA made grants available to the states on a competitive basis for the construction and/or renovation, operation and maintenance of pumpout and portable toilet dump stations. States may sub-grant to public and private marinas to install pumpouts. The USFWS administers this grant program. The CVA also provides a portion of its total funding for educational outreach regarding the effects of boater sewage and how boaters can avoid improper sewage disposal.

Coastal Zone Management Act of 1972, as amended

Under the Coastal Zone Management Act (CZMA), states receive federal assistance grants to maintain federally-approved planning programs for enhancing, protecting, and using coastal resources. These are state programs, but the CZMA requires that federal activities must be consistent with the respective states' coastal zone management programs. Depending upon the individual state's program, the CZMA provides the opportunity for considerable protection and enhancement of fisheries resources by regulation of activities and by planning for future development in the least environmentally damaging manner.

Endangered Species Act of 1973, as amended

The ESA provides for the listing of plant and animal species that are threatened or endangered. Once listed as threatened or endangered, a species may not be taken, possessed, harassed, or otherwise molested. It also provides for a review process

to ensure that projects authorized, funded or carried out by federal agencies do not jeopardize the existence of these species or result in destruction or modification of habitats that are determined by the Secretary of the DOI to be critical.

National Environmental Policy Act of 1970

The National Environmental Policy Act (NEPA) requires that all federal agencies recognize and give appropriate consideration to environmental amenities and values in the course of their decision-making. To create and maintain conditions under which man and nature can exist in productive harmony, NEPA requires that federal agencies prepare an environmental impact statement (EIS) prior to undertaking major federal actions that significantly affect the quality of the human environment. Within these statements, federal agencies must carefully assess alternatives to the proposed action that may better safeguard environmental values.

Fish and Wildlife Coordination Act of 1958

Under the Fish and Wildlife Coordination Act, the USFWS and NOAA Fisheries review and comment on fish and wildlife aspects of proposals for work and activities sanctioned, permitted, assisted, or conducted by federal agencies that take place in or affect navigable waters, wetlands, or other critical fish and wildlife habitat. The review focuses on potential damage to fish, wildlife, and their habitat; therefore, it serves to provide some protection to fisheries resources from activities that may alter critical habitat in nearshore waters. This Act is important because federal agencies must give due consideration to the recommendations of the USFWS and NOAA Fisheries.

Fish Restoration and Management Projects Act of 1950

Under this act, the DOI is authorized to provide funds to state fish and game agencies for fish restoration and management projects. Funds for protection of threatened fish communities that are located within state waters could be made available under this Act.

Lacey Act of 1981, as amended

The Lacey Act prohibits import, export, and interstate transport of illegally taken fish and wildlife. As such, the Act provides for federal prosecution for violations of state fish and wildlife laws. The potential for federal convictions under this Act has probably reduced interstate transport of illegally possessed fish and fish products.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, commonly called Superfund

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) names NOAA Fisheries as the federal trustee for living and nonliving natural resources in coastal and marine areas under U.S. jurisdiction. It could provide funds for cleanup of fishery habitat in the event of an oil spill or other polluting event.

Fish and Wildlife Act of 1956

This Act provides assistance to states in the form of law enforcement training and cooperative law enforcement agreements. It also allows for disposal of abandoned or forfeited property with some equipment being returned to states. The Act prohibits airborne hunting and fishing activities.

Appendix X. Commercial and Recreational Black Drum Fishery Regulations—Detailed Text

In general, black drum management and conservation is covered in state law through LA R.S. 56 and rules promulgated by the Commission within LAC 76. These regulations are listed below.

Commercial Black Drum Regulations

Licensing

Commercial Fisherman's License

- A commercial fisherman taking fish, including bait species, from state waters or possessing fish in the state must purchase a commercial fisherman's license. LA R.S. 56:303(A)(1)
- The cost of the commercial fisherman's license is $55 for residents and $460 for nonresidents. LA R.S. 56:303(B)
- A commercial fisherman's license is valid for one year, beginning on January 1 of each calendar year and expiring on December 31 of the same calendar year. LA R.S. 56:303.1(A)
- A commercial fisherman's license may be purchased at any time of the year for the current license year and from November 15 for the immediately following license year.. LA R.S. 56:303.1(B)
- The person in charge of the operation of each vessel engaged in commercial fishing must have, in his possession and in his name, a valid, original commercial fisherman's license. This person must also have in his possession a gear license indicating that the applicable gear fee has been paid and, if applicable, a vessel license. LA R.S. 56:303.2(A)
- A resident of this state who is seventy years of age or older may obtain a senior commercial fishing license for an annual fee of $20. The senior commercial fishing license shall be valid from January 1 of each calendar year until December 31 of the same calendar year. The license may be purchased at any time for the current license year and may be purchased after November 15 for the following license year. The license shall be in lieu of a commercial fisherman's license required by this Section and shall also serve in lieu of any commercial gear licenses that may be required by any activities engaged in by the license holder. LA R.S. 56:303(F)
- The holder of a commercial fisherman's license may transport and sell his own catch to any licensed Louisiana wholesale/retail seafood dealer located within the state of Louisiana. The holder of a commercial fisherman's license may transport and sell his own catch to a consumer only within the state and only when in possession of a fresh products license as provided in LA R.S. 56:303.1.1. However, if he purchases fish for resale or transports his catch out of the state of Louisiana, or if he sells fish to a retail seafood dealer, restaurant, or retail grocer, he becomes a wholesale/retail seafood dealer and must obtain a wholesale/retail seafood dealer's license and is governed by the laws, rules, and regulations concerning wholesale/retail seafood dealers. LA R.S. 56:303.7(A)
- Whenever the holder of a commercial fisherman's license sells or transfers possession of his own catch to a wholesale/retail seafood dealer, he shall present the license to the dealer for license verification. The commercial fisherman shall provide the wholesale/retail seafood dealer with all information, as determined by the commission to be necessary to properly manage the fishery resources of the state, that is required to complete the commercial receipt form, which shall include but not be limited to the fisherman's first and last name, license number, signature, gear used, vessel used, primary location of where fish were caught, duration of trip, and permit numbers for species requiring a permit to harvest. The commercial fisherman shall sign each commercial receipt form attesting that the information provided therein is correct. LA R.S. 56:303.7(B)
- A commercial fisherman selling fish under the authority of a fresh product license specified in LA R.S. 56:303.1.1 shall record all information required on the commercial receipt forms, except that the fresh product license number shall be recorded in place of the wholesaler/retailer seafood dealer's license number. The fresh product licensee shall complete monthly returns to the department as specified in LA R.S. 56:306.6 for wholesale/retail seafood dealers. The commercial fisherman shall sign each commercial receipt form attesting that the information provided therein is correct. LA R.S. 56:303.7(C)

Fresh Products License

- A commercial fisherman selling his catch directly to a consumer shall possess a fresh products license. LA R.S. 56:303(A)(2) and LA R.S. 56:303.1.1(A)
- The cost of a fresh products license shall be $20 for residents and $120 for nonresidents. The fresh products license

shall be valid for one year, beginning on January 1 of each calendar year and expiring on December 31 of the same calendar year. LA R.S. 56:303.1.1(B)

- Anyone holding a fresh products license shall, on or before the 10th day of each month, submit to the department, on forms provided or approved by the department for that purpose, information required by the department as provided in LA R.S. 56:303.7. LA R.S. 56:303.1.1(D)
- A commercial fisherman may purchase a secondary fresh products license for a spouse if he provides the spouse's name and social security number to the department. This secondary license will allow the commercial fisherman to continue to fish while the spouse sells the catch. The secretary of the Department of Wildlife and Fisheries shall promulgate rules and regulations implementing the provisions of this Subsection. The department is authorized to collect a fee for issuance of the license not to exceed $5 which, after compliance with Article VII, Section 9(B) of the Constitution of Louisiana relative to the Bond Security and Redemption Fund, shall be credited to the Conservation Fund. LA R.S. 56:303.1.1(E)
- A commercial fisherman selling fish under the authority of a fresh product license specified in LA R.S. 56:303.1.1 shall record all information required on the commercial receipt forms, except that the fresh product license number shall be recorded in place of the wholesaler/retailer seafood dealer's license number. The fresh product licensee shall complete monthly returns to the department as specified in LA R.S. 56:306.6 for wholesale/retail seafood dealers. The commercial fisherman shall sign each commercial receipt form attesting that the information provided therein is correct. LA R.S. 56:303.7(C)

Vessel License

- A vessel shall be licensed whenever engaged in commercial fishing in or whenever possessing fish for sale in the saltwater areas of the state defined in LA R.S. 56:322. A vessel may be licensed whenever engaged in commercial fishing in or whenever possessing fish for sale in the freshwater areas of the state defined in LA R.S. 56:322. LA R.S. 56:304(A)
- The cost of the vessel license is $15 for residents and $60 for nonresidents. LA R.S. 56:304(B)
- Vessel licenses are issued in the name of the owner of the vessel and shall list the owner's name and address, the vessel name and registration or documentation number, and any other information required by the department. LA R.S. 56:304(D)
- A vessel license is valid for one year, beginning on January 1 of each calendar year and expiring on December 31 of the same calendar year. LA R.S. 56:304.1(A)
- A vessel license may be purchased at any time of the year for the current license year and from October 1 for the immediately following license year. LA R.S. 56:304.1(B)
- It is unlawful for the owner of a commercial fishing vessel licensed under this Subpart to permit any person not holding a valid, original commercial fisherman's license to operate such licensed vessel while the vessel is engaged in commercial fishing or while the vessel is possessing fish for sale in the waters of the state. LA R.S. 56:304.2(A)
- A vessel engaged in commercial fishing and operated by a person not possessing a valid, original commercial fisherman's license subjects the vessel owner to revocation of the vessel license and seizure of the vessel and all fish and equipment thereon. LA R.S. 56:304.2(B)
- Vessel licenses are not transferable except as provided by rule or regulation of the department. LA R.S. 56:304.5(A)
- The name of a vessel for which a vessel license has been issued cannot be changed without prior notification to the department. LA R.S. 56:304.5(B)
- The person in charge of the operation of each vessel engaged in commercial fishing must have, in his possession and in his name, a valid, original commercial fisherman's license. This person must also have in his possession a gear license indicating that the applicable gear fee has been paid and, if applicable, a vessel license. LA R.S. 56:303.2(A)

Commercial Gear Licenses

- A commercial fisherman must possess a commercial gear license indicating that the applicable gear fee has been paid whenever using or possessing on the fishing grounds any gear listed in Subsection B. LA R.S. 56:305(A)
- Resident commercial gear fees are listed in LA R.S. 56:305(B)
- The commercial gear fee for nonresidents is four times the gear fee for residents. LA R.S. 56:305(C)(1)(a)
- No commercial gear license allowing the use of specific fishing gear shall be issued to any nonresident whose domiciliary state prohibits the use of similar commercial fishing gear. LA R.S. 56:305(C)(2)

- In the event more than one gear type is in possession on the fishing grounds the gear fee for each type of gear must be paid and so indicated on the gear license. LA R.S. 56:305(D)
- A gear fee must be paid for each piece of gear or each type of gear, whichever is applicable, being used to take fish or, if the gear is not in use but is in possession on the fishing grounds, the gear fee must be paid for each piece of gear or type of gear, whichever is applicable, intended for use or which was used to take fish. LA R.S. 56:305(E)
- Any commercial fisherman who purchases a trawl, skimmer, or butterfly gear license must also pay an annual fee of $10 (residents) or $40 (nonresidents) for deposit into the Shrimp Marketing and Promotion Account as provided for in LA R.S. 56:10(B)(1)(b)(i). LA R.S. 56:305(G)
- A commercial gear license is valid for one year, beginning on January 1 of each calendar year and expiring on December 31 of the same calendar year. LA R.S. 56:305.1(A)
- A commercial gear license may be purchased at any time of the year for the current license year and from October first for the immediately following license year. LA R.S. 56:305.1(B)
- A commercial gear license can only be purchased by a person possessing a valid commercial fisherman's license. LA R.S. 56:305.2(A)
- A valid commercial gear license may be transferred for temporary use only to a person holding a valid commercial fisherman's license and having the same residency status as indicated on the license being transferred. Gear licenses that require qualification shall not be transferred and may only be used by the person to whom it was issued. LA R.S. 56:305.3(A)
- A commercial gear license used by a person not holding a valid, original commercial fisherman's license and using gear under privilege of the commercial fisherman's license is subject to revocation. LA R.S. 56:305.3(B)
- The person in charge of the operation of each vessel engaged in commercial fishing must have, in his possession and in his name, a valid, original commercial fisherman's license. This person must also have in his possession a gear license indicating that the applicable gear fee has been paid and, if applicable, a vessel license. LA R.S. 56:303.2(A)

Wholesale/Retail Seafood Dealer's License

- A commercial fisherman selling his catch to anyone other than a consumer or a licensed Louisiana wholesale/retail seafood dealer must possess a wholesale/retail seafood dealer's license as provided in R.S. 56:306 et seq. LA R.S. 56:303(A)2
- Any person buying, acquiring, or handling, from any person, by any means whatsoever, any species of fish, whether fresh, frozen, processed, or unprocessed, in Louisiana from within or outside the state, for sale or resale, including bait species, whether on a commission basis or otherwise, is a wholesale/retail seafood dealer and must purchase a wholesale/retail seafood dealer's license. A licensed wholesale/retail seafood dealer may act as a retail seafood dealer as specified in LA R.S. 56:306.1. LA R.S. 56:306(A)(1)
- A wholesale/retail seafood dealer shall include but not be limited to: (a) The owner or operator of any fish factory, platform, soft shell crab shedding facility, or other processing plant. (b) A person shipping fish out of or into the state. LA R.S. 56:306(A)(2)
- The license shall be in the name of the licensee and shall list the legal mailing address and the physical location of the place of business, and any other information required by the department. If the place of business is a vehicle, then the license shall state "vehicle" and shall list the legal mailing address and physical location of the licensee. LA R.S. 56:306(B)(1)
- If the licensee owns or operates more than one place of business, then an additional wholesale/retail seafood dealer's license must be purchased for each additional place of business or vehicle. The additional licenses shall be in the same name of the operator, list a different license number than the original license, list the legal mailing address and the location of the place of business, and any other information required by the department. LA R.S. 56:306(B)(3)
- The cost of the wholesale/retail seafood dealer's license is t$250 for residents and $1,105 for nonresidents. LA R.S. 56:306.2(A)(1)
- A wholesale/retail seafood dealer's license is valid for one year, beginning on January 1 of each calendar year and expiring on December 31 of the same calendar year. LA R.S. 56:306.3(A)
- A wholesale/retail seafood dealer's license may be purchased at any time of the year for the current license year and from October 1 for the immediately following license year. LA R.S. 56:306.3(B)
- The department may also authorize the purchase of a wholesale/retail seafood dealer's license for a four-year period at four times the cost of the annual license fee. LA R.S. 56:306.3(C)

- Wholesale/retail seafood dealers shall buy directly from commercial fishermen validly licensed in Louisiana, and when purchasing fish for which a permit is required of the commercial fisherman, such dealers shall purchase only from those commercial fishermen possessing a valid permit. Wholesale/retail seafood dealers validly licensed in Louisiana, and in the case of wholesale/retail seafood dealers purchasing fish from out-of-state sellers and bringing the fish into Louisiana, shall purchase only from those persons from whom a wholesale/retail seafood dealer can legally purchase fish in the state of purchase, and from no one else. LA R.S. 56:306.4(A)(1)
- Each wholesale/retail seafood dealer who purchases fish from a licensed commercial fisherman shall record the sale on the three-part receipt form provided for in LA R.S. 56:303.7. The dealer shall copy the name and license number on the receipt form. The dealer, at the time of the sale, shall provide the commercial fisherman with a sales receipt which shall be one part of the three-part receipt form. All wholesale/retail seafood dealers shall comply with the records requirements contained in LA R.S. 56:306.5. LA R.S. 56:306.4(A)(2)
- Wholesale/retail seafood dealers can sell to anyone within or without the state. LA R.S. 56:306.4(B)

Retail Seafood Dealer License

- Any person buying, acquiring, or handling by any means whatsoever, from a Louisiana wholesale/retail seafood dealer, any species of fish whether fresh, frozen, processed, or unprocessed, that sells to the consumer for personal or household use and any person who ships fish out of or within the state of Louisiana to the consumer for personal or household use shall purchase a retail seafood dealer's license. LA R.S. 56:306.1(A)
- The license shall be in the legal name of the licensee and shall list the legal mailing address and physical location of the place of business and any other information required by the department. If the place of business is a vehicle, the license shall state "vehicle" and shall list the legal mailing address and physical location of the licensee. LA R.S. 56:306.1(B)(1)
- If the licensee owns or operates more than one place of business, then an additional retail seafood dealer's license must be purchased for each additional place of business or vehicle. The additional licenses shall be in the same name of the business, list a license number which shall be different than the original license, list the legal mailing address and the physical location of that place of business, and any other information required by the department. LA R.S. 56:306.1(B)(3)
- The cost of the retail seafood dealer's license is $105 for residents and $405 for nonresidents. LA R.S. 56:306.2(A)(2)
- A retail seafood dealer's license is valid for one year, beginning on January 1 of each calendar year and expiring on December 31 of the same calendar year. LA R.S. 56:306.3(A)
- A retail seafood dealer's license may be purchased at any time of the year for the current license year and from October 1 for the immediately following license year. LA R.S. 56:306.3(B)
- The department may also authorize the purchase of a retail seafood dealer's license for a four-year period at four times the cost of the annual license fee. LA R.S. 56:306.3(C)
- Retail seafood dealers, restaurants, and retail grocers shall buy directly only from wholesale/retail seafood dealers licensed in Louisiana. When a retail seafood dealer, restaurant, or retail grocer purchases fish from an out-of-state seller and brings the fish into the state, he shall buy directly from those persons from whom he can legally purchase fish in the state of purchase. When a restaurant or retail grocer buys fish from an out-of-state seller and brings the fish into the state, the restaurant or retail grocer shall be licensed in accordance with the provisions of LA R.S. 56:306 or 306.1 and shall possess a valid transport license when bringing such fish into the state. LA R.S. 56:306.4(C)(1)
- Restaurants and retail grocers who only purchase fish, whether fresh, frozen, processed, or unprocessed, from a licensed wholesale/retail seafood dealer and only sell such fish fully prepared by cooking for immediate consumption by the consumer, need not be licensed in compliance with the provisions of this Subpart. LA R.S. 56:306.4(C)(2)

Transport License

- Operators and drivers of any form of commercial transport, except common carriers, who are in the act of loading, unloading, or transporting fish shall have in their possession at least one of the following licenses:
  - (1) A commercial fisherman's license.
  - (2) A wholesale/retail dealer's license.
  - (3) A transport license. LA R.S. 56:307(A)
- Transport license requirements shall not apply to fish or fish products which are the result of processing as defined in LA R.S. 56:8. LA R.S. 56:307(C)

- The cost of a transport license is $30 per vehicle and can only be purchased by a person holding a valid Louisiana commercial fisherman's license or valid Louisiana wholesale/retail dealer's license. LA R.S. 56:307.1(A)
- The transport license shall be in the name of and bear the license number of the purchaser and shall state "transport license". LA R.S. 56:307.1(B)
- The transport license may be applied for in the same manner and is valid for the same one-year period as that of the purchaser's license. LA R.S. 56:307.1(C)
- The department may also authorize the purchase of a four-year transport license at four times the cost of the annual license fee. LA R.S. 56:307.1(D)
- A person transporting fish under privilege of a transport license is prohibited from buying or selling, by any means whatsoever, any species of fish. The provisions of this Section shall not apply to a person transporting fish under the privilege of a Louisiana transport license purchased in connection with a Louisiana wholesale/retail dealer's license when that person buys fish for or on behalf of the wholesale/retail dealer to whom such transport license was issued and only transports such fish to that wholesale/retail dealer. LA R.S. 56:307.2(A) and (B)
- A validly licensed commercial fisherman or wholesale/retail dealer may purchase any number of transport licenses. LA R.S. 56:307.3
- Transport licenses are freely transferable between vehicles, but the licensee remains responsible for all activities taking place under authority of that license. LA R.S. 56:307.5
- When a restaurant or retail grocer buys fish from an out-of-state seller and brings the fish into the state, the restaurant or retail grocer shall be licensed in accordance with the provisions of LA R.S. 56:306 or 306.1 and shall possess a valid transport license when bringing such fish into the state. LA R.S. 56:306.4(C)(1)

Legal Gear and Gear Requirements

- "Trotline" means a line which is four hundred forty yards or less to which hoop drops are tied at various intervals or gangions and hooks are attached and which may be retrieved manually or by electric or hydraulic haulers. LA R.S. 56:8(140)
- Commercial finfish may be taken with pole, line, the device known as a yo-yo, the device known as a trigger device, handline, with any trotline wherein hooks are not less than 24 inches apart, approved slat traps, cans and minnow traps, with legal seines and nets, with bows and arrows, or by any skin diver in saltwater or freshwater, when submerged in water and using standard spearing equipment, and by no other means except as provided in Subsection C of this Section. In the saltwater areas of the state as defined in R.S. 56:322(A) and (B), commercial finfish may be taken by means of rod and reel. Violation of this Paragraph constitutes a class three violation. LA R.S. 56:320(B)(1)
- No person shall take or possess fish taken by means of spears, poisons, stupefying substances or devices, explosives, guns, tree-topping devices, lead nets, except as provided in R.S. 56:329(B), electricity, or any instrument or device capable of producing an electric current used in shocking said fish...It shall be unlawful to possess any of the prohibited instruments, weapons, substances, or devices set out hereinabove with the intent to take fish in violation of the provisions of this Section. LA R.S. 56:320(C)(1)
- No person shall use or deploy within the state territorial waters bandit gear or longline gear. A person may possess bandit gear or longline gear aboard a vessel within state territorial waters so long as such gear is not in use or deployed to take fish. No person shall possess fish taken within the state territorial waters using bandit gear or longline gear. LA R.S. 56:320(C)(2)
- It shall be unlawful for any person to use or employ any aircraft including fixed wing aircraft, dirigibles, balloons, helicopters, or any other form of aerial surveillance in the airspace of this state to assist in the taking of finfish except in the fisheries of menhaden and herring-like fish as defined in Title 76, Section 311 of the Louisiana Administrative Code. Any aircraft, boat, or vessel and equipment utilized in the taking of finfish and any fish taken or possessed, except in the fisheries of menhaden and other herring-like fish, contrary to the provisions of this Subsection shall be subject to confiscation. Violation of this Subsection constitutes a class 5-A violation. LA R.S. 56:320(G)
- No person shall use, possess, or have in his possession, or have aboard any vessel, a gill net, trammel net, strike net, or seine in the saltwater areas of the state as defined in LA R.S. 56:322(A) and (B), except as provided in LA R.S. 56:318 and 320.2. A violation of the provisions of this Section shall constitute a class six violation. LA R.S. 56:320.1(A) and (B)
- No person shall set, maintain, take, or attempt to take fish from any trotline of which any segment of the staging line measures in excess of four feet where any portion of any hook extends above the surface of the waters of any of the

bodies of waters within the state of Louisiana. However, this Section shall not apply to White Lake in Vermilion Parish and Grand Lake and Lake Misere in Cameron Parish. Any violation of the provisions of this Section shall constitute a class two violation, LA R.S. 56:32. LA R.S. 56:321(A)

- No trawling shall be permitted in inside waters during the closed season. No vessel may pull more than the following trawl rigging in inside waters:
  - (a) One trawl which shall not exceed fifty feet in length along the corkline and sixty-six feet along the lead line and in addition, one test trawl.
  - (b) Two trawls which shall not exceed twenty-five feet along the corkline, thirty-three feet along the lead line, and have trawl doors no larger than eight feet in length and forty-three inches in height and, in addition, one test trawl.
  - (c) Two trawls which shall not exceed twenty-five feet along the corkline, thirty-three feet along the lead line, and have no more than two outer trawl doors no larger than eight feet in length and forty-three inches in height and no more than two inner sled doors, and in addition, one test trawl. LA R.S. 56:495.1(A)(1)
- It shall be legal for a vessel in Breton and Chandeleur Sounds to pull no more than one or two trawls, either or both of which cannot exceed sixty-five feet along the corkline and eighty-two feet along the lead line in length, plus one test trawl. LA R.S. 56:495(A)(2)
- Fishing with a butterfly net or skimmer net shall be prohibited in inside waters during the closed season. LA R.S. 56:495(B)
- In outside waters, no vessel shall pull more than four trawls and one test trawl. LA R.S. 56:495(C)
- Only a rod and reel shall be used for the commercial harvest of spotted sea trout...The commercial taking or sale by a commercial fisherman of spotted sea trout is prohibited except by special permit issued by the Department of Wildlife and Fisheries at a cost of one hundred dollars for residents of this state and four hundred dollars for those who are nonresidents. LA R.S. 56:325.3(A)(1) and (C)
- The commercial taking of spotted seatrout is prohibited except by special nontransferable Spotted Seatrout Permit issued by the Department of Wildlife and Fisheries at the cost of $100 for residents of this state and $400 for those who are nonresidents. This permit, along with other applicable licenses, authorizes the bearer to sell his spotted seatrout catch. LAC 76:VII.341.A.3.a

Seasons

- The fishing year for black drum shall begin on September 1, 1990 and every September 1 thereafter. LAC 76:VII.331.A.6
- Once the black drum commercial quota(s) has been met, the purchase, barter, trade or sale of black drum taken in Louisiana after the closure is prohibited. The commercial taking or landing of black drum in Louisiana, whether caught within or without the territorial waters of Louisiana after the closure is prohibited. Nothing in this rule shall be deemed to prohibit the possession of fish legally taken prior to the closure order. LAC 76:VII.331.A.7.
- The Secretary of the Department of Wildlife and Fisheries shall, by public notice, close the commercial fishery(s) for black drum when the quota(s) has been met or is projected to be met. The closure shall not take effect for at least 72 hours after notice to public. LAC 76:VII.331.A.8

Size and Possession Limits

- The minimum legal size for the recreational or commercial taking of black drum shall be 16 inches total length. LAC 76:VII.331.A.2
- It is provided further that commercial harvesters using legal gear shall be allowed to take and possess and sell black drum over 27 inches in unlimited quantities until the annual quota has been met in compliance with all other rules and regulations. LAC 76:VII.331.A.3
- The annual commercial quota for 16 to 27-inch black drum shall be 3,250,000 pounds. LAC 76:VII.331.A.4
- The annual commercial quota for black drum over 27 inches shall be 300,000 fish. LAC 76:VII.331.A.5

Bycatch

- No person shall waste any fish of this state. As used in this Section, "waste" means the harvesting of any fish for commercial purposes which results in the excessive killing of such fish. LA R.S. 56:409.1(A)
- Excessive killing shall be defined as "the killing resulting from taking or attempting to take any fish in excess of what the possessor thereof can process, utilize, or transport from the fishing grounds. Shrimp and shrimping operations are

excluded." LAC 76:VII.313.B
- No person shall purchase, sell, exchange, or offer for sale or exchange, or possess or import with intent to sell or exchange any game fish as defined in R.S. 56:8. LA R.S. 56:327(A)(1)
- The commercial taking or landing of red drum in Louisiana is prohibited. LA R.S. 56:325.3(B)
- Only a rod and reel shall be used for the commercial harvest of spotted sea trout...The commercial taking or sale by a commercial fisherman of spotted sea trout is prohibited except by special permit issued by the Department of Wildlife and Fisheries at a cost of one hundred dollars for residents of this state and four hundred dollars for those who are nonresidents. LA R.S. 56:325.3(A)(1) and (C)
- The commercial taking of spotted seatrout is prohibited except by special nontransferable Spotted Seatrout Permit issued by the Department of Wildlife and Fisheries at the cost of $100 for residents of this state and $400 for those who are nonresidents. This permit, along with other applicable licenses, authorizes the bearer to sell his spotted seatrout catch. LAC 76:VII.341.A.3.a

Area Restrictions

- Except as provided in Paragraph (2) of this Subsection, no obstructions including trawls, skimmer nets, butterfly nets, fyke nets, wings or leads, seines, gill nets, or trammel nets which interfere with the free passageway for fish as defined herein shall be set within five hundred feet of the mouth of any inlet or pass, or within five hundred feet of any water control structures, dams, or weirs. LA R.S. 56:329(B)(1)
- Trawling, skimming, or butterflying on White Lake in Cameron and Vermilion parishes and Grand Lake in Cameron Parish from official sunset to official sunrise is hereby prohibited. LA R.S. 56:410
- The taking of fish, shrimp, and other seafood from the waters of the Lake Catherine and Lake Pontchartrain Sanctuary by use of trawls, skimmer nets, butterfly nets, seines, or traps or other netting, with the exception of cast nets, drop nets, or scoop nets, is hereby prohibited. LA R.S. 56:804(B)
- The areas within a 1/4-mile radius on the lake side only of the Lambert, Grand Bayou, Mangrove, and Peconi water control structures (otherwise identified as Structures No. 5, 1, 8 and 4 respectively), and the area within a 1/8-mile radius on the lake side only of the water control structure on No Name Bayou, all within the Calcasieu Lake system; the area within a 1/4-mile radius on the lake side only of the mouths of West Cove Bayou, West Cove Canal and the Sabine Refuge Headquarters Canal where they empty into Calcasieu Lake; and the area within a 1/4-mile radius on the lake side only of the mouths of Three Bayous and Willow Bayou where they empty into Sabine Lake, are fish sanctuaries and closed zones, and that all netting of fish by any means or method, including but not limited to trawls, butterfly nets, gill nets, seines, or trammel nets, is hereby prohibited, with the exception of hand cast nets, crab traps and crab drop nets. LAC 76:VII.333
- Commercial fishing is prohibited in the following areas:
  - Elmer's Island Wildlife Refuge LAC 76:III.337
  - Salvador / Timken Wildlife Management Area LAC 76:XIX.111.A
  - Pointe aux Chenes Wildlife Management Area except in Cut Off Canal and Wonder Lake LAC 76:XIX.111.A
  - Marsh Island Wildlife Refuge LAC 76:III.310.4
  - State Wildlife and Paul J. Rainey Refuges LAC 76:III.323.A.4
  - White Lake Wetlands Conservation Area LAC 76:III.335
  - Rockefeller Wildlife Refuge LAC 76:III.309.5
  - Isle Dernieres Barrier Island Refuge LAC 76:III.331

Federal Area Restrictions

- Commercial fishing is prohibited in the following coastal national wildlife refuges:
  - Big Branch Marsh National Wildlife Refuge
  - Bayou Sauvage National Wildlife Refuge
  - Breton National Wildlife Refuge
  - Delta National Wildlife Refuge
  - Mandalay National Wildlife Refuge
  - Shell Keys National Wildlife Refuge
  - Lacassine National Wildlife Refuge
  - Cameron Prairie National Wildlife Refuge

- Sabine National Wildlife Refuge

Operational Restrictions

- All saltwater finfish except tuna, swordfish, and sharks possessed by a commercial fisherman shall have the head and caudal fin intact until set or put on shore or when sold. All saltwater finfish shall be measured in accordance with applicable law. LA R.S. 56:326(E)(1)(a)

Fishing Gear Interactions

- It shall be unlawful for any person to knowingly and intentionally use or employ any net to encircle a vessel or to otherwise knowingly and intentionally use or employ any vessel or fishing gear to interfere with the lawful fishing of another. LA R.S. 56:320(I)(1)
- It shall be unlawful for any person to knowingly and intentionally use or employ any vessel or recreational gear to interfere with the lawful commercial fishing of another. LA R.S. 56:320(I)(2)

Packaging

- The secretary of the Department of Wildlife and Fisheries is authorized to adopt rules and regulations in accordance with the Administrative Procedure Act establishing standards for the packaging of seafood in Louisiana for wholesale or retail sale. Those standards may govern the quality, contents, and weight of all seafood packaged in this state. The Louisiana Seafood Promotion and Marketing Board may make recommendations to the secretary for standards for the packaging of seafood. For purposes of this Section, retail sale shall not include food service establishments which only serve food prepared for on premises or off premises consumption as defined by LA R.S. 40:5.5(E). LA R.S. 56:578.10
- Shipments containing fish shall be plainly marked, the tags or certificates to show the date and names of the consignor and the consignee, with an itemized statement of the number of pounds of fish and the names of each kind contained therein. Bills of lading issued by a common carrier for such shipments shall state the number of packages which contain fish, and the date and names of the consignor and consignee, with an itemized statement of the number of pounds of fish and the names of each kind contained therein. Shipments of fish of any species and fish products shall be subject to inspection by enforcement agents of the department while in transit and upon leaving the state. LA R.S. 56:307.7(A)

Recordkeeping and Reporting Requirements

- Wholesale/retail seafood dealers, retail seafood dealers, restaurants, and retail grocers shall keep, in the English language the following (LA R.S. 56:306.5(A)):
- Records of the quantity and species of fish acquired, the date the fish was acquired, and the name and license number of the wholesale/retail seafood dealer or the out-of-state seller from whom the fish was acquired. When creel limits apply to commercial species, records shall also indicate the number by head count of such species of fish. LA R.S. 56:306.5(A)(1)
- Records of the quantity and species of fish sold, the date the fish was sold, and the name and license number of the person to whom the fish was sold. When sold to the consumer, the records shall indicate the quantity, species, and date and shall state that the fish was sold to the consumer. LA R.S. 56:306.5(A)(2)
- Wholesale/retail seafood dealers purchasing or acquiring fish from commercial fisherman shall complete a commercial receipt form. The commercial receipt form shall be a three-part form signed by both the commercial fisherman and the wholesale/retail seafood dealer or his designee, attesting to that the information required to be provided by each is correct. One part of the receipt form shall be retained by the wholesale/retail seafood dealer, one part shall be given to the commercial fisherman at the time of the transaction, and one part shall be transmitted to LDWF. LA R.S. 56:306.5(B)(1)
- Wholesale/retail seafood dealers are responsible for recording on the commercial receipt form that information provided by the commercial fisherman and are responsible for the following information at the time of purchase or transfer of possession of the catch from a commercial fisherman to a wholesale/retail seafood dealer: wholesale/retail seafood dealer's name and license number, commercial fisherman's name, license number and signature, transaction date, species identification, quantity and units of each species, size and condition of each species, unit price of each

species, and permit number for species requiring a permit to harvest. LA R.S. 56:306.5(B)(2)
- Required records must be maintained for three years and shall be open to inspection by LDWF. LA R.S. 56:306.5(C)
- Each wholesale/retail seafood dealer shall, on or before the 10th of each month, make a return to the department of all commercial receipt forms representing actual transactions from every commercial fisherman during the preceding month. All commercial receipt forms submitted by a dealer shall be accompanied by a monthly submission sheet signed by the wholesale/retail seafood dealer certifying that the transactions submitted represent all of the transactions by that dealer from commercial fishermen for that particular month. LA R.S. 56:306.6(A)
- A commercial fisherman selling fish under a fresh products license shall record all information required on trip tickets, except that the fresh products license number shall be recorded in place of the wholesaler/retailer seafood dealer's license number. The fresh products licensee shall complete monthly returns to LDWF as specified for wholesale/retail seafood dealers. The commercial fisherman shall sign each commercial receipt form attesting that the information provided therein is correct. LA R.S. 56:303.7(C)

Louisiana Finfish Task Force

- There is hereby established the Louisiana Finfish Task Force to study and monitor the finfish industry and to make recommendations to the Wildlife and Fisheries Commission, the Department of Wildlife and Fisheries, and other state agencies for the maximization of benefit from that industry for the state of Louisiana and its citizens. LA R.S. 56:301.10(A)
- The task force shall be composed as follows:
  - The governor or his designee.
  - Three members appointed by the secretary of the Department of Wildlife and Fisheries as follows:
    - One member who is a fisheries biologist.
    - One member who is an enforcement agent.
    - One member who is an economist.
  - The commissioner of the Department of Agriculture and Forestry or his designee.
  - The secretary of the Louisiana Department of Health or his designee.
  - Three members and three alternate members appointed by the governor each of whom shall possess a commercial fisherman's license with a "certified" endorsement pursuant to LA R.S. 56:303(E), with three to be selected from a list of six nominees submitted by the Louisiana Shrimp Association and three to be selected from a list of six nominees submitted by the Delta Commercial Fisheries Association.
  - One member appointed by the governor who is an active Louisiana dock buyer of finfish.
  - Three members and three alternate members appointed by the governor each of whom shall possess recreational freshwater and saltwater fishing licenses, with four to be selected from a list of eight nominees submitted by the Coastal Conservation Association Louisiana and two to be selected from a list of four nominees submitted by the Louisiana Chapter of the Bass Anglers Sportsman Society (B.A.S.S.).
  - One member of the Senate appointed by the president of the Senate.
  - One member of the House of Representatives appointed by the speaker of the House of Representatives. LA R.S. 56:301.10(B)
- The members appointed pursuant to the provisions of Paragraphs (B)(l) through (4) of this Section shall be nonvoting members. In addition, they shall not be considered members of the task force for determination of the number of members necessary for a quorum and for establishing the presence of a quorum. LA R.S. 56:301.10(C)
- The task force shall adopt bylaws under which it shall operate, and five voting members of the task force shall constitute a quorum sufficient to conduct meetings and business of the task force. The governor shall appoint the chairman of the task force for a period of one year, and thereafter the task force shall elect a chairman from its membership and may seek and receive assistance from universities within the state in the development of methods to increase production and marketability of finfish. The members of the task force shall serve without compensation; however, the task force may receive the same reimbursement of travel expenses for attending the meetings as is allowed for other state employees' travel, except all legislative members of the commission shall receive the same per diem and travel allowance for attending meetings of the task force or any meeting thereof as is normally provided for members of the legislature. LA R.S. 56:301.10(D)
- The task force is hereby charged with responsibility to do the following:
  - Coordinate efforts to increase finfish production and marketability.

- Provide for the study of the decline in finfish marketability and market price, provide for the study of the impacts of imported finfish on the domestic market, assist in the development of a state finfish inspection program, assist in the development of a Louisiana finfish certification and branding program, and make recommendations to the Wildlife and Fisheries Commission, the Department of Wildlife and Fisheries, the Department of Natural Resources, the Department of Agriculture and Forestry, and the Louisiana Department of Health for implementation of policies to help enhance the domestic finfish industry.
- Make recommendations with respect to issues pertaining to the finfish industry and finfish production to the various state agencies charged with responsibility for differing elements of the finfish industry in this state, including the Department of Wildlife and Fisheries, the Department of Natural Resources, the Coastal Protection and Restoration Authority, the Louisiana Department of Health, the Department of Agriculture and Forestry, and the legislature.
- Develop markets and marketing strategies for the development and expansion of markets for finfish harvested from Louisiana waters.
- Represent the interests of the Louisiana finfish industry before federal and state administrative and legislative bodies on issues of importance to the Louisiana finfish industry.
- Contract for legal services to represent the interests of the Louisiana finfish industry in judicial, administrative, and legislative proceedings.
- Perform any acts deemed necessary and proper to carry out its duties and responsibilities. LA R.S. 56:301.10(E)

Louisiana Seafood Promotion and Marketing Board

- Recognizing that the commercial fishing industry in Louisiana has reached an ebb economically, creating an environment which has or could place, not only commercial fishermen, but also wholesale and retail dealers in dire economic straits, which situation could have an extreme economic impact on the state economy as a whole if nothing is done to alleviate the situation, and recognizing that there exist barriers and impediments to the economic well-being of the commercial fishery industry in Louisiana and recognizing that among these barriers and impediments, the virtual void in this state of any cohesive, coordinated and comprehensive seafood promotion and marketing effort and stratagem has a significant negative impact on the seafood industry, the Legislature of Louisiana does hereby establish the Louisiana Seafood Promotion and Marketing Board in an effort to aid the industry in two vital aspects--product promotion and marketing development. LA R.S. 56:578.1(A)
- The purpose of this Subpart, then, is to enhance the public image of commercial fishery products, thereby promoting the consumption of these products and, further, to assist the seafood industry, including commercial fishermen and wholesale and retail dealers, in market development so as to better utilize existing markets and to aid in the establishment of new marketing channels. Attention to the promotion and marketing of non-traditional and underutilized species of seafood would be inherent in the purpose of the council established herein. LA R.S. 56:578.1(B)

Louisiana Wild Seafood Certification Program

- A certification program for Louisiana wild fish, as defined in LA R.S. 56:8, and for Louisiana wild seafood products which are taken, harvested, or landed in Louisiana. LAC 76:I.701
- Must possess one of the following resident or nonresident Louisiana licenses: commercial fisherman's license; senior commercial fisherman's license; fresh products dealer license; seafood wholesale/retail dealer; or seafood retail dealer. LAC 76:I.701.C.1.a
- Wholesale/retail dealers must have their facility located within Louisiana. Retailers are not required to have their facility located within Louisiana. LAC 76:I.701.C.1.b
- Eligible participants not requiring an LDWF license include in-state restaurants or grocers who only sell seafood that is fully prepared by cooking for immediate consumption by the consumer, and all out-of state retailers. LAC 76:I.701.C.1.c
- Must possess and be in compliance with all other state and federal permits, licenses, and laws regarding the buying, acquiring, or handling, from any person, by any means whatsoever, any species of fish or seafood products,whether fresh, frozen, processed, or unprocessed, for sale or resale, whether on a commission basis or otherwise. LAC 76:I.701.C.1.d
- Product considered eligible to possess the LWSCP logo must meet the following criteria:

- Eligible wild seafood includes crab, oysters, freshwater finfish, saltwater finfish, crawfish, and shrimp. Seafood must be wild-caught, taken from Louisiana waters or from the U.S. Gulf of Mexico (Gulf) and any other adjacent state waters, and landed in Louisiana. Farmed and/or aquaculture products are excluded from program participation. LAC 76:I.701.C.2.a
- Seafood must be taken by a Louisiana licensed commercial fisherman. Seafood must be landed in Louisiana and either be sold under an LWSCP-participating fish products dealer license, or be purchased and/or physically acquired by a wholesale/retail seafood dealer participating in the LWSCP. Transfer of product throughout the supply chain must be between LWSCP participants until the product has been placed in sealed and LWSCP-labeled retail packaging. LAC 76:I.701.C.2.b
- Seafood commingled with any other seafood that does not meet the above requirements, domestic or foreign, shall be prohibited from possessing the LWSCP label. LAC 76:I.701.C.2.c

Recreational Black Drum Regulations

Licensing

- A recreational fisherman must purchase a basic recreational fishing license to use the following gear or to possess fish on the fishing grounds which have been caught for recreational purposes:
  - Hook and line
  - Bow and arrow
  - A barbless spear, or a multi-pronged barbed gig
  - Castnets with a radius not to exceed eight feet six inches
  - Frog gigs or catchers
  - Scuba gear. LA R.S. 56:302(A)
- In addition to a basic recreational fishing license, a recreational fisherman over the age of sixteen years using any gear listed in LA R.S. 56:302.3 must purchase a recreational gear license as provided therein. Anyone under the age of sixteen years shall not be required to purchase or possess a gear license. However, any person using crawfish nets, dip nets, landing nets, minnow traps, crab nets, or crab lines for the purpose of taking fish for recreational purposes shall not be required to purchase or possess a basic recreational fishing license or be required to purchase a gear license. LA R.S. 56:302(B)
- The cost of the annual basic recreational fishing license is $9.50 for residents and $60 for nonresidents, except that residents using a rod or fishing pole, hook and line, without a reel and without using artificial bait shall pay $2.50 per year; however, any person required by this Part to possess a basic $2.50 license shall be subject to a maximum fine of $5 for not possessing the license as herein required, and there shall be no court costs associated with the fine. LA R.S. 56:302.1(A)
- In addition to the annual basic recreational fishing license, any person fishing in the saltwater areas of the state defined in LA R.S. 56:322 must purchase a saltwater license. The fee for the annual saltwater license is $5.50 for residents and $30 for nonresidents. As a condition of the application for and the granting of the saltwater license, all saltwater finfish caught or transported by the license holder while the license is in effect are presumed to have been taken in the waters of Louisiana. LA R.S. 56:302.1(C)(1)(a)
- Between June 1, 2014, and May 31, 2022, in addition to the fee required by Subparagraph (a) of this Paragraph for purchase of a saltwater fishing license, there shall be an additional fee of $7.50 to be paid for each license purchased by a resident that shall be credited to the Saltwater Fish Research and Conservation Fund, LA R.S. 56:10(B)(1)(g). The commission is authorized to increase the additional fee to an amount not to exceed $9.50. The increase in the additional fee shall be used for the administration and conducting of the saltwater fish stock estimate. LA R.S. 56:302.1(C)(1)(c)
- The saltwater license is not required for residents possessing a $2.50 basic recreational fishing license and using only a rod or fishing pole, hook and line, without a reel and without using artificial bait. LA R.S. 56:302.1(C)(3)
- A recreational fisherman must possess, in addition to a basic recreational fishing license, a recreational gear license indicating that the applicable gear fee has been paid, whenever using or possessing on the fishing grounds any gear listed in Subsection B. LA R.S. 56:302.3(A)
- Recreational gear fees are found in LA R.S. 56:302.3(B).
- The gear fee for nonresidents is four times the gear fee for residents. LA R.S. 56:302.3(C)

- A valid recreational gear license may be transferred for temporary use only to a person holding a basic fishing license and having the same residency status as indicated on the license being transferred. LA R.S. 56:302.3(E)
- Basic recreational licenses, freshwater trout licenses, saltwater licenses, and recreational gear licenses are valid beginning June 1 of each calendar year and expiring on June 30 of the following calendar year. However, through promulgation and adoption of rules and regulations therefor, the department may issue recreational licenses and recreational gear licenses for a period of one year from the date of issuance. Any such rule promulgated and adopted under the provisions of this Section shall supersede the licensure period delineated in this Section prior to the adoption of the rule. LA R.S. 56:302.4(A)

Legal Gear and Gear Requirements

- Freshwater and saltwater recreational fish may be taken by means of rod, fishing pole, hook and line, trolling line, handline, bait casting, fly casting apparatus, crawfish nets, by use of devices known as yo-yos or trigger devices, bow and arrow, recreational hoop nets, recreational wire nets, recreational slat traps, standard spearing equipment used by a skin diver sport fishing in saltwater or freshwater when submerged in the water, recreational pipes, recreational buckets, recreational drums, recreational tires, and recreational cans, and by no other means except a barbless spear or a multi-pronged barbed gig that may be used in saltwater for taking flounder. Recreational wire nets and recreational hoop nets authorized for use under the provisions of this Section shall be used only in the geographical areas of the state designated as freshwater under the provisions of LA R.S. 56:322. LA R.S. 56:320(A)(1)
- No person shall take or possess fish taken by means of spears, poisons, stupefying substances or devices, explosives, guns, tree-topping devices, lead nets, except as provided in LA R.S. 56:329(B), electricity, or any instrument or device capable of producing an electric current used in shocking said fish; except a barbless spear or a multi-pronged barbed gig that may be used in salt water for taking flounder. LA R.S. 56:320(C)(1)
- No person shall use or deploy within the state territorial waters bandit gear or longline gear. A person may possess bandit gear or longline gear aboard a vessel within state territorial waters so long as such gear is not in use or deployed to take fish. No person shall possess fish taken within the state territorial waters using bandit gear or longline gear. LA R.S. 56:320(C)(2)

Size and Possession Limits

- The daily take and possession limit for black drum caught recreationally within or without Louisiana waters shall be five fish per day and in possession. LAC 76:VII.3.331.A.1
- The minimum legal size for the recreational or commercial taking of black drum shall be 16 inches total length. LAC 76:VII.331.A.2
- The maximum legal size for the recreational taking of black drum shall be 27 inches total length; provided however that recreational fishermen shall be allowed to take and possess no more than one black drum per day over 27 inches. LAC 76:VII.3.331.A.3

Operational Restrictions

- No person shall sell or barter any fish that has been taken recreationally or under the authority of any type of recreational fishing license or with any recreational gear. LA R.S. 56:302.10(A)
- All saltwater recreational finfish shall have the head and caudal fin intact until set or put on shore. All saltwater recreational finfish shall be measured in accordance with applicable law. LA R.S. 56:325.2(A)
- No person shall possess any finfish parts, such as filleted fish, while aboard a vessel on the water. For the purpose of consumption at sea aboard the harvesting vessel, a person shall have no more than two pounds of finfish parts per person on board the vessel, provided that the vessel is equipped to cook such finfish and such finfish does not exceed applicable bag limits. LA R.S. 56:325.2(B)

Fishing Gear Interactions

- It shall be unlawful for any person to knowingly and intentionally use or employ any vessel or recreational gear to interfere with the lawful commercial fishing of another. LA R.S. 56:320(I)(2)

Appendix XI. Chronology of Major Changes to Louisiana's Black Drum Fisheries Regulations

1986

Legislature outlaws the use of purse seines in Louisiana waters, except to harvest menhaden and herring-like species (Act 387).

1989

Commission establishes regulations for a minimum size limit of 16 inches total length (TL) and a maximum size limit of 27 inches TL for commercial and recreational harvest (although some harvest of black drum over 27 inches is allowed); establishes commercial quotas of 3.25 million pounds for 16 to 27-inch black drum and 300,000 head (i.e. individuals) for black drum longer than 27 inches; requires commercial bull drum permit for commercial harvest of black drum longer than 27 inches; and establishes a five fish per person recreational bag and possession limit, with only one fish over 27 inches allowed.

1991

Legislature changes licensing regulations so that saltwater gill nets are licensed separately and establishes a $250 fee for licensee to use any legal number of gill nets in saltwater areas of the state (Act 887).

1995

Legislature bans the use of entanglement nets (gill nets, seines, and trammel nets) in saltwater areas of Louisiana; establishes special gear permits and licenses allowing limited use of these gear for catching black drum seasonally until March 1, 1997; prohibits commercial fishing under these restrictions at night and on weekends; and creates a commercial rod and reel license that may be used to catch black drum and can only be obtained after certain strict criteria are met (Act 1316, Marine Resources Conservation Act of 1995).

1997

All harvest of black drum by entanglement nets is banned; legal commercial gear to harvest black drum is limited to trawl, set line, and hook and line.

2000

Legislature provides for creation of commercial fishing reporting and recordkeeping requirements (trip ticket program; Act 130)

Commission discontinues commercial bull drum permit system as trip ticket program makes it possible to monitor harvest of the two commercial quotas without requiring individual harvest reports.

2008

Legislature modifies LA R.S. 56:325.4 to require LDWF to monitor and evaluate the condition of the black drum stock in Louisiana waters and submit a peer reviewed report of the findings of the evaluation to the Legislature biennially no later than March 1 of each even numbered year; the report shall contain the SPR and biological condition and profile of the species and stock assessment (Act 38).

2010

Legislature modifies LA R.S. 56:325.4 to require LDWF to monitor and evaluate the condition of the black drum stock in Louisiana waters and submit a peer reviewed report of the findings of the evaluation to the Legislature every five years; the report shall contain the SPR and biological condition and profile of the species and stock assessment; if data indicate that the SPR is below 30 percent, LDWF shall within two weeks after such finding close the season for at least one year or provide for the Commission's consideration management options derived from data that indicate that the SPR is estimated

to have at least a 50 percent chance of recover to a 30 percent ratio within 10 years or some other appropriate recovery period based on the biology of the black drum stock, environmental conditions, and the needs of the fishing communities (Act 607).

2016

Legislature modifies LA R.S. 56:325.4 to require LDWF to establish management targets for black drum to ensure a sustainable population (Act 205).

Commission subsequently adopts LAC 76:385 to establish that biomass targets must be based upon the average (geometric mean) SSB from the stock's historical time series.

Appendix XII. Penalties for Regulatory Violations

Classes of violations vary by legislative statute or Commission rule. Penalties for each class of violation are below (LA R.S. 56:31-37.1):

- Class One: First offense—fine of $50, imprisonment for no more than 15 days, or both; second offense—fine of $75-250, imprisonment of 30-60 days, or both; third and subsequent offenses—fine of $250-550 and imprisonment of 30-90 days
- Class Two: First offense—fine of $100-350, imprisonment of no more than 60 days, or both; second offense—fine of $300-550 and imprisonment of 30-60 days; third and subsequent offenses—fine of $500-750, imprisonment of 60-90 days, and forfeiture of anything seized in connection with the violation
- Class Three: First offense—fine of $250-500, imprisonment of no more than 90 days, or both; second offense—fine of $500-800, imprisonment of 60-90 days, and forfeiture of anything seized in connection with the violation; third and subsequent offense—fine of $750-1,000, imprisonment of 90-120 days, and forfeiture of anything seized in connection with the violation. In addition to any other penalty, for a second or subsequent violation of the same provision of law the penalty imposed may include revocation of the permit or license under which the violation occurred for the period for which it was issued and bar the issuance of another permit or license for that same period.
- Class Four: First offense—fine of $400-950, imprisonment of no more than 120 days, or both; second offense—fine of $750-999 and imprisonment of 90-180 days; third and subsequent offenses—fine of $1,000-5,000 and imprisonment of 180 days to two years. All Class Four penalties include forfeiture of anything seized in connection with the violation.
- Class Five-A: First offense—fine of $500-750 and imprisonment of 15-30 days; second offense—fine of $750-1,000 and imprisonment of 60-90 days; third and subsequent offenses—fine of $750-1,000 and imprisonment of 90-120 days. All Class Five penalties include forfeiture of anything seized in connection with the violation. In addition, the license under which the violation occurred shall be revoked and not reinstated at any time during the period for which it was issued and for one year thereafter.
- Class Five-B: First offense—fine of $350-500 and imprisonment of 30 days; second offense—fine of $500-1,000 and imprisonment of 60 days; third and subsequent offenses—fine of $1,000-2,000 and imprisonment of 90 days. All Class Five penalties include forfeiture of anything seized in connection with the violation. In addition, the license under which the violation occurred shall be revoked and not reinstated at any time during the period for which it was issued and for one year thereafter.
- Class Six: For each offense, a fine of $900-950, imprisonment of no more than 120 days, or both, as well as forfeiture of anything seized in connection with the violation.
- Class Seven-A: For each offense, a fine of $5,000-7,500, imprisonment for one year, or both, as well as forfeiture of anything seized in connection with the violation.
- Class Seven-B: For each offense, a fine of $5,000-7,500 and imprisonment for one year, as well as forfeiture of anything seized in connection with the violation.
- Class Eight: For each offense, a fine of $5,000-7,000 and imprisonment for 60 days to six months.

In addition to all other penalties, anyone convicted of Class 1-4, 6, and 7 violations may have their license under which the violation occurred revoked for the period for which it was issued. LA R.S. 56:38(A)

In addition to all other penalties, violators shall forfeit any black drum seized in connection with their violation upon conviction. LA R.S. 56:39

Anyone who kills, catches, takes, possesses, or injures any wildlife or aquatic life in violation of Title 56, regulations adopted pursuant to Title 56, or a federal statute or regulation governing fish and wildlife, or, through the violation of any other state or federal law or regulation, kills or injures any wildlife and aquatic life, is liable to the state for the value of each wildlife and aquatic life, unlawfully killed, caught, taken, possessed, or injured. LA R.S. 56:40.1