Monterey Bay Aquarium
Seafood Watch

Environmental sustainability assessment of wild-caught Black drum *(Pogonias cromis)* from the United States caught using trotlines.

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Species:	Black drum *(Pogonias cromis)*
Location:	United States: Gulf of Mexico
Gear:	Trotline
Type:	Wild Caught
Author:	Seafood Watch
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Assessed using Seafood Watch Fisheries Standard v3

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About Seafood Watch

Monterey Bay Aquarium's Seafood Watch program evaluates the environmental sustainability of wild-caught and farmed seafood commonly found in the United States marketplace. Seafood Watch defines sustainable seafood as originating from sources, whether wild-caught or farmed, which can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems. The program's goals are to raise awareness of important ocean conservation issues and empower seafood consumers and businesses to make choices for healthy oceans.

Seafood Watch's science-based ratings are available at www.SeafoodWatch.org. Each rating is supported by a Seafood Watch assessment, in which the fishery or aquaculture operation is evaluated using the Seafood Watch standard.

Seafood Watch standards are built on our guiding principles, which outline the necessary environmental sustainability elements for fisheries and aquaculture operations. The guiding principles differ across standards, reflecting the different impacts of fisheries and aquaculture.

- Seafood rated Best Choice comes from sources that operate in a manner that's consistent with our guiding principles. The seafood is caught or farmed in ways that cause little or no harm to other wildlife or the environment.

- Seafood rated Good Alternative comes from sources that align with most of our guiding principles. However, one issue needs substantial improvement, or there's significant uncertainty about the impacts on wildlife or the environment.

- Seafood rated Avoid comes from sources that don't align with our guiding principles. The seafood is caught or farmed in ways that have a high risk of causing harm to wildlife or the environment. There's a critical conservation concern or many issues need substantial improvement.

Each assessment follows an eight-step process, which prioritizes rigor, impartiality, transparency and accessibility. They are conducted by Seafood Watch scientists, in collaboration with scientific, government, industry and conservation experts and are open for public comment prior to publication. Conditions in wild capture fisheries and aquaculture operations can change over time; as such assessments and ratings are updated regularly to reflect current practice.

More information on Seafood Watch guiding principles, standards, assessments and ratings are available at www.SeafoodWatch.org.

Guiding Principles

Seafood Watch defines sustainable seafood as originating from sources, whether fished[1] or farmed, that can maintain or increase production in the long term without jeopardizing the structure or function of affected ecosystems.

The following guiding principles illustrate the qualities that fisheries must possess to be considered sustainable by the Seafood Watch program (these are explained further in the Seafood Watch Standard for Fisheries):

- Follow the principles of ecosystem-based fisheries management.
- Ensure all affected stocks are healthy and abundant.
- Fish all affected stocks at sustainable levels.
- Minimize bycatch.
- Have no more than a negligible impact on any threatened, endangered, or protected species.
- Managed to sustain the long-term productivity of all affected species.
- Avoid negative impacts on the structure, function, or associated biota of aquatic habitats where fishing occurs.
- Maintain the trophic role of all aquatic life.
- Do not result in harmful ecological changes such as reduction of dependent predator populations, trophic cascades, or phase shifts.
- Ensure that any enhancement activities and fishing activities on enhanced stocks do not negatively affect the diversity, abundance, productivity, or genetic integrity of wild stocks.

These guiding principles are operationalized in the four criteria in this standard.Each criterion includes:

- Factors to evaluate and score
- Guidelines for integrating these factors to produce a numerical score and rating

Once a rating has been assigned to each criterion, Seafood Watch develops an overall recommendation. Criteria ratings and the overall recommendation are color coded to correspond to the categories on the Seafood Watch pocket guides and online guide:

Best Choice/Green: Buy first; they're well managed and caught or farmed responsibly.

Good Alternative/Yellow: Buy, but be aware there are concerns with how they're caught, farmed or managed.

Avoid/Red: Take a pass on these for now; they're caught or farmed in ways that harm other marine life or the environment.

[1] "Fish" is used throughout this document to refer to finfish, shellfish and other invertebrates

Summary

This report evaluates the black drum fishery caught via trotline in the Gulf of Mexico, United States. The focus is on fisheries in Louisiana and Texas where most of the commercial fishery landings for black drum occur.

Stock assessments are conducted in Louisiana every 5 years for black drum, and fishery-independent surveys are conducted regularly in Texas to monitor abundance. The black drum stock is not currently considered overfished in the Gulf of Mexico but had been overfished in the late 1980s in Louisiana. Overfishing is not occurring currently in Louisiana, but occurred historically for a brief period. Currently, there are no management thresholds established for the Louisiana black drum stock, but a limit reference point has been proposed. There are no reference points for fishing mortality in Texas, but landings have shown a stable mean over the past decade.

Little is known about bycatch in the trotline fisheries because of a lack of observer coverage. From experimental studies, bycatch mortality of finfishes in trotlines is low. Sea turtles have been known to infrequently interact with trotlines; however, no data are available specific to their interaction with black drum fisheries. The use of circle hooks mitigates bycatch mortality frequency, but it does not completely prevent it.

Management measures such as size limits and gear restrictions are in place in both Louisiana and Texas. Enforcement agencies monitor for violations to fisheries regulations. Fishery-independent and -dependent data are collected regularly, yet more data are needed on bycatch and discards in the black drum trotline fisheries.

Similarly to bottom longlines, trotlines have a moderate impact on the environment.

The black drum trotline fisheries in the Gulf of Mexico are rated "Yellow" or "Good Alternative."

Final Seafood Recommendations

SPECIES | FISHERY	C 1 TARGET SPECIES	C 2 OTHER SPECIES	C 3 MANAGEMENT	C 4 HABITAT	OVERALL	VOLUME (MT) YEAR
Black drum | Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Louisiana	4.284	1.732	3.000	3.000	**Good Alternative (2.859)**	Unknown
Black drum | Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Texas	3.318	1.732	3.000	3.000	**Good Alternative (2.682)**	Unknown

Summary

The black drum fishery in the Gulf of Mexico via trotline is recommended as a Good Alternative.

Scoring Guide

Scores range from zero to five where zero indicates very poor performance and five indicates the fishing operations have no significant impact.

Final Score = geometric mean of the four Scores (Criterion 1, Criterion 2, Criterion 3, Criterion 4).

Best Choice/Green = Final Score >3.2, and no Red Criteria, and no Critical scores

Good Alternative/Yellow = Final score >2.2-3.2, and neither Harvest Strategy (Factor 3.1) nor Bycatch Management Strategy (Factor 3.2) are Very High Concern2, and no more than one Red Criterion, and no Critical scores

Avoid/Red = Final Score ≤2.2, or either Harvest Strategy (Factor 3.1) or Bycatch Management Strategy (Factor 3.2) is Very High Concern or two or more Red Criteria, or one or more Critical scores.

[2] Because effective management is an essential component of sustainable fisheries, Seafood Watch issues an Avoid recommendation for any fishery scored as a Very High Concern for either factor under Management (Criterion 3).

Introduction

Scope of the analysis and ensuing recommendation

This report assesses the commercial United States black drum (*Pogonias cromis*) fishery in the Gulf of Mexico, via trotline, with a focus on Louisiana and Texas, where most commercial fisheries landings occur.

Species Overview

Black drum is a nearshore and estuarine marine sciaenid ranging from the Bay of Fundy to the Gulf of Argentina (Sutter et al. 1986). Stocks from the Gulf of Mexico (GOM) have genetically diverged from those of the Atlantic coast {Leidig et al. 2015}. Black drum ranges from very shallow water to 100 ft (33 m) deep. It lives on mud, sand, and oyster reef habitats and feeds primarily on shellfish and worms, using its barbels for foraging (GSMFC 2017). Young black drum under 10 lb are called puppy drum, while adults, which reach an average of 50 lb, are referred to as bull drum. Black drum is a group synchronous batch spawner, and females produce an average of 32 million eggs annually (Fitzhugh et al. 1993). Young fish mature and are recruited to the fishery at 5 years of age. Drum is long-lived, up to 43 years in the GOM (Beckman et al. 1990).

The Gulf States Marine Fisheries Commission coordinates management among states. In 1993, it developed a regional fishery management plan that ensures that consistent measures are applied across regions (Leard et al. 1993). Individual state agencies (in Texas, the Texas Parks and Wildlife Department, and in Louisiana, the Louisiana Department of Wildlife and Fisheries) have management authority in their jurisdictions. Most black drum are landed in Louisiana and Texas with minimal harvest (≈1% per state of total drum harvest) in Alabama, Florida, and Mississippi. Harvest of black drum in the GOM dates more than a century, but the fishery grew because red drum harvests were prohibited in the late 1980s and the market for black drum increased.

Trotlines used in this fishery are shorter bottom longlines fished in nearshore shallow habitat (Figure 1).

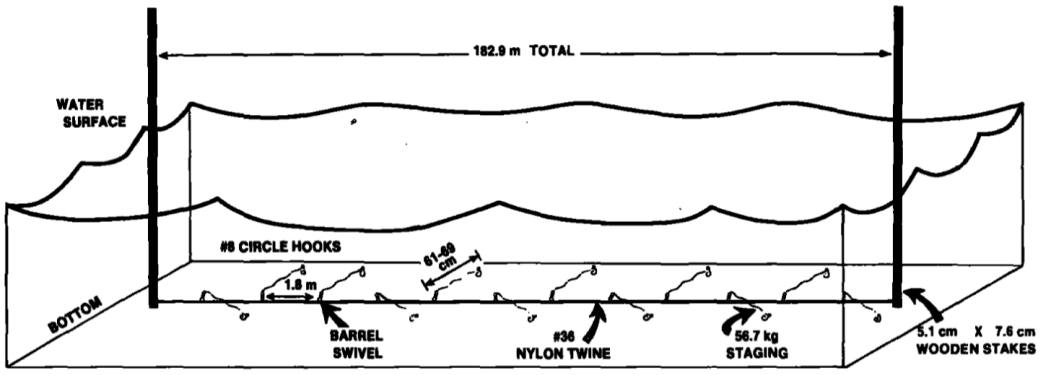

FIGURE 2.—Bottom trotline.

Figure 1: Bottom trotline suspended in the water across wooden stakes with circle hooks coming off gangions resting on the seafloor (McEachron et al. 1987).

Production Statistics

In the Gulf of Mexico, the primary producer of black drum is Louisiana (54%; 598 mt in 2020), followed by Texas (44%; 485 mt), with minimal landings in Alabama (1.6%; 18 mt), Florida (0.8%; 9 mt), and Mississippi (0.2%; 2 mt) (Figure 2) (NMFS 2021). Figure 3 shows annual commercial and recreational black drum landings in Louisiana from 1982 to 2018.

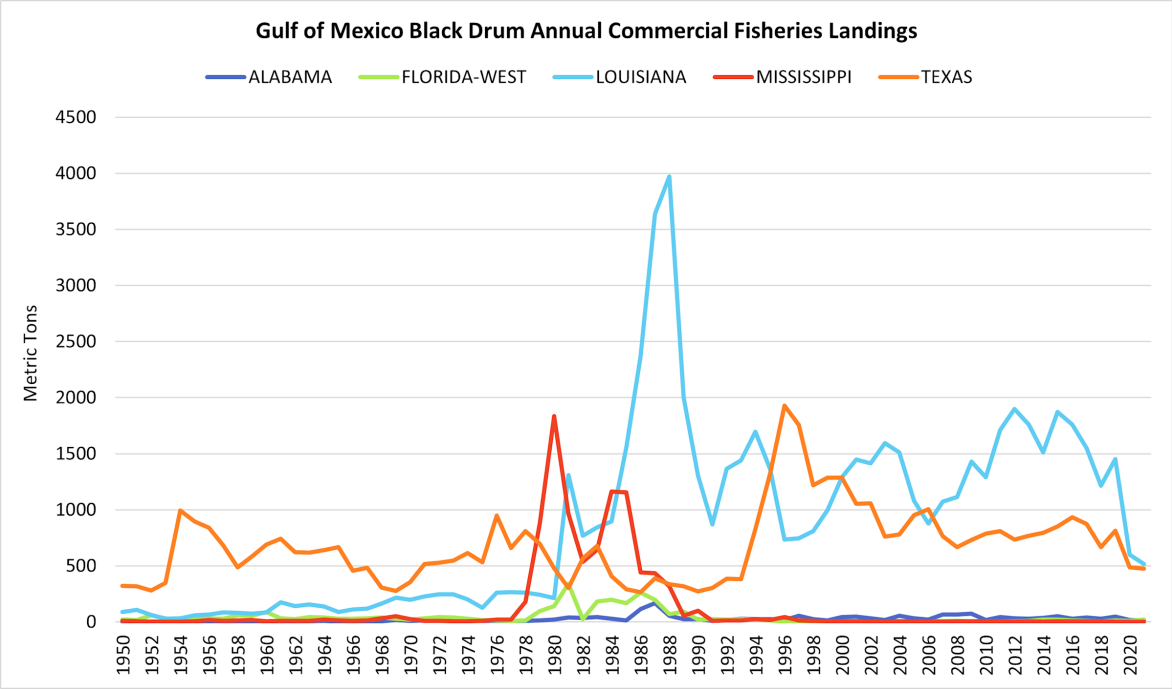

Figure 2: Annual commercial landings by metric ton for all black drum fisheries in the Gulf of Mexico (NMFS 2021).

Year	Harvest		%Commercial	%Recreational
	Commercial	Recreational		
1982	1.69	0.94	64.2%	35.8%
1983	1.86	1.98	48.4%	51.6%
1984	1.98	0.98	67.0%	33.0%
1985	3.42	0.60	85.1%	14.9%
1986	5.23	0.94	84.8%	15.2%
1987	8.02	0.84	90.5%	9.5%
1988	8.76	0.22	97.5%	2.5%
1989	4.41	0.49	90.0%	10.0%
1990	2.88	0.41	87.5%	12.5%
1991	1.91	0.52	78.6%	21.4%
1992	3.01	0.76	79.8%	20.2%
1993	3.18	0.54	85.6%	14.4%
1994	3.74	0.48	88.7%	11.3%
1995	3.00	0.83	78.4%	21.6%
1996	1.62	0.81	66.7%	33.3%
1997	1.64	1.16	58.6%	41.4%
1998	1.78	1.67	51.7%	48.3%
1999	2.20	1.02	68.3%	31.7%
2000	2.84	1.87	60.3%	39.7%
2001	3.20	1.66	65.8%	34.2%
2002	3.11	1.76	63.8%	36.2%
2003	3.51	1.79	66.2%	33.8%
2004	3.76	1.03	78.5%	21.5%
2005	2.38	1.09	68.5%	31.5%
2006	1.93	1.25	60.8%	39.2%
2007	2.36	1.09	68.4%	31.6%
2008	2.46	1.30	65.5%	34.5%
2009	3.15	1.42	69.0%	31.0%
2010	2.84	1.19	70.6%	29.4%
2011	3.77	1.38	73.3%	26.7%
2012	4.19	1.32	76.0%	24.0%
2013	3.88	1.17	76.9%	23.1%
2014	3.33	0.97	77.5%	22.5%
2015	4.28	1.08	79.8%	20.2%
2016	3.88	0.59	86.9%	13.1%
2017	3.41	0.60	85.0%	15.0%
2018	2.76	0.65	81.0%	19.0%

Figure 3: Louisiana annual commercial and recreational black drum landings (West et al. 2020).

Importance to the US/North American market.

No statistics are available on import or export of black drum from the Gulf of Mexico. Most of the market for black drum has been in the United States, although some is sold to Mexico (Leard et al. 1993). In 2020, the Gulf of Mexico black drum commercial fishery value was roughly $3 million (Figure 4) (NMFS 2021).

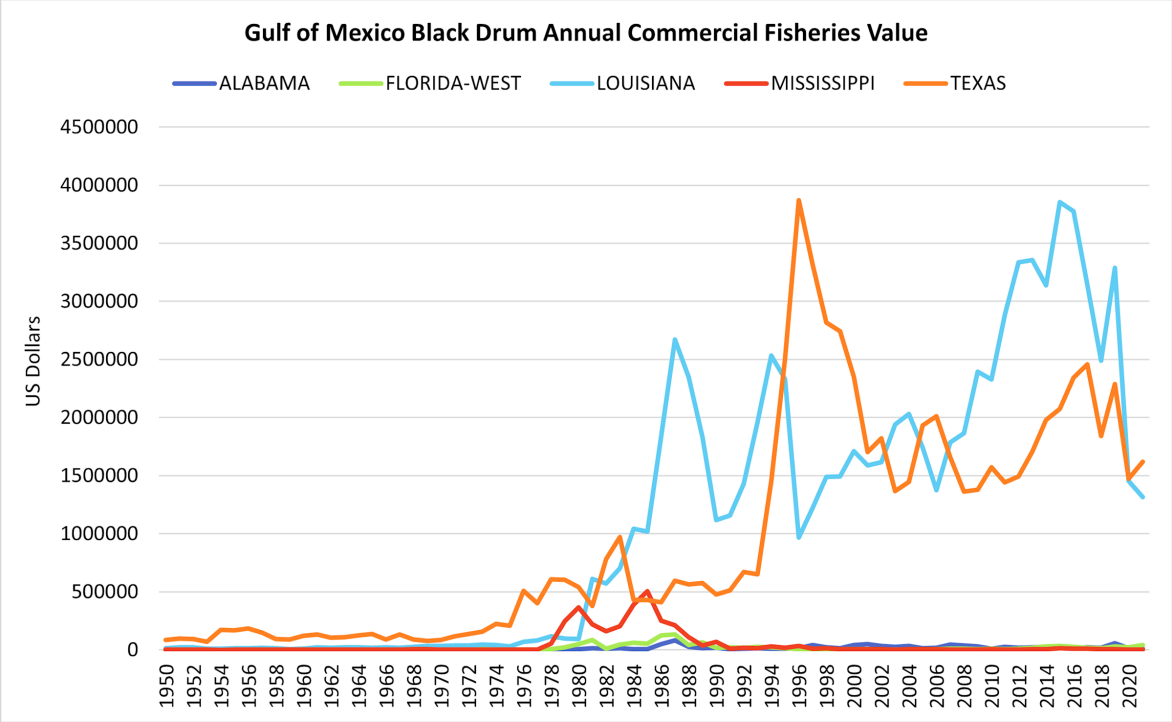

Figure 4: Annual commercial landings by U.S. dollar value for all black drum fisheries in the Gulf of Mexico (NMFS 2021).

Common and market names.

Black drum, drum.

Primary product forms

Fresh whole gutted, fresh fillets, frozen headed and gutted, frozen fillets.

Assessment

This section assesses the sustainability of the fishery(s) relative to the Seafood Watch Standard for Fisheries, available at www.seafoodwatch.org. The specific standard used is referenced on the title page of all Seafood Watch assessments.

Criterion 1: Impacts on the species under assessment

This criterion evaluates the impact of fishing mortality on the species, given its current abundance. When abundance is unknown, abundance is scored based on the species' inherent vulnerability, which is calculated using a Productivity-Susceptibility Analysis. The final Criterion 1 score is determined by taking the geometric mean of the abundance and fishing mortality scores. The Criterion 1 rating is determined as follows:

- ***Score >3.2=Green or Low Concern***
- ***Score >2.2 and ≤3.2=Yellow or Moderate Concern***
- ***Score ≤2.2 = Red or High Concern***

Rating is Critical if Factor 1.3 (Fishing Mortality) is Critical.

Guiding principles

- *Ensure all affected stocks are healthy and abundant.*
- *Fish all affected stocks at sustainable level*

Criterion 1 Summary

BLACK DRUM			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Louisiana	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Texas	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)

Criterion 1 Assessments

SCORING GUIDELINES

Factor 1.1 - Abundance
Goal: Stock abundance and size structure of native species is maintained at a level that does not impair recruitment or productivity.

- *5 (Very Low Concern) — Strong evidence exists that the population is above an appropriate target abundance level (given the species' ecological role), or near virgin biomass.*
- *3.67 (Low Concern) — Population may be below target abundance level, but is at least 75% of*

the target level, OR data-limited assessments suggest population is healthy and species is not highly vulnerable.

- *2.33 (Moderate Concern) — Population is not overfished but may be below 75% of the target abundance level, OR abundance is unknown and the species is not highly vulnerable.*
- *1 (High Concern) — Population is considered overfished/depleted, a species of concern, threatened or endangered, OR abundance is unknown and species is highly vulnerable.*

Factor 1.2 - Fishing Mortality

Goal: Fishing mortality is appropriate for current state of the stock.

- *5 (Low Concern) — Probable (>50%) that fishing mortality from all sources is at or below a sustainable level, given the species ecological role, OR fishery does not target species and fishing mortality is low enough to not adversely affect its population.*
- *3 (Moderate Concern) — Fishing mortality is fluctuating around sustainable levels, OR fishing mortality relative to a sustainable level is uncertain.*
- *1 (High Concern) — Probable that fishing mortality from all source is above a sustainable level.*

Black drum

Factor 1.1 - Abundance

Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Louisiana

Low Concern

The most recent stock assessment (2020) in Louisiana reports black drum as not overfished, based on an estimate of abundance (49% spawning potential ratio) that is above the Louisiana proposed conservation and management threshold (20% spawning potential ratio) (West et al. 2020). But, the stock has historically been overfished in the past during the 1985 to 2018 time series. Abundance was predicted using a statistical catch-at-age model and landings data from the Louisiana Department of Wildlife and Fisheries Recreational Creel Survey and Trip Ticket Programs, National Marine Fisheries Service commercial statistical records, and the NMFS Marine Recreational Information Program. The Louisiana Department of Wildlife and Fisheries fishery-independent marine trammel net survey data were used to develop an index of abundance. In Louisiana, abundance is scored a low concern, because of evidence from the recent stock assessment that the stock is above the proposed reference point but with some reduced sensitivity in the reference point.

Justification:

Trajectory plots from the most recent Louisiana stock assessment indicate that the stock has not been overfished, and overfishing has not been occurring in recent history.

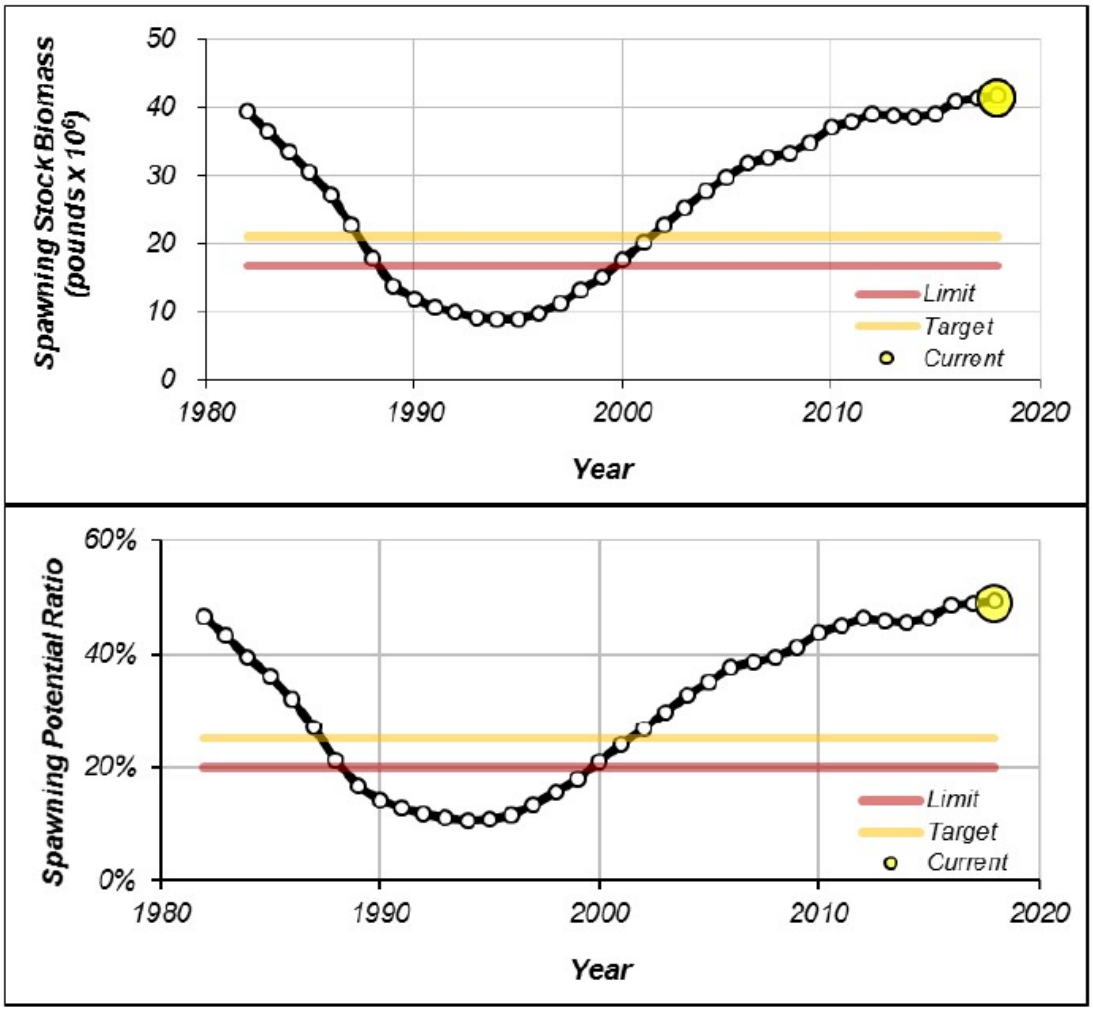

Figure 5: Time-series of ASAP base model estimated ratios of annual spawning stock biomass and spawning potential ratio in Louisiana relative to proposed limit and established target reference points. Current values represent the geometric mean of the 2016–18 estimates (West et al. 2020).

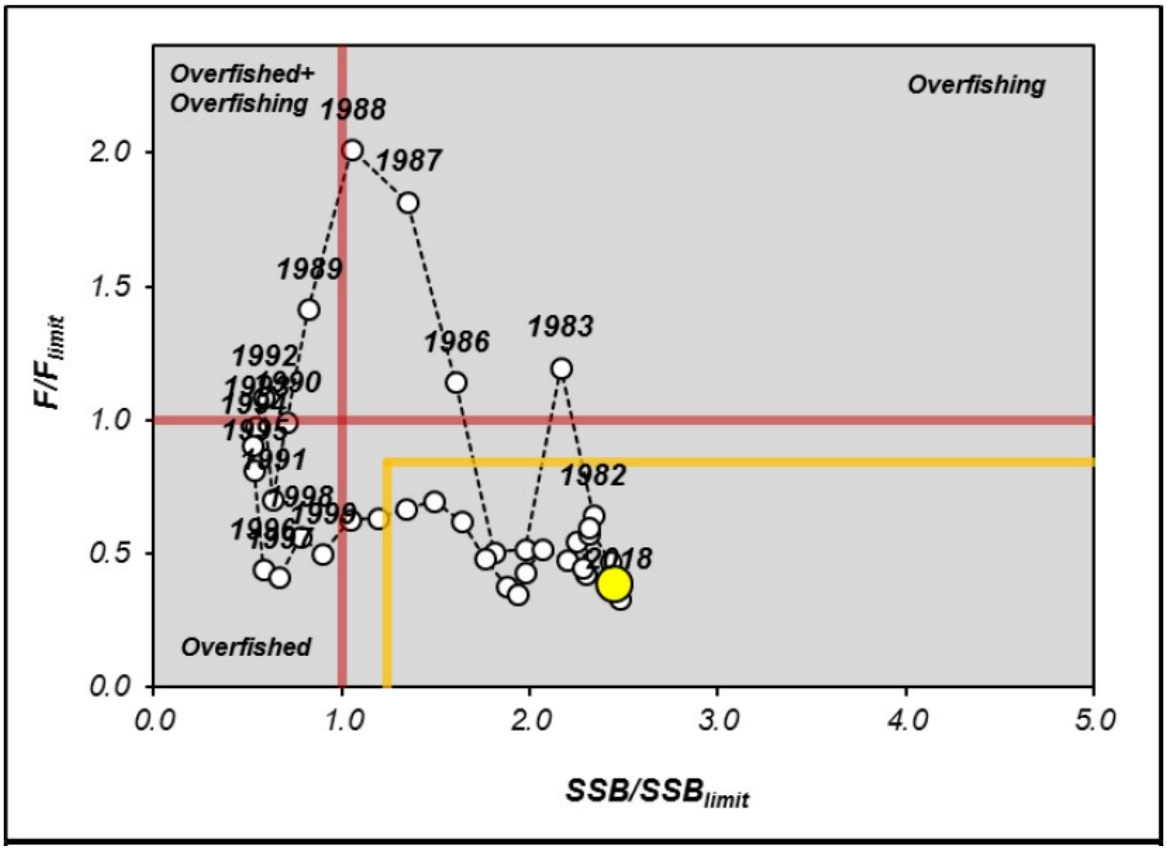

Figure 6: Estimated ratios of annual average fishing mortality rates and female spawning stock biomass to the proposed limit reference points. Target reference points are shown by the yellow lines. The first and last years of the time series are identified, along with the years where the stock was considered either overfished or overfishing was occurring. The yellow circle represents current status (geometric mean 2016–18) (West et al. 2020).

Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Texas

Low Concern

In Texas, fisheries-independent data are used to determine relative abundance, size, and long-term trends in abundance and stability of black drum, to assist in managing and allocating harvest of marine resources and implementing management regulations (Martinez-Andrade 2018). Fishery-independent gillnet sampling is conducted overnight during each spring and fall season, while bag-seine sampling occurs on a biweekly period every month (Martinez-Andrade 2018). In 2020, all fishery-independent sampling was canceled during April and May due to COVID-19 (pers. comm., Dr. Fernando Martinez-Andrade, TPWD, November 2021). As a result, seasonal bag-seine catch rates (June and July; peak recruitment months) are used to assess black drum abundance status because annual catch rate estimates may be misleading (pers. comm., Dr. Fernando Martinez-Andrade, TPWD, November 2021). Furthermore, both seasonal gillnet catch rates (spring/fall) and annual catch rates (excluding 2020) are used to assess black drum abundance for the same reason (pers. comm., Dr. Fernando Martinez-Andrade, TPWD, November 2021). The bag-seine time series shows fluctuating seasonal catches, with a decreasing trend beginning in 2017. The annual and seasonal gillnet time-series show an overall trend of increased abundance, with a relatively

stable mean in recent years (Figures 8–10).

Abundance is considered to be of low concern, because the stock is not highly vulnerable (medium vulnerability based on a productivity-susceptibility analysis) and there are two appropriate data-limited assessment methods based on distinct data sources that suggest the stock is healthy. Vulnerability was rated as "medium" based on an overall productivity-susceptibility analysis score of 3.07 (productivity = 2, susceptibility = 2.32) (Figure 7).

Justification:
Vulnerability was rated as "medium" based on an overall productivity-susceptibility analysis score of 3.07 (productivity = 2, susceptibility = 2.32).

Productivity Attribute	**Relevant Information**	**Score (1 = low risk, 2 = medium risk, 3 = high risk)**
Average age at maturity	5 yrs (Murphy & Taylor 1989)	2
Average maximum age	43 years (Beckman et al. 1990)	3
Fecundity	32 million eggs/yr (Fitzhugh et al. 1993)	1
Average maximum size	100 cm (Beckman et al. 1990)	2
Average size at maturity	62 cm (Fitzhugh et al. 1993)	2
Reproductive strategy	broadcast spawner	1
Trophic level	3.9 (Froese & Pauly 2017)	3

Susceptibility Attribute	**Relevant Information**	**Score (1 = low risk, 2 = medium risk, 3 = high risk)**
Areal overlap (Considers all fisheries)	Default score due to limited information	3
Vertical overlap (Considers all fisheries)	Species is targeted	3
Selectivity of fishery (Specific to fishery under assessment)	Species is targeted	2
Post-capture mortality (Specific to fishery under assessment)	Retained species	3

Figure 7: Productivity-Susceptibility Analysis

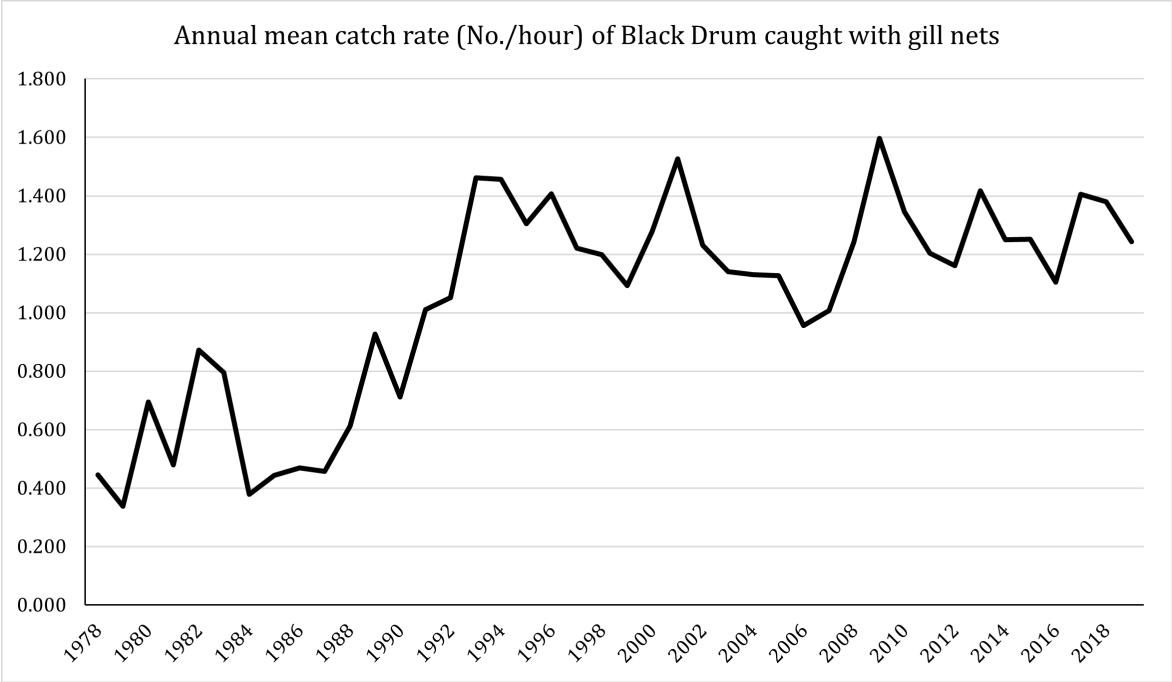

Figure 8: Fisheries-independent gillnet annual survey time series of black drum catch per hour 1978–18 (data provided by Dr. Fernando Martinez-Andrade, TPWD).

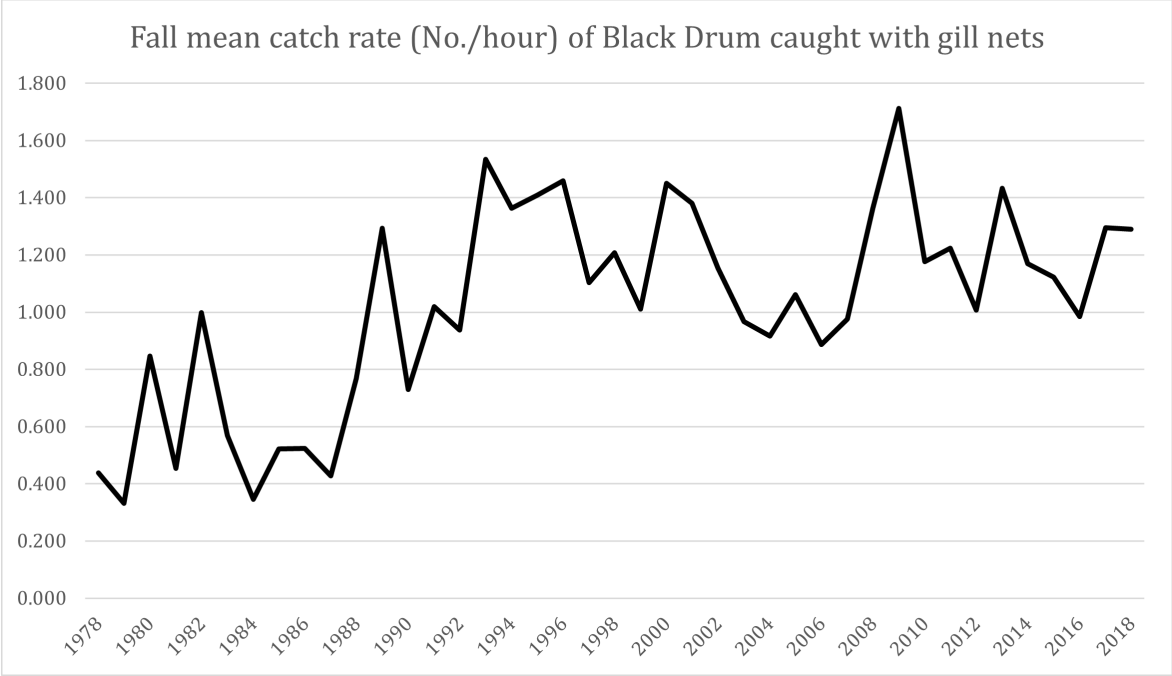

Figure 9: Fisheries-independent gillnet fall survey time series of black drum catch per hour 1978–18 (data provided by Dr. Fernando Martinez-Andrade, TPWD).

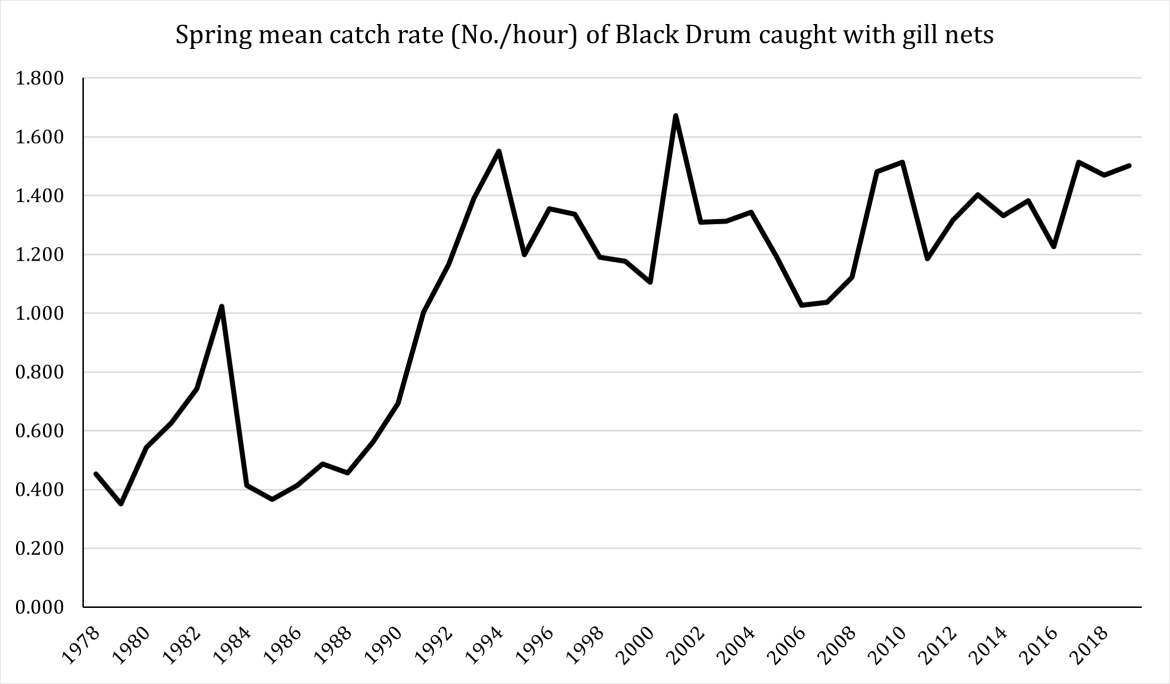

Figure 10: Fisheries-independent gillnet spring survey time series of black drum catch per hour 1978–18 (data provided by Dr. Fernando Martinez-Andrade, TPWD).

Factor 1.2 - Fishing Mortality

Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Louisiana

Low Concern

The most recent stock assessment (2020) in Louisiana reports black drum as not experiencing overfishing (West et al. 2020). Fishing mortality for this stock is defined as overfishing when rates exceed $F_{20\%}$ ($F/F_{20\%} > 1$). A geometric mean from 2016 to 2018 was used to determine that current fishery mortality conditions ($F/F_{20\%} = 0.39$) are below this threshold, even including the recreational fishery, which is a significant contributor. Overfishing has occurred in the past (before 1995); however, fishing mortality rates have shown an overall decreasing trend as a result of regulatory changes. Fishery mortality is scored a low concern because overfishing is not occurring.

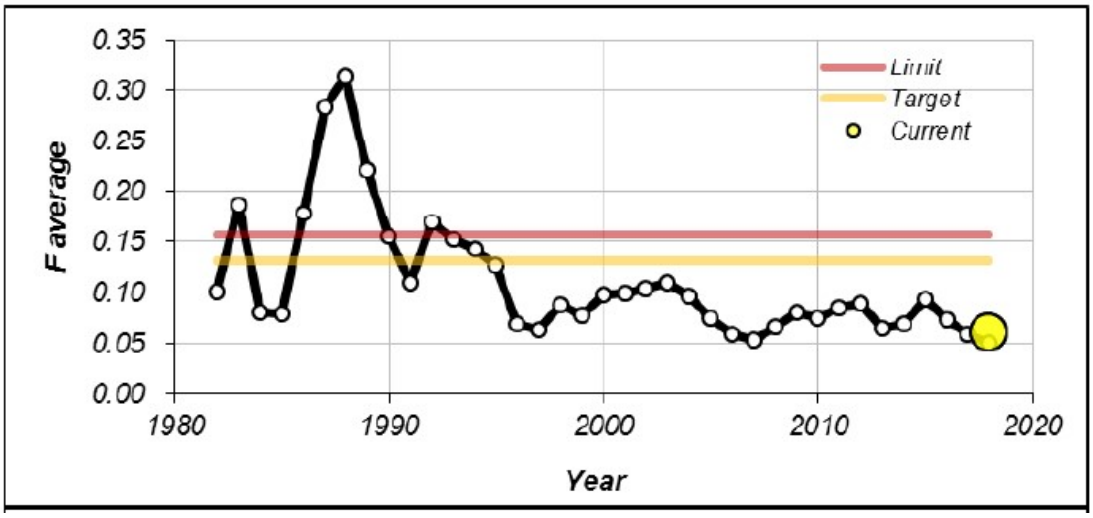

Figure 11: Estimated average fishing mortality rates relative to the proposed limit and established target reference points. Current values represent the geometric mean of the 2016–18 estimates (West et al. 2020).

Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Texas

Moderate Concern

An assessment of fishing mortality relative to a defined reference point is not available for Texas. Annual commercial fisheries landings data show a relatively stable mean for Texas landings in the last decade. Fishery mortality is scored a moderate concern because of the lack of a reference point in Texas.

Criterion 2: Impacts on Other Species

All main retained and bycatch species in the fishery are evaluated under Criterion 2. Seafood Watch defines bycatch as all fisheries-related mortality or injury to species other than the retained catch. Examples include discards, endangered or threatened species catch, and ghost fishing. Species are evaluated using the same guidelines as in Criterion 1. When information on other species caught in the fishery is unavailable, the fishery's potential impacts on other species is scored according to the Unknown Bycatch Matrices, which are based on a synthesis of peer-reviewed literature and expert opinion on the bycatch impacts of each gear type. The fishery is also scored for the amount of non-retained catch (discards) and bait use relative to the retained catch. To determine the final Criterion 2 score, the score for the lowest scoring retained/bycatch species is multiplied by the discard/bait score. The Criterion 2 rating is determined as follows:

- ***Score >3.2=Green or Low Concern***
- ***Score >2.2 and ≤3.2=Yellow or Moderate Concern***
- ***Score ≤2.2 = Red or High Concern***

Rating is Critical if Factor 2.3 (Fishing Mortality) is Crtitical

Guiding principles

- *Ensure all affected stocks are healthy and abundant.*
- *Fish all affected stocks at sustainable level.*
- *Minimize bycatch.*

Criterion 2 Summary

Criterion 2 score(s) overview

This table(s) provides an overview of the Criterion 2 subscore, discards+bait modifier, and final Criterion 2 score for each fishery. A separate table is provided for each species/stock that we want an overall rating for.

BLACK DRUM			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Louisiana	1.732	1.000: < 100%	Red (1.732)
Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Texas	1.732	1.000: < 100%	Red (1.732)

Criterion 2 main assessed species/stocks table(s)

This table(s) provides a list of all species/stocks included in this assessment for each 'fishery' (as defined by a region/method combination). The text following this table(s) provides an explanation of the reasons the listed species were selected for inclusion in the assessment.

GULF OF MEXICO | ATLANTIC, WESTERN CENTRAL | TROTLINE | UNITED STATES | LOUISIANA			
SUB SCORE: 1.732	DISCARD RATE: 1.000	**SCORE: 1.732**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Sea turtles	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Finfish	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Black drum	3.670: Low Concern	5.000: Low Concern	Green (4.284)

GULF OF MEXICO | ATLANTIC, WESTERN CENTRAL | TROTLINE | UNITED STATES | TEXAS			
SUB SCORE: 1.732	DISCARD RATE: 1.000	**SCORE: 1.732**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Sea turtles	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Finfish	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Black drum	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)

Data are quite limited regarding bycatch type and abundance in the black drum trotline fishery. State-level data were obtained for Louisiana, but were unfortunately not at a resolution sufficient to distinguish bycatch or co-caught species to the species level. Sheepshead (*Archosargus probatocephalus*) was determined to be bycatch based on LDWF trip ticket data (Adriance et al. 2019). Research studies in Texas found bycatch of hardhead catfish (*Arius felis*), red drum (*Sciaenops ocellatus*), and spotted seatrout (*Cynoscion nebulosus*), as well as a low frequency (<5%) of gafftopsail catfish (*Barge marinus*), ladyfish (*Elops saurus*), Atlantic croaker (*Micropogonias undulatus*), and southern flounder (*Paralichthys*

lethostigma) (McEachron et al. 1987)(Morris et al. 1991){Andriance et al. 2019}.

In a study in Louisiana (George et al. 2008), researchers tested the efficacy of baited trotlines to remove black drum in an effort to increase oyster survival on commercial oyster reefs. Their trotlines caught six fish species; although red drum was the only species to make up >5% of the total catch, most fishes were released alive and unharmed. In a study of survival of released black drum, red drum, and spotted seatrout (*Cynoscion nebulosus*) caught on trotlines, the survival rates were 67%, 100%, and 64%, respectively (Martin et al. 1987). It is unclear if these experimental studies are representative of the trotline bycatch and survival in the commercial fishery. Circle hooks, which were used in this study and also in the commercial fishery, are known to reduce bycatch mortality in some fisheries but not to avoid it {Cooke and Suski 2004}.

Sea turtles are known to infrequently interact with trotlines, and one was documented as entangled in a trotline in Texas, although researchers did not specify which species {Plotkin and Amos 1990}. Green turtle (*Chelonia mydas*), loggerhead turtle (*Caretta caretta*), Kemp's ridley turtle (*Lepidochelys kempii*), hawksbill turtle (*Eretmochelys imbricata*), and leatherback turtle (*Dermochelys coriacea*) are known to occur in the Gulf of Mexico. There are no documented cases of sea turtles confirmed as bycatch specific to the black drum trotline fishery; however, there is also a lack of observer monitoring.

Criterion 2 Assessment

SCORING GUIDELINES

Factor 2.1 - Abundance
(same as Factor 1.1 above)

Factor 2.2 - Fishing Mortality
(same as Factor 1.2 above)

Factor 2.3 - Modifying Factor: Discards and Bait Use
Goal: Fishery optimizes the utilization of marine and freshwater resources by minimizing post-harvest loss. For fisheries that use bait, bait is used efficiently.

Scoring Guidelines: The discard rate is the sum of all dead discards (i.e. non-retained catch) plus bait use divided by the total retained catch.

Ratio of bait + discards/landings	Factor 2.3 score
<100%	1
>=100	0.75

Finfish

Factor 2.1 - Abundance

Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Louisiana
Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Texas

Moderate Concern
Abundance for unknown finfishes is scored a moderate concern based on Seafood Watch Criteria. Likely encountered species include sheepshead (*Archosargus probatocephalus*), hardhead catfish (*Arius felis*), spotted seatrout (*Cynoscion nebulosus*), red drum (*Sciaenops ocellatus*), gafftopsail catfish (*Barge marinus*), ladyfish (*Elops saurus*), Atlantic croaker (*Micropogonias undulatus*), and southern flounder (*Paralichthys lethostigma*) (Adriance et al. 2019). See the Criterion 2 Summary for additional information.

Factor 2.2 - Fishing Mortality

Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Louisiana
Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Texas

Moderate Concern
Fishing mortality for unknown finfishes is categorized a high concern (bycatch score of 2) based on Seafood Watch Criteria. But, because of the moderate to high (64% to 100%) documented survival rates for released finfishes in the trotline fishery, this score is modified. Therefore, fishing mortality is rated a moderate concern (Martin et al. 1987).

Sea turtles

Factor 2.1 - Abundance

Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Texas
Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Louisiana

High Concern
Abundance for unknown sea turtles is scored a high concern, based on the Seafood Watch Standard for Wild Capture Fisheries.

Factor 2.2 - Fishing Mortality

Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Texas
Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Louisiana

Moderate Concern
Fishing mortality for unknown sea turtles is categorized a high concern (bycatch score of 1) following the Seafood Watch Criteria. Sea turtles are known to infrequently interact with trotlines, and one was documented as entangled in a trotline in Texas, although researchers did not specify

which species {Plotkin and Amos 1990}. The circle hooks used in the black drum fishery in both Louisiana and Texas are known to mitigate sea turtle bycatch but not to avoid it (Read 2007). More fishery-specific data are needed to determine the effectiveness of sea turtle bycatch mitigation {Cooke and Suske 2004} in the black drum fishery. Trotline gear is regulated to <440-yd length in Louisiana and must not exceed 600 ft (200 yd) in Texas (Leard et al. 1993). Because of the shorter gear with modified hooks, the fishery mortality concern is modified from the high score noted in the Seafood Watch Criteria, and it is rated a moderate concern.

Factor 2.3 - Discard Rate/Landings

Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Louisiana
Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Texas

< 100%

Little information is available regarding bait use in the trotline fishery. Natural bait (fish, crab, or plant matter) must be used in Texas (TPWD 2016). The most commonly used baits in the trotline fishery are cut blue crab (*Callinectes sapidus*), dead shrimp (*Penaeus* spp.), and oleander (*Nerium* spp.) leaves (McEachron et al. 1987)(George et al. 2008). No data are collected on discards in the commercial fishery; however, discard mortality is noted to be 0% to 36% in experimental studies (Morris et al. 1991).

Criterion 3: Management Effectiveness

Five factors are evaluated in Criterion 3: Management Strategy and Implementation, Bycatch Strategy, Scientific Research/Monitoring, Enforcement of Regulations, and Inclusion of Stakeholders. Each is scored as either 'highly effective', 'moderately effective', 'ineffective,' or 'critical'. The final Criterion 3 score is determined as follows:

- *5 (Very Low Concern) — Meets the standards of 'highly effective' for all five factors considered.*
- *4 (Low Concern) — Meets the standards of 'highly effective' for 'management strategy and implementation' and at least 'moderately effective' for all other factors.*
- *3 (Moderate Concern) — Meets the standards for at least 'moderately effective' for all five factors.*
- *2 (High Concern) — At a minimum, meets standards for 'moderately effective' for Management Strategy and Implementation and Bycatch Strategy, but at least one other factor is rated 'ineffective.'*
- *1 (Very High Concern) — Management Strategy and Implementation and/or Bycatch Management are 'ineffective.'*
- *0 (Critical) — Management Strategy and Implementation is 'critical'.*

The Criterion 3 rating is determined as follows:

- ***Score >3.2=Green or Low Concern***
- ***Score >2.2 and ≤3.2=Yellow or Moderate Concern***
- ***Score ≤2.2 = Red or High Concern***

Rating is Critical if Management Strategy and Implementation is Critical.

Guiding principle

- The fishery is managed to sustain the long-term productivity of all impacted species.

Five factors are evaluated in Criterion 3: Management Strategy and Implementation, Bycatch Strategy, Scientific Research/Monitoring, Enforcement of Regulations, and Inclusion of Stakeholders. Each is scored as either 'highly effective', 'moderately effective', 'ineffective,' or 'critical'. The final Criterion 3 score is determined as follows:

Criterion 3 Summary

FISHERY	MANAGEMENT STRATEGY	BYCATCH STRATEGY	RESEARCH AND MONITORING	ENFORCEMENT	INCLUSION	SCORE
Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Louisiana	Moderately Effective	Moderately Effective	Moderately Effective	Highly effective	Highly effective	**Yellow (3.000)**
Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Texas	Moderately Effective	Moderately Effective	Moderately Effective	Highly effective	Highly effective	**Yellow (3.000)**

Criterion 3 Assessment

SCORING GUIDELINES

Factor 3.1 - Management Strategy and Implementation

Considerations: What type of management measures are in place? Are there appropriate management goals, and is there evidence that management goals are being met? Do manages follow scientific advice? To achieve a highly effective rating, there must be appropriately defined management goals, precautionary policies that are based on scientific advice, and evidence that the measures in place have been successful at maintaining/rebuilding species.

Factor 3.2 - Bycatch Strategy

Considerations: What type of management strategy/measures are in place to reduce the impacts of the fishery on bycatch species and when applicable, to minimize ghost fishing? How successful are these management measures? To achieve a Highly Effective rating, the fishery must have no or low bycatch, or if there are bycatch or ghost fishing concerns, there must be effective measures in place to minimize impacts.

Factor 3.3 - Scientific Research and Monitoring

Considerations: How much and what types of data are collected to evaluate the fishery's impact on the species? Is there adequate monitoring of bycatch? To achieve a Highly Effective rating, regular, robust population assessments must be conducted for target or retained species, and an adequate bycatch data collection program must be in place to ensure bycatch management goals are met.

Factor 3.4 - Enforcement of Management Regulations

Considerations: Do fishermen comply with regulations, and how is this monitored? To achieve a Highly Effective rating, there must be regular enforcement of regulations and verification of compliance.

Factor 3.5 - Stakeholder Inclusion

Considerations: Are stakeholders involved/included in the decision-making process? Stakeholders are individuals/groups/organizations that have an interest in the fishery or that may be affected by the management of the fishery (e.g., fishermen, conservation groups, etc.). A Highly Effective rating is given if the management process is transparent, if high participation by all stakeholders is encouraged, and if there a mechanism to effectively address user conflicts.

Factor 3.1 - Management Strategy And Implementation

Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Louisiana

Moderately Effective

The Louisiana Department of Wildlife and Fisheries manages black drum under the 2019 Black Drum Fisheries Management Plan (Adriance et al. 2019). Currently, there are no management thresholds established, but a limit reference point (20% spawning potential ratio, SPR) has been proposed (West et al. 2020). From 1995 to 2019, a 30% SPR was implemented and never fell below the limit during the time frame (Davis et al. 2015). Although no management thresholds are currently established, the Louisiana Department of Wildlife and Fisheries has established management targets per LAC 76: VII.385 that act similar to management thresholds (LDWF 2022). Harvest control rules that were implemented previously are no longer in place as of 2020 (West et al. 2020). Therefore, currently, there are no harvest control rules established for the Louisiana black drum stock (West et al. 2020). But, in Louisiana, there is a size limit of 16 in with annual quotas based on size (3.25 million lb for fish 16 to 27 in and 300,000 lb for fish >27 in) (West et al. 2020). Therefore, we score management as moderately effective because, although there are no harvest control rules or management thresholds established, the current status of the stock is above the previously established limit reference point (30% SPR) and the current proposed limit reference point (20% SPR), indicating that management is effective, and it is unlikely that the fishery is having a serious negative impact on the stock.

Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Texas

Moderately Effective

Management measures are in place with evaluation of trends in annual fishery-independent surveys of CPUE in Texas (Martinez-Andrade 2018). In Texas, there is a slot limit of 14 to 30 in with no possession limits (LDWF 2017)(TPWD 2016). Texas implemented a limited entry and license buyback program for the commercial finfish fishery in 2000, retiring 241 (44%) commercial fishing licenses. Because of limited data in Texas but the unlikelihood that the fishery is having serious negative impacts on retained populations, management is scored moderately effective.

Factor 3.2 - Bycatch Strategy

Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Louisiana
Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Texas

Moderately Effective

Limited data are collected on bycatch in the GOM commercial black drum fisheries. Some studies have found discards of finfishes in proportions >5% of the total catch (McEachron et al. 1987) (Morris et al. 1991)(George et al. 2008) (see the Criterion 2 Summary for details). Trotlines are horizontal lines with hoop drops or gangions (see Figure 1 in the Introduction). In Louisiana, trotlines must be less than 440 yd and in Texas they must not exceed 600 ft (200 yd); metal stakes are prohibited (Leard et al. 1993). But in both Louisiana and Texas, circle hooks (1/2-in minimum

gap) that minimize bycatch release mortality are required on trotlines. In Texas, there are limits to the amount of gear in the water (no more than 20 trotlines) and gear must be removed from 1 p.m. Friday to 1 p.m. Sunday (TPWD 2016). Because of limited data availability, some measures that are in place to reduce bycatch, and evidence of low bycatch mortality, bycatch strategy is rated a moderate concern.

Factor 3.3 - Scientific Research And Monitoring

Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Louisiana
Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Texas

Moderately Effective

Fishery-dependent and fishery-independent data are collected in both Louisiana (peer-reviewed stock assessments take place every 5 years) and Texas (fisheries-independent data are collected yearly) to monitor abundance (Adriance et al. 2019)(Martinez-Andrade 2018). There is no observer coverage and little is known about bycatch frequency. There is a lack of monitoring bycatch, so research and monitoring is rated moderately effective.

Factor 3.4 - Enforcement Of Management Regulations

Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Louisiana
Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Texas

Highly effective

In Louisiana, the Louisiana Department of Wildlife and Fisheries (LDWF) Enforcement Division is responsible for execution and enforcement of laws, rules, and regulations of the state relative to fisheries resources (LDWF 2017a). In Texas, the Law Enforcement Division of the Texas Parks and Wildlife Department (TPWD) is responsible for protecting Texas' wildlife and enforcing regulations (TPWD 2017). Game wardens and agents from both agencies educate the public about regulations, conduct regular patrols, issue citations, and arrest violators. A toll-free number is available to report fishing violations in both Louisiana and Texas, with rewards up to $1,000 for information leading to conviction of a wildlife crime. Because of regular enforcement and a requirement of trip tickets, enforcement of management regulations is ranked highly effective.

Factor 3.5 - Stakeholder Inclusion

Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Louisiana
Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Texas

Highly effective

The Louisiana Department of Wildlife and Fisheries (LDWF) encourages public input at monthly Louisiana Wildlife and Fisheries Commission meetings (LDWF 2017b). Three of the seven positions of the commission are held for representatives of the commercial fishing and fur industries. LDWF asserts the inclusion of data from the scientific community in management decisions. The Texas Parks and Wildlife Department encourages public input to the Texas Park and Wildlife Commission at an annual hearing and also through phone, mail, fax, and its website (TPWD 2017a). Stakeholder inclusion is ranked highly effective because management includes stakeholder input regularly and considers all user groups.

Criterion 4: Impacts on the Habitat and Ecosystem

This Criterion assesses the impact of the fishery on seafloor habitats, and increases that base score if there are measures in place to mitigate any impacts. The fishery's overall impact on the ecosystem and food web and the use of ecosystem-based fisheries management (EBFM) principles is also evaluated. Ecosystem Based Fisheries Management aims to consider the interconnections among species and all natural and human stressors on the environment. The final score is the geometric mean of the impact of fishing gear on habitat score (factor 4.1 + factor 4.2) and the Ecosystem Based Fishery Management score. The Criterion 4 rating is determined as follows:

- ***Score >3.2=Green or Low Concern***
- ***Score >2.2 and ≤3.2=Yellow or Moderate Concern***
- ***Score ≤2.2 = Red or High Concern***

Guiding principles

- Avoid negative impacts on the structure, function or associated biota of marine habitats where fishing occurs.
- Maintain the trophic role of all aquatic life.
- Do not result in harmful ecological changes such as reduction of dependent predator populations, trophic cascades, or phase shifts.
- Ensure that any enhancement activities and fishing activities on enhanced stocks do not negatively affect the diversity, abundance, productivity, or genetic integrity of wild stocks.
- Follow the principles of ecosystem-based fisheries management.

Rating cannot be Critical for Criterion 4.

Criterion 4 Summary

FISHERY	FISHING GEAR ON THE SUBSTRATE	MITIGATION OF GEAR IMPACTS	ECOSYSTEM-BASED FISHERIES MGMT	SCORE
Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Louisiana	Score: 3	Score: 0	Moderate Concern	**Yellow (3.000)**
Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Texas	Score: 3	Score: 0	Moderate Concern	**Yellow (3.000)**

Criterion 4 Assessment

SCORING GUIDELINES

Factor 4.1 - Physical Impact of Fishing Gear on the Habitat/Substrate
Goal: The fishery does not adversely impact the physical structure of the ocean habitat, seafloor or associated biological communities.

- *5 - Fishing gear does not contact the bottom*
- *4 - Vertical line gear*
- *3 - Gears that contacts the bottom, but is not dragged along the bottom (e.g. gillnet, bottom longline, trap) and is not fished on sensitive habitats. Or bottom seine on resilient mud/sand*

habitats. Or midwater trawl that is known to contact bottom occasionally. Or purse seine known to commonly contact the bottom.

- *2 - Bottom dragging gears (dredge, trawl) fished on resilient mud/sand habitats. Or gillnet, trap, or bottom longline fished on sensitive boulder or coral reef habitat. Or bottom seine except on mud/sand. Or there is known trampling of coral reef habitat.*
- *1 - Hydraulic clam dredge. Or dredge or trawl gear fished on moderately sensitive habitats (e.g., cobble or boulder)*
- *0 - Dredge or trawl fished on biogenic habitat, (e.g., deep-sea corals, eelgrass and maerl)*
  Note: When multiple habitat types are commonly encountered, and/or the habitat classification is uncertain, the score will be based on the most sensitive, plausible habitat type.

Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts
Goal: Damage to the seafloor is mitigated through protection of sensitive or vulnerable seafloor habitats, and limits on the spatial footprint of fishing on fishing effort.

- *+1 —>50% of the habitat is protected from fishing with the gear type. Or fishing intensity is very low/limited and for trawled fisheries, expansion of fishery's footprint is prohibited. Or gear is specifically modified to reduce damage to seafloor and modifications have been shown to be effective at reducing damage. Or there is an effective combination of 'moderate' mitigation measures.*
- *+0.5 —At least 20% of all representative habitats are protected from fishing with the gear type and for trawl fisheries, expansion of the fishery's footprint is prohibited. Or gear modification measures or other measures are in place to limit fishing effort, fishing intensity, and spatial footprint of damage caused from fishing that are expected to be effective.*
- *0 —No effective measures are in place to limit gear impacts on habitats or not applicable because gear used is benign and received a score of 5 in factor 4.1*

Factor 4.3 - Ecosystem-Based Fisheries Management
Goal: All stocks are maintained at levels that allow them to fulfill their ecological role and to maintain a functioning ecosystem and food web. Fishing activities should not seriously reduce ecosystem services provided by any retained species or result in harmful changes such as trophic cascades, phase shifts or reduction of genetic diversity. Even non-native species should be considered with respect to ecosystem impacts. If a fishery is managed in order to eradicate a non-native, the potential impacts of that strategy on native species in the ecosystem should be considered and rated below.

- *5 — Policies that have been shown to be effective are in place to protect species' ecological roles and ecosystem functioning (e.g. catch limits that ensure species' abundance is maintained at sufficient levels to provide food to predators) and effective spatial management is used to protect spawning and foraging areas, and prevent localized depletion. Or it has been scientifically demonstrated that fishing practices do not have negative ecological effects.*
- *4 — Policies are in place to protect species' ecological roles and ecosystem functioning but have not proven to be effective and at least some spatial management is used.*
- *3 — Policies are not in place to protect species' ecological roles and ecosystem functioning but detrimental food web impacts are not likely or policies in place may not be sufficient to protect species' ecological roles and ecosystem functioning.*
- *2 — Policies are not in place to protect species' ecological roles and ecosystem functioning and*

the likelihood of detrimental food impacts are likely (e.g. trophic cascades, alternate stable states, etc.), but conclusive scientific evidence is not available for this fishery.

- *1 — Scientifically demonstrated trophic cascades, alternate stable states or other detrimental food web impact are resulting from this fishery.*

Factor 4.1 - Impact of Fishing Gear on the Habitat/Substrate

Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Louisiana
Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Texas

Score: 3

Trotlines are scored a 3, according to Seafood Watch Criteria for bottom longlines, because they are shallow set with hooks resting on benthic substrate (see Figure 1 in the Introduction).

Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts

Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Louisiana
Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Texas

Score: 0

There are no known current trotline modifications implemented to mitigate gear impacts.

Factor 4.3 - Ecosystem-based Fisheries Management

Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Louisiana
Gulf of Mexico | Atlantic, Western Central | Trotline | United States | Texas

Moderate Concern

Little information is available on the impacts of the black drum fisheries on the ecosystem. Black drum is a benthic forager; adults feed mainly on bivalves and are important predators on oyster reefs (Brown et al. 2008). Some piscivorous fishes and sharks feed on black drum (Leard et al. 1993). Both Louisiana and Texas have changing coastlines due to hazardous weather such as hurricanes. The net effect of these events is unclear because they can both destroy habitat and create shallow waterbottom habitat (Leard et al. 1993). Louisiana recently released a Coastal Master Plan to respond to the loss of habitat with adaptive management and habitat restoration (State of Louisiana 2017). Both states have marine protected areas that make up a small proportion of black drum habitat (National Ocean Service 2017). Fisheries-independent data are collected to inform management about shrimp, oyster, and finfishes {LDFW 2016}, although the integration of these data at an ecosystem level to black drum management is unclear. The ecosystem-based fisheries management score is ranked a moderate concern, because there is a lack of spatial management but detrimental food web impacts from the fishery are unlikely.

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Scientific review does not constitute an endorsement of the Seafood Watch® program, or its seafood recommendations, on the part of the reviewing scientists. Seafood Watch® is solely responsible for the conclusions reached in this report.

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Appendix A: Updates to the U.S. Gulf of Mexico Black Drum Report

Updates to the April 2, 2018 U.S. Gulf of Mexico Black Drum report were made on October 28, 2022:

Overall recommendations for black drum caught by trotlines in the Gulf of Mexico remain unchanged, but individual criterion updates are outlined below.

Updates included:

- C3.1 (Management Strategy and Implementation) downgraded from highly effective to moderately effective for black drum caught in Louisiana. This is because harvest control rules and management thresholds have been removed and are no longer established, per the updated 2019 Louisiana Black Drum Fisheries Management Plan.

Appendix B: Rating Review Summary Tables

Criteria	Previous Report (2018; Texas)	Current Review (2022; Texas)
Who conducted the stock assessment?	Texas Parks and Wildlife Department; Dr. Fernando Martinez-Andrade	Same as previous
When was the stock assessment conducted?	2016	2019
Where/what are the catch composition data source(s)?	Research studies; 1987 and 1991	Same as previous
Who manages the fishery?	Texas Parks and Wildlife Department	Same as previous
What is the date of the published management plan?	2016	2019
Are there any amendments?	No	Same as previous

Criteria	Previous Report (2018; Louisiana)	Current Review (2022; Louisiana)
Who conducted the stock assessment?	Louisiana Department of Wildlife and Fisheries	Same as previous
When was the stock assessment conducted?	2015	2020
Where/what are the catch composition data source(s)?	2017 pers. comm.; TIP Program	LDWF trip ticket data from the 2019 LA Black Drum Fishery Management Plan
Who manages the fishery?	Louisiana Department of Wildlife and Fisheries	Same as previous
What is the date of the published management plan?	2017	2019
Are there any amendments?	No	Same as previous