

**Audubon Nature Institute
Gulf United For Lasting Fisheries (G.U.L.F.) Responsible Fisheries
Management Certification Scheme**

2nd Surveillance Assessment Report

For The
Louisiana Blue Crab Commercial Fishery

Including
Transition of the Fishery from v1.1 to v1.2 of the G.U.L.F. RFM Standard

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Glossary

B_{LIM}	Limit reference point for biomass
CPUE	Catch per Unit Effort
DMS	Data Management Subcommittee
EEZ	Exclusive Economic Zone
EP	Evaluation Parameter
ETPs	Endangered Threatened and Protected Species
FAO CCRF	FAO Code of Conduct for Responsible Fisheries
FAO Eco	FAO Ecolabelling Guidelines
FAO	United Nations Food and Agriculture Organization
F_{limit}	Limit reference point for fishing mortality
FMP	Fisheries Management Plan
F_{target}	Target reference point for fishing mortality
G.U.L.F	Gulf United for Lasting Fisheries
GMFMC	Gulf of Mexico Fishery Management Council
GOM	Gulf of Mexico
GSMFC	Gulf States Marine Fisheries Commission
HCR	Harvest Control Rule
LA	Louisiana
LAC	Louisiana Administrative Code
LDWF	Louisiana Department of Wildlife and Fisheries
LED	Law Enforcement Division
LFF	Louisiana Fisheries Forward
LWFC	Louisiana Wildlife and Fisheries Commission
MCS	Monitoring Control and Surveillance
MSY	Maximum Sustainable Yield
NC	Non-Conformance
NOAA	National Oceanic and Atmospheric Administration
CTF	Crab Task Force
SEAMAP	Southeast Area Monitoring and Assessment Program
SPR	Spawning Potential Ratio
SPR_{limit}	Limit reference point for SPR
SSB	Spawning Stock Biomass
SSB_{limit}	Limit reference point for SSB
SSB_{target}	Target reference point for SSB ($SSB_{limit} \times 1.5$)
TTF	Technical Task Force
VMS	Vessel Monitoring System

i. Summary and Recommendations

This document is the 2nd Surveillance Audit Report (Ref: LA/BLUEC/001.2/2018) for the Certification of Louisiana Blue Crab Commercial Fisheries against the Audubon Nature Institute Gulf United for Lasting Fisheries (GULF) Responsible Fisheries Management (RFM) Standard v1.2.

The Louisiana Department of Wildlife & Fisheries (LDWF) on behalf of the blue crab commercial fishers in Louisiana requested an assessment of the Louisiana blue crab (*Callinectes sapidus*) commercial fishery to the FAO-Based Audubon Nature Institute Gulf United for Lasting Fisheries (GULF) Responsible Fisheries Management (RFM) Certification Scheme, hereafter G.U.L.F. RFM. *Certification was granted on the 20th October 2016.*

The unit of certification (UoC) includes the Louisiana blue crab (*Callinectes sapidus*) commercial fishery, employing baited pot/trap gears, within Louisiana State Territorial Waters, under the management of the Louisiana Department of Wildlife & Fisheries (LDWF) and Louisiana Wildlife and Fisheries Commission (LWFC).

Demonstration of continued compliance is verified through a rigorous assessment conducted by a team of assessors from a third party, accredited certification body, SAI Global. The Assessment Team followed established procedures for GULF RFM Certification, in accordance with EN45011/ISO/IEC Guide 65 accredited certification procedures and using the GULF Responsible Fisheries Management Standard Issue 1.2 (January 2018) as the assessment framework. Details of the assessment team are provided in [Appendix 1](#).

This Assessment Report monitors for any progress in regards to relevant corrective actions, changes in the management regime, regulations and their implementation, stock assessment and status, and wider ecosystem considerations since the conclusion of the 1st surveillance assessment in 2017. Ultimately this assessment evaluates whether current practices in the management of the blue crab fishery remain consistent with criteria contained in the G.U.L.F. RFM Standard.

The assessment team recommends that the management system of the applicant fishery, the Louisiana blue crab (*Callinectes sapidus*) commercial fishery, employing baited pot/trap gears, within Louisiana State Territorial Waters, under the management of the Louisiana Department of Wildlife & Fisheries (LDWF) and Louisiana Wildlife and Fisheries Commission (LWFC), be granted continued certification.

The key outcomes of this Surveillance Assessment have been summarized in the Assessment Outcome Summary and Recommendations of the Assessment Team.

Areas that will be reviewed in the next (i.e. the 3rd) Surveillance Assessment in late 2019 are listed in the following page.

Review Areas in Future Surveillance Audits

The blue crab fishery remains on track with the corrective actions planned and implemented up to 2018 and detailed in this 2nd Surveillance report.

The Assessment Team will continue to review non-conformances and associated corrective management actions throughout the lifespan of this certificate. In particular, once management measures and fishery performance information for 2019, and an updated stock assessment become available in 2019, a new determination will be made in relation to the status of the two Non-Conformances.

Related to the non-conformances identified in the original Full Assessment report as addressed through appropriate corrective actions up until the time of this surveillance, a number of generally relevant areas will be reviewed in upcoming surveillance audits including:

1. New research and/or publication of analysis relating to diamondback terrapins and ghost fishing ^{1 2};
2. Results of the planned 2019 stock assessment;
3. Blue crab juvenile abundance trends (for surveillance audits where new stock assessments are not available);
4. Management performance vs management objectives as they relate to a) abundance of the blue crab stock and b) fishing effort reduction;
5. Future implementation of harvest control measures including closures and harvest bans on adult and immature female crab;
6. Blue crab mortality sources (including potential blue crab catches in shrimp or other non-directed fisheries and/or ghost fishing effect from derelict traps);
7. Information collection/records relating to routinely encountered bycatch, retained catches, bait species usage and interactions with Endangered, Threatened, Protected (ETP) species.

¹https://www.gsmfc.org/ann_mtgs/2017-10/Gen_Sess/4.%20Bycatch%20in%20the%20Commercial%20Blue%20Crab%20Fishery%20in.pdf

² <https://www.stevenhpearson.com/publications> : Pearson SH and Wiebe JJ. Interactions between Diamondback Terrapins (*Malaclemys terrapin*) and the Crab Industry in Terrebonne Bay, Louisiana: Do Ghost Traps Impact Terrapin Populations within Coastal Louisiana? To be submitted to Marine Pollution

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1. Introduction

LDWF on behalf of blue crab commercial fishers in Louisiana requested an assessment of the Louisiana blue crab (*Callinectes sapidus*) commercial fishery to the G.U.L.F. RFM Certification Scheme and following an extensive assessment, Certification was granted on the 20th October 2016. The unit of certification includes the Louisiana blue crab commercial fishery, employing baited pot/trap gears, within Louisiana State Territorial Waters, under the management of the LDWF and Louisiana Wildlife and Fisheries Commission (LWFC).

This assessment represents the **2nd Surveillance Audit Report** for Louisiana blue crab and fulfills part of the procedure for the continuing certification of the fishery to the G.U.L.F RFM Certification Scheme. The G.U.L.F RFM Certification Scheme is a voluntary program for Gulf of Mexico fisheries, administered by the Audubon Nature Institute, whose purpose is to provide the fishing industry with a “Certification of Responsible Fisheries Management” at the highest level of market acceptance. Certification to the Scheme demonstrates a commitment that communicates to customers and consumers the responsibility of fishermen and fisheries management authorities.

At the core of the G.U.L.F RFM Certification Scheme is the G.U.L.F RFM Standard (**Current Issue: Issue 1.2. Jan 2018**). The G.U.L.F RFM Standard is based on the 1995 FAO Code of Conduct for Responsible Fisheries and on the FAO Guidelines for the Eco-labelling of Fish and Fishery Products from Marine Capture Fisheries adopted in 2005 and amended/extended in 2009, which in turn are based on the current suite of agreed international instruments addressing fisheries.

The Certification Scheme is accredited to the international standard ISO/IEC 17065, confirming that consistent, competent and independent certification practices are applied. Formal ISO/IEC 17065 accreditation by an IAF (International Accreditation Forum) Accreditation body gives the Scheme formal recognition and a credible position in the International marketplace and ensures that products certified under the Program are identified at a recognized level of assurance. Demonstration of compliance is verified through a rigorous assessment by a competent, third party, accredited certification body, SAI Global. The assessment was conducted by a team of SAI Global appointed Assessors comprising of internal staff and externally contracted fishery experts according to established procedures for GULF RFM Certification, in accordance with EN45011/ISO/IEC Guide 65 accredited certification procedures, and using the GULF Responsible Fisheries Management Standard Issue 1.2 (Jan 2018) as the assessment framework. Details of the assessment team are provided in [Appendix 1](#).

As the 2018 audit is the 2nd of 4 annual surveillance audits to be conducted within the 5 year lifetime of the current certificate, the primary role of this Surveillance Audit Report is to monitor progress relative to corrective action measures, changes in the management regime, regulations and their implementation, stock assessment and status, and wider ecosystem considerations since the conclusion of the 1st Surveillance Assessment in 2017. Ultimately, this assessment evaluates whether current practices in the management of the blue crab fishery remain consistent with criteria contained in the G.U.L.F. RFM Standard.

The Assessment is based on 8 Fundamental Clauses contained within 5 Sections of responsible fisheries management (RFM) namely:

- [Section A: The Fisheries Management System](#)
- [Section B: Data Collection, Stock Assessment and Scientific Advice](#)
- [Section C: Management Objectives for the Stock](#)
- [Section D: Precautionary Approach](#)
- [Section E: Serious Impacts of the Fishery on the Ecosystem](#)

1.1. Recommendations of the Assessment Team

The assessment team recommends that the management system of the applicant fishery, the Louisiana blue crab (*Callinectes sapidus*) commercial fishery, employing baited pot/trap gears, within Louisiana State Territorial Waters, under the management of the Louisiana Department of Wildlife & Fisheries (LDWF) and Louisiana Wildlife and Fisheries Commission (LWFC), be granted continued certification.

2. Fishery Applicant Details

Table 1. Fishery applicant details.

Applicant Contact Information	
Organization/Company Name:	Louisiana Department of Wildlife and Fisheries (LDWF)
Date:	November 2014
Address:	Building: Louisiana Department of Wildlife and Fisheries (LDWF)
	Street: 2000 Quail Drive
	City: Baton Rouge
	Country: Louisiana, USA
	Postal Code: 70898
Phone:	+1 225-765-2800
Web:	http://www.wlf.louisiana.gov/
Contact person:	Peyton Cagle
Position:	Program Manager
E-mail Address	pcagle@wlf.la.gov

3. Unit(s) of Assessment and Certification

The applicant Unit of Assessment (UoA) (i.e., what is to be assessed) during this assessment is described by the following:

Unit of Assessment (UoA)		
Species:	Common name:	Blue crab
	Latin name:	<i>Callinectes sapidus</i>
Geographical Area(s)		The Gulf of Mexico State Waters of Louisiana, FAO Statistical Area 31
Stock(s)		Louisiana State Territorial Waters
Management System		State of Louisiana through the Louisiana Wildlife and Fisheries Commission (LWFC) and the Louisiana Department of Wildlife and Fisheries (LDWF)
Fishing gear(s)/method(s)		Baited pots/traps

The applicant Unit of Certification (UoC) (i.e., what will continue to be covered by the certificate if all Units of Assessment listed above continue to meet the required standard) is described by the following:

Unit of Certification (UoC)					
Species:	Common name:	1	Blue crab	Stock:	Louisiana State Territorial Waters
	Latin name:		<i>Callinectes sapidus</i>		
Geographical Area(s)		2	The Gulf of Mexico State Waters of Louisiana, FAO Statistical Area 31		
Management System		3	State of Louisiana through the Louisiana Wildlife and Fisheries Commission (LWFC) and the Louisiana Department of Wildlife and Fisheries (LDWF)		
Fishing gear(s)		4	Baited pots/traps		

Note, the UoA and the UoC are the same. All commercial Blue crab fishermen in Louisiana are covered by the certificate.

3.1. Changes to the Unit of Certification

There have been no changes to the Unit of Certification in the past year (i.e. since the fishery underwent Surveillance 1). Therefore, the Unit of Certification remains the same for the coming year.

4. Fishery Observations

4.1. Stock status update

Assessment of stock status is conducted annually based on indices of exploitable biomass generated by the LDWF fishery-independent blue crab survey, and on estimates of fishing mortality generated using harvest data from the LDWF Trip Ticket system and exploitable biomass estimates. The data and information are used in stock assessments conducted at regular intervals (West et al. 2011, 2014), and in updates to the most recent stock assessment in 2016 and 2018. The most recent update stock assessment was conducted in early 2018³ due to the overfished status of the fishery in 2015 and to high fishing mortality near the limit reference point in 2014. Since 2016 the stock has not been overfished nor has overfishing occurred (West et al. 2018). A full stock assessment will be conducted in 2019. The stock assessments use a catch-survey/Collie-Sissenwine analysis (Collie and Sissenwine 1983). The model is intended for data moderate situations where a full age structure is lacking, and it balances the number of individuals from the juvenile life stage to that for exploitable-size crabs, given constant natural mortality, while scaling these values to harvest. The data requirements are a time-series of landings and corresponding abundance indices for juvenile and adult life stages, an estimate of instantaneous natural mortality, and the relative selectivity of the juvenile and adult life stages to the survey gear. Assumptions of the catch-survey model are: (i) the stock is closed to migration, (ii) natural mortality occurs at a constant rate, and (iii) all surviving recruits will grow into the fully-recruited stage within the model year. Survey indices of abundance are assumed proportional to absolute abundance. Crabs greater than 25 mm in carapace width are assumed to be equally vulnerable to the survey gear.

The previous assessments (West et al. 2011, 2014) established precautionary limits to fishing by requiring that exploitable biomass not fall below the three lowest levels observed (1968 – 2009) where the stock demonstrated sustainability (i.e., no observed declines in recruitment over a wide-range of exploitable biomasses). This is equivalent to maintaining the stock above a limit spawning potential ratio (SPR; Goodyear, 1993). Louisiana blue crab data does not allow for reliable estimates of MSY. The assessments, therefore, define a limit based upon the history of the fishery (i.e., a 19.1% SPR_{limit}). The fishing mortality rate limit F_{limit} and SSB_{limit} that are equivalent to this SPR_{limit} were estimated as 0.98 year⁻¹ and 16.4 million pounds, respectively (West et al. 2014). To define the targets of fishing, (i.e., SSB, F, and SPR) sufficiently far from the limits as a buffer from random variability of the environment, the biomass target reference point (SSB_{target}) is defined as $SSB_{limit} \times 1.5 = 24.6$ million pounds. This biomass is achieved when there is an equilibrium SPR_{target} of 28.7% and F_{target} of 0.75 year⁻¹.

The Louisiana Wildlife and Fisheries Commission adopted a resolution on February 6, 2014 establishing the following policy based on the overfishing and overfished limits and targets of fishing described above: “Should the fishing mortality or exploitable biomass exceed the overfished or overfishing limits, or exceed the targets for three consecutive years, as defined in the most current Louisiana blue crab stock assessment, LDWF shall come before the Commission with an updated assessment and a series of management options for the Commission to review and act upon, intended to keep the fishery from becoming overfished, and that management options for review and action shall include provisions for emergency closures, time-based closures, and spatial closures.”

³ <http://www.wlf.louisiana.gov/sites/default/files/pdf/page/37756-stock-assessments/labassessment2018.pdf>

The blue crab is a short-lived, highly productive species. SSB_{limit} was set so as to ensure the stock does not fall below the three lowest levels observed (1968 – 2009) where the stock demonstrated sustainability (i.e. no observed declines in recruitment over a wide-range of exploitable biomasses). While the 2015 estimate was the lowest level recorded in the time series, the stock has previously recovered from SSB_{limit} , and did so once again in 2016 and 2017 (Figure 1). Therefore the SSB_{limit} can be considered to be precautionary and set above the point at which recruitment is likely to be impaired. Recent recruitment levels have been declining and reached the lowest values in the time series (Figure 1). Despite the increased abundance and biomass of adults, recruitment has not recovered, which may be due to various factors including ecosystem drivers and decreases in larval subsidies from other states in the Gulf of Mexico due to the connectedness of blue crab populations west of the Apalachicola River.

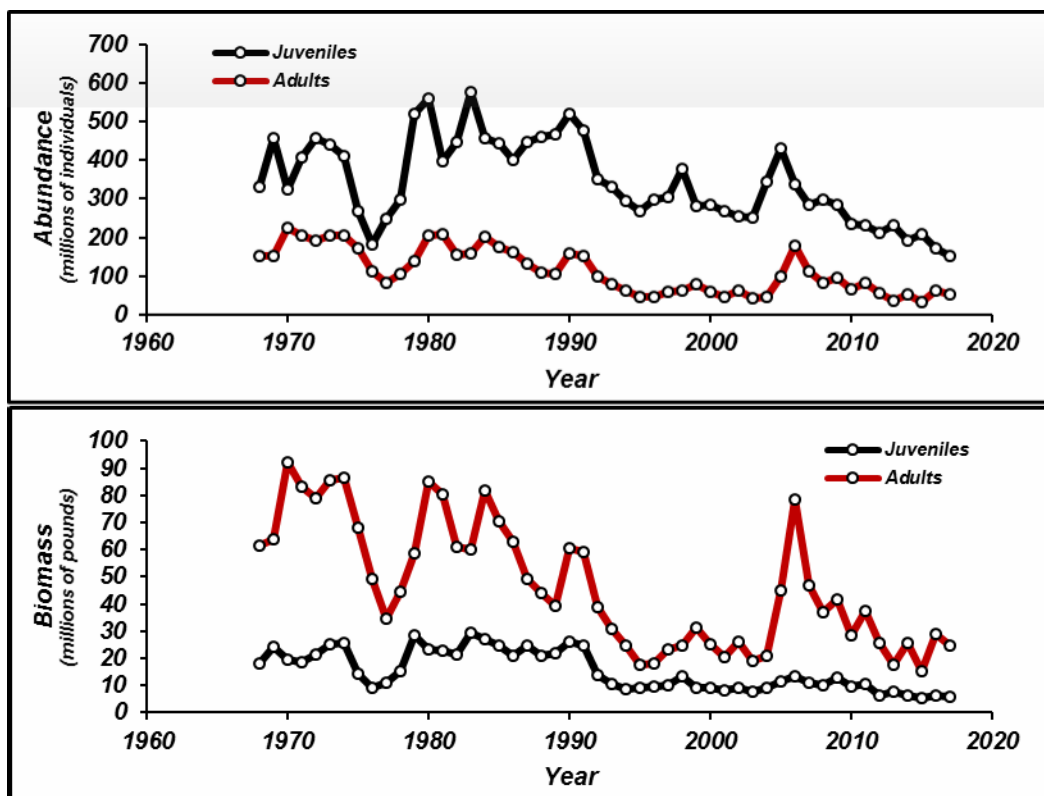


Figure 1. Abundance (top) and biomass (bottom) of juveniles and adults from the fishery-independent survey. Figure from 2018 updated stock assessment (West et al. 2018).

Updates have been provided of the time series of fishing mortality rates and exploitable biomass relative to the targets and limits of each reference point (Figure 2). Fishing mortality rates exceeding F_{limit} (or ratios of $F/F_{limit} > 1.0$) indicate overfishing; stock biomasses below SSB_{limit} (or ratios of $SSB/SSB_{limit} < 1.0$) indicate an overfished condition. The 2015 and 2016 estimates of F/F_{limit} were near the target and far lower than the limit, suggesting that the stock has not been experiencing overfishing recently. Similarly, the 2016 and 2017 estimates of SSB/SSB_{limit} were also near the target and much higher than the limit (Figure 2), suggesting that the stock has not been overfished

recently⁴. These current estimates of fishing mortality and exploitable biomass suggest that the fishery is sustainably exploiting the blue crab stock and that recent management measures may have had some positive effects, although the persistently low juvenile index of abundance (Figure 1) indicates that cautious management should be employed.

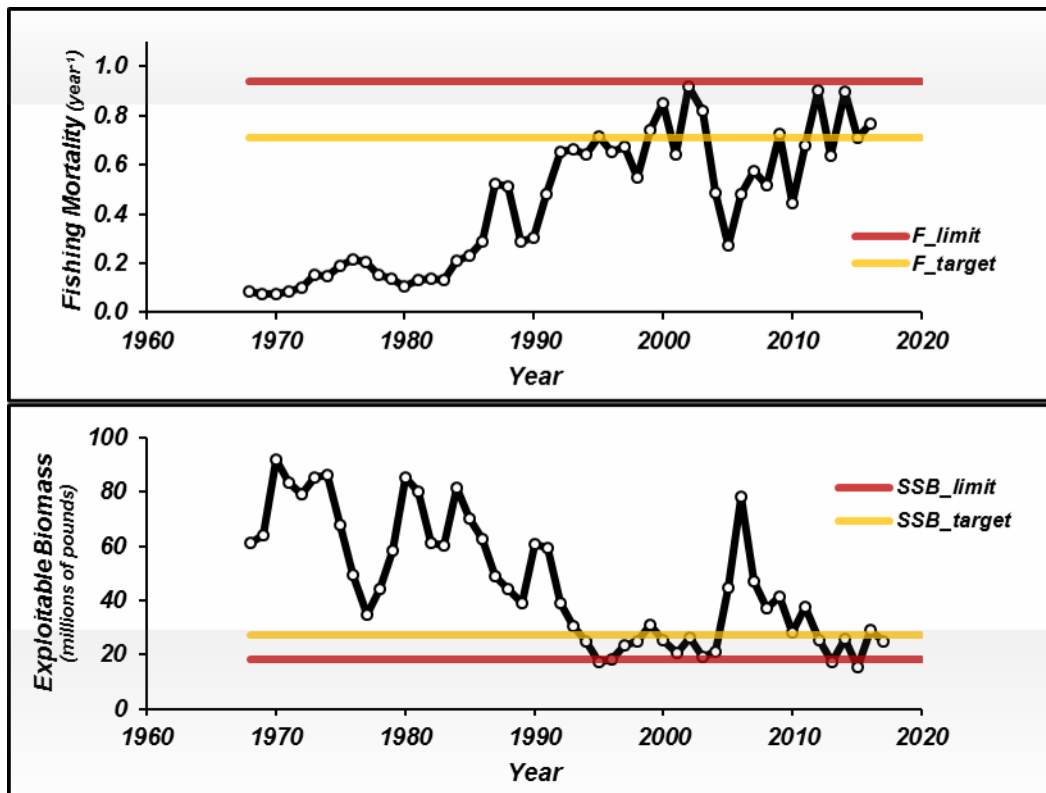


Figure 2. Fishing mortality rates and exploitable biomass over time relative to the targets and limits of each reference point. Figure from 2018 updated stock assessment (West et al. 2018)

Update on Gulf-wide Blue Crab Mark-Recapture Study

An effort to tag blue crab in the Gulf of Mexico is underway. Some preliminary results have been presented at the Crab Task Force Meeting on May 8th 2018⁵ by Zachary Darnell of the Gulf Coast Research Lab. 1,868 recaptures have been currently reported for an overall recapture rate of 12.8%. This is within the range reported for previous blue crab mark-recapture studies along the Atlantic Coast (5–39.7%). Recapture rates for individual states have been variable, ranging from 1.5% for Texas to 20.7% for Alabama. The recapture rates for Louisiana was 13.2%. Distances travelled by tagged crabs ranged from 0–337.3 km, with an average travel distance of 24.3 ± 35.0 km (mean \pm SD). In general, tagged mature female blue crabs moved seaward, with the most rapid seaward movement occurring during the summer months. For most estuaries, tagged female crabs showed a pattern of

⁴ <http://www.wlf.louisiana.gov/sites/default/files/pdf/page/37756-stock-assessments/labassessment2018.pdf>

⁵ http://www.wlf.louisiana.gov/sites/default/files/crab_tagging_update_5.8.18.pdf

general spreading once they exited their home estuary, with crabs traveling in all directions. There were, however, exceptions. Crabs tagged in the Pontchartrain Basin tended to continue moving east, even once out of Lake Borne. Crabs tagged in Steinhatchee, FL exhibited a consistent north-westward movement pattern. While crabs were primarily recaptured in the same state in which they were tagged, some crabs did cross state lines and were recaptured in neighbouring states.

4.2. Landings Update

Typically, more than half of Louisiana blue crabs are harvested from the Pontchartrain and Terrebonne basin ⁶.



Figure 3. Louisiana coastal basins (note, basins used in the LA Trip Ticket Program may differ to some degree from this map).

Updates have been provided of the time series of Louisiana blue crab landings and fishing effort in the 2018 stock assessment update. Landings have been relatively stable since 2011. Fishing effort rose significantly from 2011 through 2014 but then declined to average levels for the timeframe from 2005 through 2017. Hence, Catch Per Unit Effort (CPUE) declined substantially from 2011 through 2014 but rose to average levels since 2014 (Figure 4).

⁶ www.wlf.louisiana.gov/sites/default/files/pdf/document/37780-fisheries-brochures/blue_crab_front.pdf

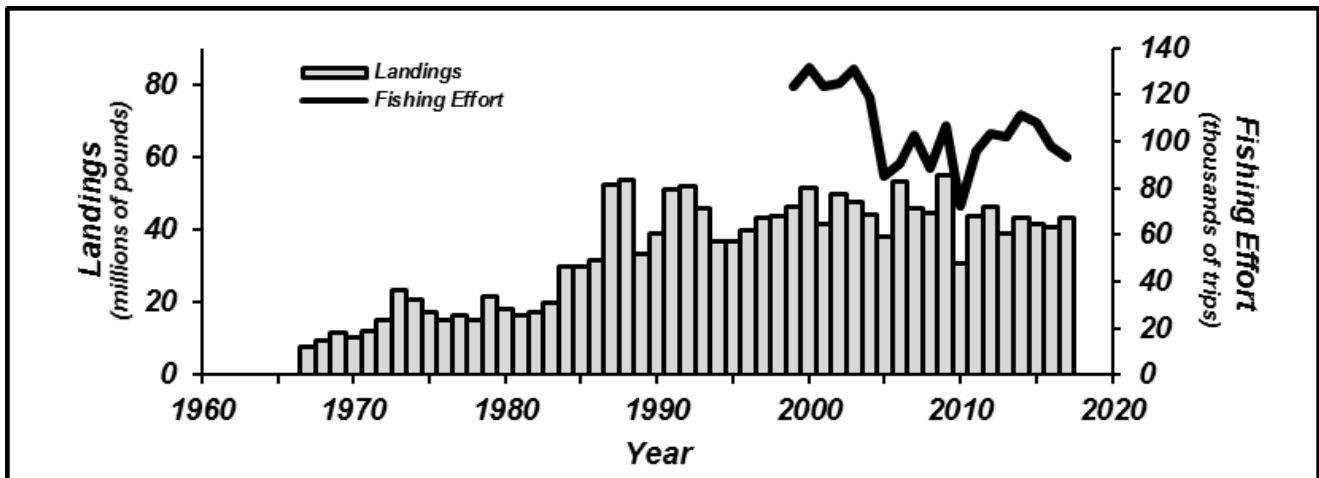


Figure 4. Landings and fishing effort of Louisiana blue crab. Figure from 2018 updated stock assessment (West et al. 2018).

4.3. Enforcement update

Since the previous surveillance in 2017 (no. 1) there have been no significant changes to the enforcement assets deployed. Similarly, there has been a similar enforcement effort to 2017.

The most common violation between July 2017-2018 has been the use of crab traps without required markings (Table 2), followed by the destruction of legal crab traps/removal of contents and violation of crab trap escape ring requirements, as well as the taking/possession of immature female crabs as per 76 Part VII:3 and the taking of crabs during closed season as per 76 Part VII:346. Enforcement agents confirmed that the relatively new ring measures and the closures during 2018 were relatively simple to enforce and that there was generally a good level of compliance. During the December 2018 site visit the enforcement agents also communicated that in 2019 they may have a more specific breakdown on enforcement hours spent based on gear type and fishery.

Table 2. Criminal citations (Type R) and warnings (Type W) for the Louisiana crab fishery from July 1st 2017 to July 31st 2018.

VIOLATION CODE	DESCRIPTION	TYPE	TOTAL	TYPE	TOTAL
25.1	Take / possess over limit blue crabs (144/person)	R	4		
43	Take crab with illegal gear	R	2		
60	Possess crabs in berry stage	R	5		
61	Use crab traps without required markings	R	22	W	1
62	Fail to remove unserviceable traps	O			
62.1	Intentionally discard crab trap in navigable waters	O			
62.2	Violate abandoned crab trap removal regulations	R	4		
63	Destroy legal crab traps or removing contents	R	17		
64	Set crab traps in navigable channels	R	4		
64.1	Violate crab trap escape ring requirements	R	17	W	3
81	Fail to mark crab containers	R	1		

81.1	Fail to mark softshell crab container or	R	7		
82	Tending crab traps illegal hours	R	8		
95	Theft of crab trap(s)	R	11		
96	Possess or sell undersized crabs (10% to 19%)	R	3		
96.2	Sell undersize crabs (10% to 19%)	0			
96.3	Possess over 20% undersize crabs	R	2		
96.4	Obtain license or engage in activity after	0			
96.5	Fail to comply with stone crab requirements	R	1		
96.6	Taking/Posses immature female crabs as per 76 PartVII:3	R	14	W	1
96.7	Taking crabs closed season as per 76 Part VII:346	R	13		

4.4. Ecosystem Update

There are no significant changes in the ecosystems impacts for this fishery since the previous surveillance.

4.4.1. ETP Species

Endangered and threatened species in Louisiana as of April 2018 are listed on Fish and Wildlife Service website⁷. Some of these include:

MAMMALS

Manatee, West Indian
(*Trichechus manatus*)

Whale, finback
(*Balaenoptera physalus*)

Whale, humpback
(*Megaptera novaeangliae*)

Whale, right
(*Eubalaena glacialis*)

Whale, sei
(*Balaenoptera borealis*)

Whale, sperm

FISH

Sawfish, Smalltooth
(*Pristis pectinata*)

Sturgeon, Atlantic
(*Acipenser oxyrhynchus desotoi*)

Sturgeon, pallid
(*Scaphirhynchus albus*)

Sturgeon, Shovelnose
(*Scaphirhynchus platyrhynchus*)

STATUS

Threatened

Endangered

Endangered²

Endangered²

Endangered²

Endangered²

Endangered²

Threatened⁵

Endangered

Threatened (S/A)⁶

GENERAL DISTRIBUTION IN LOUISIANA

Lake Pontchartrain & tributaries on North shore; rare along Gulf coast

Coastal waters

Coastal waters

Coastal waters

Coastal waters

Coastal waters

Gulf of Mexico: Texas to Florida

Pearl River & Lake Pontchartrain tributaries

Mississippi River & tributaries

Mississippi River & tributaries

⁷ <https://www.fws.gov/southeast/pdf/fact-sheet/louisiana-ecological-services-field-office-t-and-e-species.pdf>

REPTILES

Alligator, American (<i>Alligator mississippiensis</i>)	Threatened (S/A) ⁴	Entire state
Snake, Louisiana pine (<i>Pituophis ruthveni</i>)	Threatened	Bienville, Natchitoches, Sabine, & Vernon Parishes
Tortoise, gopher (<i>Gopherus polyphemus</i>)	Threatened	Washington, St. Tammany, & Tangipahoa Parishes
Turtle, Kemp's (Atlantic) ridley sea (<i>Lepidochelys kempii</i>)	Endangered ⁵	Coastal waters
Turtle, green sea (<i>Chelonia mydas</i>)	Threatened ⁵	Coastal waters
Turtle, hawksbill sea (<i>Eretmochelys imbricata</i>)	Endangered ⁵	Coastal waters
Turtle, leatherback sea (<i>Dermochelys coriacea</i>)	Endangered ⁵	Coastal waters
Turtle, loggerhead sea (<i>Caretta caretta</i>)	Threatened ⁵	Coastal waters
Turtle, ringed map (=sawback) (<i>Graptemys oculifera</i>)	Threatened	Pearl & Bogue Chitto Rivers

Available evidence suggests that the blue crab fishery does not currently pose serious risks to any of these species. Recent research of the blue crab fishery on diamondback terrapins, a species of special concern In Louisiana, is presented below.

4.4.2. Species of Concern – diamondback terrapin

New research has been published on the distribution and ecology of diamondback terrapins (*Malaclemys terrapin*), a species of special concern that has been found to occasionally interact with the blue crab pot fishery. There is a limited area of potential interaction between the blue crab fishery and diamondback terrapins, and LDWF biologists are researching their distribution and abundance throughout coastal LA. In this respect, LDWF implemented a multi-year (2013–2015) project which evaluated diamondback terrapin nesting ecology along Louisiana's coastline, principally within the Deltaic Plain. Pearson et al. (2018a)⁸ in their resulting analysis and publication of the Deltaic Plain study (which includes about half of the Louisiana coastline extending roughly from the center of the Louisiana coast past the Mississippi border and East into Alabama) found a patchy distribution with local areas of abundance in Louisiana's Deltaic marshes similar to those described in the Chenier Plain by Selman et al. (2014) (note the Chenier Plain includes about half of the Louisiana coastline extending roughly from the center of the Louisiana coast West into Texas). Together, the Deltaic and Chenier Plains include most of Louisiana's coastline. The Pontchartrain, Terrebonne and Barataria Basins are within the Deltaic Plain of Louisiana and occupy the vast majority in it. In the Pontchartrain and Terrebonne basins, the highest diamondback terrapin CPUE sites were within remote locations. In contrast, the site with the highest CPUE in Barataria Basin was in relative proximity to anthropogenic development (e.g., boat launch, fishing communities); however, this site was in an area where trapping for blue crab (*Callinectes sapidus*) is prohibited. Higher CPUE at these sites is likely attributable to the improved habitat quality with higher salinity near the Gulf of Mexico, proximity to nesting habitats, or to reduced pressure from fisheries in or around these sites. The authors highlighted that additional

⁸ <http://www.bioone.org/doi/full/10.1655/Herpetologica-D-17-00057.1>

research was needed to further determine the drivers of diamondback terrapin abundance within Louisiana's Deltaic Plain coastal regions.

The Selman et al (2014) and Pearson et al. (2018a) studies now provide distribution data on diamondback terrapins along most of the coastline in Louisiana. In another study on the ecology of diamondback terrapins across Louisiana's coast based on a 2012-2015 survey, Pearson and Wiebe (2018b)⁹ showed the distribution and the ecological factor for nesting areas and that throughout their range many different biotic and abiotic factors have been shown to influence diamondback terrapin abundance, distribution, and nesting success. The study focused on identifying nest site locations, nest predators and predation rates, nest surface characteristics, nest depth, clutch size, egg morphometrics, nest and nest survivorship. The results indicate that diamondback terrapin nesting occurs coast-wide in locations where suitable nesting substrates exist. Nests are laid in open areas and beneath dense vegetative cover with surface slopes in all orientations. Depredation rates range between 50 and 100 percent depending on nesting beach location. These results provide Louisiana's first evaluation of diamondback terrapin nesting ecology critical for determining their conservation status within Louisiana.

Since 2010, Louisiana has made great strides in describing diamondback terrapin populations, nesting ecology and interactions with crab fisheries. These efforts have helped determine that terrapin populations exist in Louisiana and that nesting successfully occurs across the coastline, but that current threats to terrapin populations are largely caused by anthropogenic activities such as land development, commercial fishing, and oil spills. These findings provide natural resource managers with critical life history information that will be incorporated into current and future coastal restoration plans to benefit diamondback terrapins, as well as to better inform their interactions with the Blue crab fishery (Pearson and Wiebe, 2018)¹⁰.

Diamondback terrapin regulations

Diamondback terrapins were identified during the full assessment as an ETP species that could be caught by trap gear but research confirmed that the effects of the fishery on this species were negligible. Current regulation relative to the species interaction with this fishery include the following:

§56/635¹¹. Diamondback terrapins; trapping; turtle eggs

A. No person shall take diamondback terrapins by means of traps of any kind, and no person shall take the eggs of any species of turtle, except the red ear (*Trachemys Scripta*), wherever found.

B. No person shall ship diamondback terrapins out of the state between the fifteenth of April and the fifteenth of June. All diamondback terrapins caught by any means whatsoever during that period shall be immediately returned to the water alive.

Acts 1992, No. 256, §1, eff. July 1, 1993; Acts 1995, No. 604, §1.

If a person ships diamondback terrapins into Louisiana and then ships them out, there is no way to prove they were not caught in Louisiana. Therefore, preventing them from shipping terrapins out gives enforcement

⁹ <https://doi.org/10.1016/j.ocecoaman.2018.01.017>

¹⁰ <https://www.sciencedirect.com/science/article/pii/S0964569117305781>

¹¹ http://www.wlf.louisiana.gov/sites/default/files/pdf/document/39939-title/ose_legal_forms_2015title56.pdf

authorities the ability to take action whether caught illegally in Louisiana or shipped in (no way to tell the difference) (pers. comm. LTC Chad Hebert, Jan 2019).

4.4.3. Bait Used

The main bait used in the blue crab fishery is reported to be menhaden, gizzard shad and sea catfish (as well as carcasses from freshwater catfish processing, Harry Blanchet, LDWF, pers. comm.). An assessment of these species is provided below. All of these species appear to be relatively abundant.

Gulf menhaden

The bait fishery for menhaden (*Brevoortia patronus*) in the Gulf grew rapidly during the 1980s but leveled off in the 1990s and today is almost negligible, compared to reduction fishery landings. Menhaden are most often used for bait in the blue crab and crawfish fisheries; however, they are also used in the fisheries for stone crab, spiny lobster, and various commercial and recreational finfish.

Because of the vast difference in landings by the reduction fishery versus the bait fishery, the reduction fishery is the only significant component with regard to fishing pressure on the stock. In the most recent stock assessment for Gulf menhaden, SEDAR32A (SEDAR 2013), the MAC, the GSMFC, and the states have agreed to implement an MSY proxy [fecundity (SSB)] and reference points relative to the current level of fishing effort.

The assessment concluded that the Gulf menhaden stock is neither overfished nor is overfishing occurring (Figure 5)¹². A 2016 update confirmed that the stock remains as determined in 2013, not overfished or overfishing occurring. The recommendation for the next assessment was in 2018¹³.

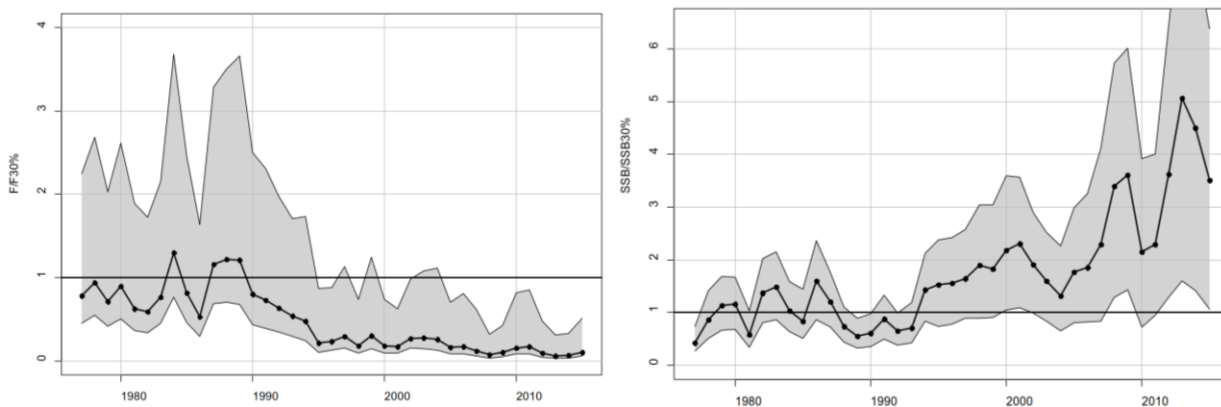


Figure 5. Gulf menhaden biomass (SSB/SSB30%) and fishing mortality (F/F30%) in the 2016 assessment.

¹² <https://www.gsmfc.org/publications/GSMFC%20Number%20240.pdf>

¹³ <https://www.gsmfc.org/publications/GSMFC%20Number%20254.pdf>

Atlantic menhaden

While Atlantic menhaden (*Brevoortia tyrannus*) reduction landings have declined since the mid-2000s, menhaden landings for bait have become increasingly important to the total coastwide landings of menhaden. Commercial bait landings occur in almost every Atlantic coast state. A majority of the menhaden-for-bait landings are used commercially in crab, lobster, and hook-and-line fisheries.

The Atlantic menhaden stock is currently managed under Amendment 2 (2012) to the Fishery Management Plan. Amendment 2 instituted a 170,800 metric ton (mt) total allowable catch (TAC) beginning in 2013 and established state-by-state allocations based on landings history from 2009-2011. States are required to close their fisheries when their portion of the TAC has been reached and any overages must be paid back the following year.

In 2015, the Board established a 187,880 mt TAC for the 2015 and 2016 fishing years. This represented a 10% increase from the 2013 and 2014 TAC. In October 2016, the Board approved a TAC of 200,000 mt for the 2017 fishing year, representing a 6.45% increase from the 2015 and 2016 fishing years. Both increases stemmed from results of the 2015 Stock Assessment as well as projection analysis (Figure 6). Amendment 3 to the Atlantic Menhaden FMP was initiated in 2015 to consider the development of ecological reference points (ERPs) and revisit allocation methods.

Based on the assessment update, Atlantic menhaden are neither overfished nor experiencing overfishing¹⁴.

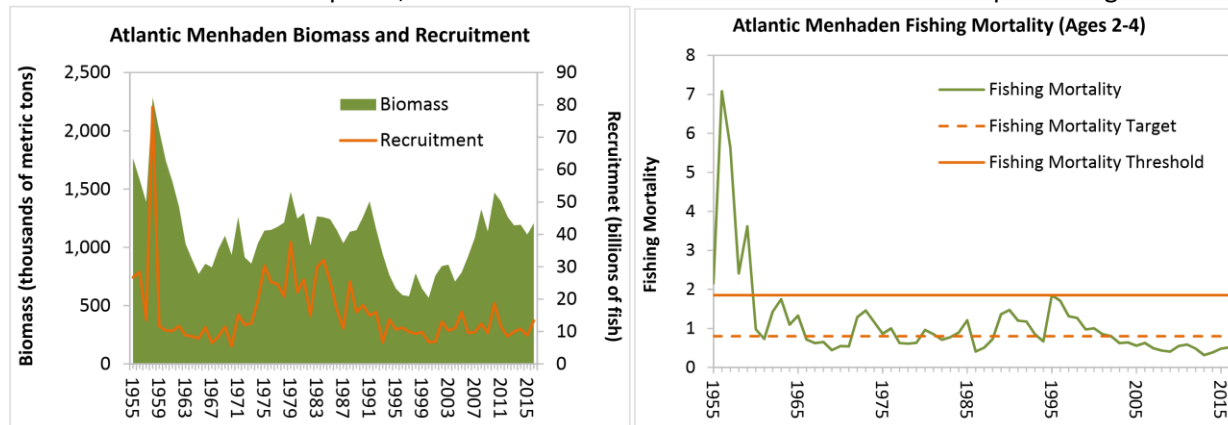


Figure 6. Atlantic menhaden biomass, recruitment and fishing mortality (ages 2-4).

Sea Catfish/Hardhead catfish

Sea catfish (also called hardhead catfish) (*Ariopsis felis*) are found in the nearshore waters and brackish estuaries of the southeast U.S. Atlantic coast and the Gulf coast from Cape Cod to the Yucatan. They prefer sandy or muddy bottoms and tolerate a wide range of salinity from the open ocean to nearly fresh. They are found in coastal waters from spring through fall. During winter they move into deeper waters. Hardhead catfish are considered

¹⁴ https://www.asmfc.org/uploads/file//598e214eMenhadenAssessmentOverview_Aug2017.pdf

abundant and widespread¹⁵. Occasional mass mortalities are observed on the Gulf Coast as a result of disease and low oxygen levels, which are often associated with algae blooms¹⁶.

The Gulf of Mexico population quickly rebounds from these mortality events and is not declining. Data from angler surveys and industrial trawls in the southeastern US and Gulf of Mexico likely underestimated catches of hardhead sea catfish, as they are frequently discarded at sea. Areas of high abundance are usually avoided as these fish are considered a nuisance (Muncy and Wingo 1983). This species is considered Least Concern on the IUCN Red List with a stable population trend¹⁷.

Gizzard shad

Gizzard shad (*Dorosoma cepedianum*) is highly abundant in the lakes and rivers of Louisiana. Total adult population size is unknown but very large. This species is common in much of its range (North America) and has increased in abundance in the lower Missouri River as a result of human-caused changes in the river (e.g., reservoir construction) (Pflieger and Grace 1987). The trend over the past 10 years or three generations is uncertain but likely to be relatively stable. This species is considered Least Concern on the IUCN Red list¹⁸.

4.5. Current Regulations and Proposed Changes

4.5.1. Current (2018) Crab Regulations¹⁹

Fishing Gear

Gear allowed to harvest blue crab in Louisiana waters includes:

- Crab traps (main gear, used for > 99% of catches)
- Crab drop nets (negligible catches)
- Trotlines, handlines, and bushlines (negligible catches)
- Dip and cast nets (negligible catches)
- Trawl, skimmer, and butterfly nets* (negligible catches)

2018 Crab Trap Requirements

The table below shows the current trap requirements in Louisiana as of December 2018 ²⁰.

¹⁵ <https://arxiv.org/ftp/arxiv/papers/1210/1210.3062.pdf>

¹⁶ <http://gcrl.usm.edu/public/fish/hardhead.catfish.php>

¹⁷ <https://www.iucnredlist.org/species/190456/1952682#population>

¹⁸ <https://www.iucnredlist.org/species/191210/15364728#population>

¹⁹ www.wlf.louisiana.gov/sites/default/files/pdf/page/41407-regulations/commercialfishingbrochure201810-30-18.pdf

²⁰ www.wlf.louisiana.gov/sites/default/files/pdf/page/41407-regulations/commercialfishingbrochure201810-30-18.pdf

Table 3. Current Louisiana blue crab current trap requirements.

Night restrictions	Fishermen may not bait, tend, check, or remove crab traps, their contents, lines, buoys, or markers in public waters from 1/2-hour after legal sunset until 1/2-hour before legal sunrise.
Trap placement	Fishermen must place traps so vessels can safely navigate waters (i.e. not in navigable channels or entrances to streams).
Unserviceable traps	Fishermen must properly dispose of unserviceable crab traps back at the dock to reduce the risk and potential impact of derelict traps.
Damage to or destruction of traps	Apart from the crab trap licenseholder (or his agent), no one may intentionally damage or destroy the respective crab trap, attached floats or lines, or its contents.
Trap identification	Fishermen must mark traps with a plastic bait box cover or a 2-inch stainless steel, self-locking tag attached to the center of the trap ceiling to identify ownership. Either one must be legibly engraved or embossed with the corresponding Commercial Fisherman License number
Floats and float lines	Fishermen must mark all crab traps with a solid float, 6 inches in diameter or larger, attached with a non-floating line, 1/4 inches in diameter or larger. Fishermen do not have to mark traps with a float and line in areas designated as freshwater north of the northern bank of the Intracoastal Waterway and west of LA Highway 70 and those areas located on the eastern side of the Mississippi River and inland from the saltwater line, unless the trap is placed in a lake. Fishermen may attach crab traps to a trotline attached to a non-floating line and a visible float measuring at least 6 inches in diameter or 1/2 gallon in volume. Each trap on a trotline must be registered with LDWF and tagged with the corresponding Commercial Fisherman License number
Escape rings	Each crab trap must have a minimum of three escape rings to allow undersized crabs to escape the trap. They must be placed on the vertical outside walls flush with the trap floor or baffle. There must be at least two rings located in the upper chamber of the trap. Single chambered traps must have three rings placed on the vertical outside walls flush with the trap floor. Rings must be rigid, 2-3/8 inches in inside diameter or larger (not including the ring material) and attached to the trap with material of smaller diameter than the wire strands of the trap. Escape rings are not required on any crab trap constructed of square wire mesh 2-5/16 inches or larger. No material should obstruct the escape rings and hamper or prevent crabs from exiting, except from April 1 through June 30 and September 1 through October 31.
Metal tackle and traps	Fishermen may not use metal tackle or metal crab traps in any of the public waters north of the Intracoastal Waterway in the Calcasieu River, in any body of water of the Calcasieu River System north of the Intracoastal Canal, or in Vermilion Bay from Cypremort Point one mile offshore to Blue Point.
Closed area	Fishermen may not use crab traps in the Tchefuncte River.

Wildlife Management Areas (WMAs) and Refuges

Commercial crabbing is prohibited in large areas of Louisiana within coastal State and National Wildlife Refuges²¹. The following closures (list updated in January 2019) provide refuge for blue crab and other important species, as well as protection for diamondback terrapins and their habitats (i.e. brackish water of salt marshes, estuaries, and tidal creeks). Commercial fishing is prohibited in:

²¹ www.wlf.louisiana.gov/sites/default/files/pdf/page/41407-regulations/commercialfishingbrochure201810-30-18.pdf

1) Bayou Sauvage National Wildlife Refuge (23,000 acres). Bayou Sauvage National Wildlife Refuge contains a wide variety of wildlife habitat, including bottomland hardwoods, freshwater and brackish marshes, lagoons, canals, borrow pits, and natural bayous. All commercial fin fishing and shell fishing is prohibited. Recreational crabbing is permitted with a limit of 12 dozen per person. Fishing, crabbing and crawfishing equipment must be attended at all times²².

2) Big Branch Marsh NWR (15,000 acres). Habitats at the Refuge include lake shoreline, nearshore grass beds, freshwater and brackish marsh, cypress-tupelo forest, bayous, hardwood forest hammocks, and long-leaf pine savannah. Commercial fishing and shell fishing is prohibited²³. Recreational fishing, crawfishing and crabbing are permitted from one-half hour before legal sunrise to one-half hour after legal sunset, except we allow night fishing, crabbing, and crawfishing from the bank and pier on Lake Road.

3) Breton National Wildlife Refuge (6,100 acres). Breton National Wildlife Refuge, established in 1904, is the second oldest refuge in the National Wildlife Refuge System. The Refuge is comprised of a series of barrier islands including Breton Island and the Chandeleur Islands in the Gulf of Mexico. Recreational fishing and crabbing on the Refuge is allowed year-round in accordance to Louisiana state fishing regulations. All fishing and crabbing equipment must be attended at all times. Trotlines, slat traps, or nets are not allowed²⁴.

4) Delta National Wildlife Refuge (48,800 acres). Located in the active delta at the mouth of the Mississippi River, the Refuge comprises close to 48,800 acres of marsh and open water in Plaquemines Parish, Louisiana. These lush wetlands and marshes provide habitat for migratory birds, a multitude of fish and wildlife species, and serve as a nursery for the rich aquatic resources of the region²⁵. All commercial fishing is prohibited. Recreational fishing and crabbing are permitted from one-half hour before legal sunrise until one-half hour after legal sunset. However, during state waterfowl season, all public entry is prohibited between Main Pass and Raphael Pass and recreational fishing and crabbing are only permitted from 12 p.m. (noon) until one-half hour after legal sunset on lands northwest of Main Pass and south of Raphael Pass²⁶.

5) Elmer's Island Wildlife Refuge (1,145 acres). Elmer's Island Wildlife Refuge features saltwater marsh, coastal dunes, and beaches. No person shall commercially fish, conduct any guiding service, hunt, pursue, kill, molest or intentionally disturb any type of wildlife on the refuge, except for the legal recreational harvest of living aquatic resources²⁷.

6) Marsh Island Wildlife Refuge (76,664 acres). Habitat on this refuge is mainly brackish to intermediate marsh and flat, with very few remaining trees. Crabs may be harvested recreationally from the open portion of the refuge and 12 dozen crabs are allowed per boat or vehicle per day. All commercial fishing and use of any commercial fishing gear on the refuge is prohibited²⁸.

7) Rockefeller Wildlife Refuge (76,042 acres). Rockefeller Wildlife Refuge (RWR) is located in southwestern Louisiana within Cameron and Vermilion parishes and is mostly marshlands. The refuge is bordered by the Gulf of

²² <https://www.fws.gov/southeast/pdf/regulations/bayou-sauvage-national-wildlife-refuge-hunt.pdf>

²³ <https://www.fws.gov/southeast/pdf/regulations/big-branch-marsh-national-wildlife-refuge-hunt-fish.pdf>

²⁴ https://www.fws.gov/refuge/Breton/visit/rules_and_regulations.html

²⁵ <https://www.fws.gov/refuge/Delta/about.html>

²⁶ <https://www.fws.gov/southeast/pdf/regulations/delta-national-wildlife-refuge-hunt-fish.pdf>

²⁷ http://www.wlf.louisiana.gov/sites/default/files/pdf/refuge/32508-elmers-island-wildlife-refuge/elmers_island_management_plan_final.pdf

²⁸ <http://www.wlf.louisiana.gov/refuge/marsh-island-wildlife-refuge>

Mexico for 26 miles. All commercial fishing is prohibited²⁹. Crabs may be harvested recreationally from the open portion of the refuge and 12 dozen crabs are allowed per boat or vehicle per day.

8) Salvador Wildlife Management Area (34,520 acres). The area is primarily freshwater marsh with many scattered ponds. Only recreational harvest by hand line allowed. Commercial fishing is prohibited³⁰.

9) Bayou Teche NWR is a 9,028-acre refuge situated along and on either side of Bayou Teche, an ancient channel of the Mississippi River. The refuge consists of 6 non-contiguous management units, ranging in size from 81 acres to 3,619 acres³¹. Habitats on the refuge include bottomland hardwood forests, cypress-tupelo swamps, bayous, and freshwater marshes. Commercial fishing or crabbing is prohibited³².

10) Mandalay NWR (4,416 acres). Located five miles southwest of the city of Houma, Louisiana, Mandalay National Wildlife Refuge conserves 4,416 acres of freshwater marsh and pond habitat, intersected with levees and man-made canals, and bisected by the Intercoastal Waterway³³. Recreational crabbing is allowed. Commercial fishing is not allowed. The use of nets, traps, or unattended lines (trot, jog, bush, etc) is not allowed.³⁴

11) State Wildlife Refuge (13,000 acres). Marshland habitat. Only recreational harvest by hand line allowed. Crabs may be harvested from the open portion of the refuge, and 12 dozen crabs are allowed per boat or vehicle per day. A maximum of 12 crab nets is allowed per boat or vehicle. No commercial harvest is allowed³⁵.

12) Isle Derniers Barrier Island Refuge (1,900 acres). It consists of four barrier islands in the Isles Dernieres chain—Wine, Trinity/East, Whiskey, and Raccoon Islands—and several thousand acres of associated water. Only fishing from boats along the shore and wade fishing in the surf areas of the islands are allowed³⁶.

13) Pass-a-Loutre WMA – POINTE-AUX-CHENES (115,000 acres). The habitat consists of river channels and their associated banks, natural bayous, and manmade canals which are interspersed with intermediate and freshwater marshes³⁷. Only recreational harvest by hand line allowed.

14) Barataria Preserve, National Park Service, Crown Point (23,000 acres). The preserve's 23,000 acres include bayous, swamps, marshes, and forests. Commercial fishing is prohibited. Recreational crabbing (pots or hand line) possession limit is 12 dozen crabs per person per day³⁸.

²⁹ <https://www.rwrefuge.com/public-use.html>

³⁰ <http://www.wlf.louisiana.gov/wma/2765>

³¹ https://www.fws.gov/refuge/Bayou_Teche/about.html

³² <https://www.fws.gov/southeast/pdf/regulations/bayou-teche-national-wildlife-refuge-hunt-fish.pdf>

³³ <https://www.fws.gov/refuge/Mandalay/about.html>

³⁴ <https://www.fws.gov/southeast/pdf/regulations/mandalay-national-wildlife-refuge-hunt-fish.pdf>

³⁵ <http://www.wlf.louisiana.gov/refuge/state-wildlife-refuge>

³⁶ http://www.wlf.louisiana.gov/sites/default/files/pdf/refuge/32512-isle-dernieres-barrier-islands-refuge/isles_dernieres_regulations_-_may_2016.pdf

³⁷ <http://www.wlf.louisiana.gov/wma/2786>

³⁸ <http://www.eregulations.com/louisiana/fishing/w-m-a-s-refuges-federal-lands/>

4.5.2. Proposed New Regulations for 2019

Modified Louisiana blue crab commercial harvest regulations have been proposed for the 2019 season³⁹. A summary is included below:

- At its September 6, 2018 meeting, the Louisiana Wildlife and Fisheries Commission adopted a Notice of Intent (NOI) to change regulation (LAC 76:VII.346) for the recreational and commercial harvest of blue crabs in 2019. The proposed rule would change the season during which the harvest of mature female blue crabs is closed, currently set for March 1 to April 30, to September 9 – October 13, 2019⁴⁰. These changes are expected to result in less negative impact on the crab fishery while maintaining the same level of protection to the blue crab stock, based on an analysis of historical annual crab harvest and market information⁴¹. These regulations will replace the previous 30-day closure, imposed in 2017, and the 60-day mature female harvest restriction imposed in the spring of 2018, and (potentially) the previously proposed spring 2019 restriction. The 2019 restriction includes a ban on recreational harvest of female blue crab during the 2019 season.
- The Notice of Intent also lists the sunset provision removal for the current ban on commercial harvest of immature female blue crabs (active in 2017, 2018 and 2019), making the ban permanent.
- Violation of any of the above provisions constitutes a class two violation⁴².

Industry is discussing potential legislation to increase the penalties for the take of immature or berry female blue crab.

Additional Regulations – 2019 Area Closures for removal of derelict traps

Derelict traps are traps that have been lost or abandoned. Large numbers of crab traps are lost or abandoned each year in Louisiana due to a number of reasons:

- Separated from their buoys by tides, currents, storms, or passing boats
- Caught in and displaced by shrimp gear
- Theft and vandalism
- Improper disposal of old, unfishable traps
- Poor assembly or maintenance of lines and floats
- Abandoned by fishermen leaving the fishery.

Derelict traps can "ghost fish", continuing to capture blue crabs and other species. They can also create a navigational hazard for boats and become entangled in other fishing gear such as shrimp nets.

³⁹ http://www.wlf.louisiana.gov/current_commercial_crab_regs

⁴⁰ <https://louisianadirectseafood.com/lwfc-to-modify-blue-crab-harvest-regulations/>

⁴¹ <http://www.wlf.louisiana.gov/sites/default/files/pdf/page/41762-commission-minutes-present-2016/june2018commissionminutes.pdf>

⁴² <http://www.wlf.louisiana.gov/sites/default/files/pdf/page/41845-current-commercial-crab-regulations/lffcommcrabregs2018-19.pdf>

In addition to other prohibitions for immature and mature female crabs, the Louisiana Wildlife and Fisheries Commission, at the October 2018 meeting, has authorized 5 crab trap closures in 2019 for the removal of derelict crab traps. During a closure, all crab traps must be removed from the closure areas (i.e. no fishing allowed); and any remaining crab traps within the closure areas are considered and treated abandoned - subject to removal. Only persons authorized by the Louisiana Wildlife and Fisheries Commission may remove these abandoned crab traps from the closure areas. Abandoned traps must be brought to the designated disposal sites.

Planned 2019 crab trap closure areas for the removal of derelict traps are shown in Figure 7 below⁴³. Three of the closures (No. 1, 3 and 4) are 14 days closures while the other two (No. 2 and 5) are 10 days closures. The closures span between February and March. Typically, more than half of Louisiana blue crabs are harvested from Lake Pontchartrain and the Terrebonne basin⁴⁴, both of which will be subject to trap removal area closures in February 2019. Areas for derelict trap removal are generally selected based on largest blue crab landings and highest loss of traps, areas of shallow water, and input from each area manager.



Figure 7. Derelict traps removal areas and dates planned for 2019.

⁴³ <http://www.wlf.louisiana.gov/fishing/derelict-crab-trap-removal>

⁴⁴ www.wlf.louisiana.gov/sites/default/files/pdf/document/37780-fisheries-brochures/blue_crab_front.pdf

Since the Derelict Crab Trap Removal Program began, volunteers have helped remove more than 37,000 abandoned/lost traps (Table 4).

Table 4. Derelict traps removed in Louisiana since 2004.

Year	Area(s)	Traps Removed	Boat Days
2004	2	6,894	90+
2005	4	4,623	50+
2006	1	2,935	31+
2007	2	1,495	15
2008	1	1,234	3
2009	1	788	N/A
2010	1	477	N/A
2011	1	1,100	N/A
2012	2	2,798	66
2013	2	969	32
2014	1	1,051	24
2015	1	422	9
2016	3	2,580	50+
2017	6	5,674	68
2018	5	4,061	68
Total	33	37,101	506+

Surveillance Meetings

Table 5. Surveillance meetings.

Date & Time	Organization	Present	Overview/Key Items Discussed
December 11 th 2018 09:00	Louisiana Department of Wildlife and Fisheries (LDWF), Baton Rouge Office	<p>LDWF (management system, stock assessment, ecosystem) Peyton Cagle (Crustaceans Program Manager) Damon Morris (Program Manager, Sustainable Fisheries and Seafood) Harry Blanchet (Biologist Administrator, formerly Director, Marine Fisheries) Christian Winslow (Interim Director, Marine Fisheries, formerly Marine Fisheries Program Manager, Operations)</p> <p>LDWF LED, (Enforcement) LTC Chad Hebert Major Edward Skena</p> <p>Assessment Team Vito Romito On site (Assessment Team Lead) Rom Lipcius (through conference call) Virginia Polonio (through conference call)</p>	<ul style="list-style-type: none"> ▪ 2017 and 2018 closures ▪ 2019 proposed restriction and decision process to select option ▪ Immature female ban ▪ Derelict trap (removal) closures during 2018 and plans for 2019 ▪ Treatment of recovered traps (e.g. recycle, disposal) ▪ Fishing licenses decline, active and latent licenses. ▪ Recreational fishing license trap limit (10 trap/person) ▪ No trap limit for commercial fishery ▪ Legislative process to accept new regulations (Commission to Legislature). New regulation on 2019 closures expected in January 2019 ▪ Potential for effort re-distribution around closures ▪ Mature female closure restriction in September 2019 may be based on 2019 stock assessment results ▪ Escape rings ▪ Professionalism program and its results ▪ Enforcement effort and assets in the past 18 months ▪ Compliance rates with closure ▪ Most prevalent offenses in 2017/2018 ▪ Ongoing discussion about increasing the cost of penalties ▪ Policing of recreational fishermen ▪ Lost traps characterisation (lost, stolen, run over by other boats or scooped up in shrimp trawl nets) ▪ Landing by pot gear (99-100% of total), very limited shrimp trawl landings ▪ Active non-conformances and relative corrective actions ▪ Stock status in relation to reference points ▪ Reliability of harvest control mechanisms ▪ Ban on immature female crabs likely to become a permanent regulation ▪ Plans to publish a 2019 stock assessment ▪ Objective to improve overall SSB and juvenile abundance

			<ul style="list-style-type: none"> ▪ Discussions about updating Gulf wide stock assessment ▪ Ongoing blue crab genetic study at Texas A&M ▪ Gulf Coast Tagging study – data collection is still ongoing ▪ Updates on bycatch issues in the fishery ▪ Reliability of information on bycatch data from derelict crab traps, sampling not representative but concentrated in hotspot areas ▪ Recent publications on diamondback terrapin ▪ Ecosystem modelling studies as a result of the Mississippi water diversion plans
December 11 th 2018 13.00	Louisiana Crab Task Force (CTF)	<p>Crab Task Force (CTF) Board Warren Delacroix</p> <p>LDWF Peyton Cagle (Crustaceans Program Manager) Damon Morris (Program Manager, Sustainable Fisheries and Seafood)</p> <p>Assessment Team Vito Romito On Site (Assessment Team Lead) Rom Lipcius (through conference call) Virginia Polonio (through conference call)</p>	<ul style="list-style-type: none"> ▪ Review of closures in 2017 and 2018 and plans for 2019, industry behaviour and input in consultation and management decision ▪ Immature female ban ▪ Analysis supporting proposed September 2019 adult female ban ▪ Data feeding into the 2019 stock assessment ▪ Plans to raise severity of violations in a similar manner as currently done in the oyster fishery ▪ Conflict. Conflict with shrimp fishermen is mostly resolved by communications between fishermen themselves ▪ Bycatch. The fishery generates very little bycatch and if species other than crab are caught, these are immediately released back in the water ▪ Derelict trap clean-up, parties participating (collection on the water + collection from docks and disposal).
December 12 th 2018 09.00	Audubon Nature Institute	<p>John Fallon Director Of Sustainability & Coastal Conservation</p> <p>Laura Deighan Program Coordinator</p> <p>Assessment Team Vito Romito (Team Lead) On site</p>	<ul style="list-style-type: none"> ▪ Crab fishery updates ▪ Derelict trap closures ▪ Corrective action status ▪ RFM program updates

5. Assessment Outcome Summary

5.1. Section A. The Fisheries Management System

There are effective legal and administrative frameworks, appropriate for management of the blue crab fishery, in place. The Louisiana blue crab fishery and its industry operate under the legal authorities established by the Constitutions of the State of Louisiana and the United States of America. Legal authority to manage the blue crab fishery is shared by the Legislature, the Louisiana Wildlife and Fisheries Commission (LWFC), and the Secretary of the Louisiana Department of Wildlife and Fisheries (LDWF). The Legislature is the primary law-making body of the state and may enact laws and regulations concerning the blue crab fishery and stock, based on recommendations from the LDWF and the LWFC. Regulations and statutes relevant to the LWFC and LDWF are provided in LA R.S. 56. Louisiana (LA) Revised Statutes (R.S.) 56:6381.5 (Saltwater Fishery Standards) defines the legislative intent, findings, purposes, policy, and standards for the conservation and management of all species of fish in Louisiana, including the prevention of overfishing. Allocation of resources for the management system is determined in part from each of three institutions (the Legislature, LWFC, and the LDWF). The Legislature approves the LDWF annual budget. The LDWF budget for 2017 was \$ 185 million, while the one recommended for 2018/2019 FY was \$ 175 million. Dispute resolution through the court system is a fundamental part of the Louisiana and U.S. legal systems. Both the LWFC and the LDWF may sue and be sued if necessary to resolve disputes. Procedures and mechanisms are established within the management system to reduce conflict and legal conflicts may be resolved through the state judicial system.

The LDWF is an active participant in the GSMFC which provides an excellent mechanism for sharing regional management objectives within individual states to ensure responsible management of shared stocks. The GSMFC Crab Subcommittee includes state biologists from each of the Gulf States. Several GOM blue crab fishery management plans (FMP) were developed which provided guidance to blue crab fishery managers in the Gulf coast states. The LDWF also participates with the Southeast Area Monitoring and Assessment Program (SEAMAP), a State/Federal/university program for collection, management and dissemination of fishery-independent data and information in the southeastern United States. Full or updated LDWF stock assessments were completed in 2011, 2014, 2016, and 2018 which reviewed the status of the blue crab stock and provided the necessary guidelines to protect the blue crab resource. Any new blue crab state statute or LWFC rule requires a Fiscal and Economic Impact Statement or a Fiscal Note, respectively. Socio-economic data obtained from the trip ticket monitoring program is also used by the LDWF for research, fishery monitoring, and management recommendations. Blue crab regulations adopted in 2014 and later may have influenced overall fishing effort as measured by number of fishing trips and overall harvest.

Dynamite, poisons, and other comparable destructive fishing practices are illegal to harvest blue crabs. There is no evidence that the illegal use of dynamite, poisons, and other destructive fishing practices are currently being used to harvest blue crabs.

Effective mechanisms have been established for fisheries monitoring, surveillance, and control and to ensure compliance with the conservation and management measures for the blue crab fishery. The LDWF Law Enforcement Division (LED) is a fully-commissioned state-wide law enforcement agency with the primary mission

of enforcing Legislative regulations, LWFC rules, and any LDWF Secretary actions to help protect Louisiana's natural resources. Sanctions are enforceable, adequate in severity, and have increasing levels of penalties; consequently, they are effective in securing compliance and discouraging violations. LA R.S. 56:31-37.1 defines penalties for eight classes of violations (Class 1 to Class 8), with increasing levels of penalty that may include fines, jail time, loss of fishing license, and forfeiture of property and catch. Compliance in this fishery remained high during 2018. Louisiana Fisheries Forward (LFF) program promotes public awareness and advises all sectors of Louisiana's commercial fishing industry, including fishermen, dock owners, processors, and distributors on various fishery and industry related topics. DWF provides education and training programs to improve the skills of fishers and their understanding of fisheries regulations with public outreach efforts being made in English, Spanish, and Vietnamese. New commercial crab gear requirements program was recently approved in 2014 by the State Legislature (Act 40, R.S. 56:305.6) in response to a crab industry request concerning mandatory training for new crab fisherman. Anyone wishing to obtain a commercial crab trap license must first complete a training program unless they held a commercial crab trap license in any two years from 2011 to 2014.

5.2. Section B. Data Collection, Stock Assessment and Scientific Advice

Fishery-dependent and fishery-independent data are collected in a routine and consistent manner to allow for scientifically robust assessment of: 1) the state of the stock relative to the management elected reference points or suitable substitutes or other performance indicators; 2) the performance of the fishery with respect to the utilization of the resource; 3) the performance of management measures, harvest controls and associated rules that support the strategy and the defined objectives of the fishery; and 4) the impact of the fishery on the ecosystem and other identified impacts.

Data review and analysis consider and take sufficient account of all fishery removals of the target stock(s) including retained catch and discards in target and non-target fisheries. Data review and analysis consider and take sufficient account for catches and discards of other commercial and non-commercial species associated with fishing activity to the extent that impacts on these species can be understood. Data is collected and research advanced to improve the understanding of the biology, life-cycle and reproductive cycle of the stock under consideration, its geographic range, its habitat and role in the ecosystem, to improve management of the fishery.

There is a formal process by which fisher knowledge can be incorporated and influence fishery management. There is an established scientific survey and system of checks of harvest data to both generate and verify data. LDWF uses the best available scientific data and provides stock assessment information and related advice for the objectives of fisheries management. The 2015 and 2016 estimates of F/F_{limit} were near the target and far lower than the limit, suggesting that the stock has not been experiencing overfishing recently. Similarly, the 2016 and 2017 estimates of SSB/SSB_{limit} were also near the target and much higher than the limit, suggesting that the stock has not been overfished recently.

5.3. Section C. Management Objectives for the Stock

The management system specifies management objectives to achieve optimal utilization of the resource and ensure that the stock is not overfished and that overfishing is not occurring. These objectives are outlined in the blue crab FMP which integrates fishing, habitat, conservation, and socio-economic factors into a balanced strategy to maintain the long-term sustainability of the fishery. The provisions of the blue crab FMP act to ensure that short term considerations do not compromise the long-term management objectives for the resource. The mechanisms for controlling harvest are identified, formally established and implemented in accordance with the best available scientific information. The last stock assessment of blue crab (West et al., 2018) found that the blue crab stock was not overfished and overfishing was not occurring. Prior to this assessment, the earlier assessment (West et al. 2016) indicated that the stock was overfished and overfishing was occurring, which initiated effective corrective actions by management intended to allow the stock to rebuild to target reference points and not exceed limit reference points. Consequently, the harvest control rules in force appear to be sufficiently precautionary to avoid overfishing and an overfished stock, as opposed to taking action once overfishing is occurring or the overfished condition is actually reached.

The Assessment Team views that management's response to the overfished status and overfishing of the blue crab stock demonstrated that measures, harvest control mechanisms and associated actions were sufficiently formalized so that management was able to effectively respond and take action to situations of impaired recruitment, overfishing and overfished status. Given the elimination of overfished status and overfishing in recent years, the Assessment Team is of the opinion that the management actions were at least in part responsible for the recovery of the stock and fishery. Given that the recovery has occurred only over 2-3 years, the long-term effectiveness of the harvest control mechanisms needs to be evaluated after the 2019 stock assessment and at future surveillance audits.

5.4. Section D. The Precautionary Approach

The LDWF 2011 and 2014 stock assessments proposed maximum fishing mortality rates and minimum biomass levels to serve as proxies for maximum sustainable yield (MSY); these reference points are consistent with the precautionary approach. Any perceived uncertainty concerning the status of the Louisiana blue crab stock is adequately addressed through the LDWF stock assessment models and supported by other considerations that support the thesis that the current precautionary approach is adequate and that a more conservative fishing mortality than presently utilized is not deemed absolutely necessary.

5.5. Section E. Serious Impacts of the Fishery on the Ecosystem

LDWF conduct assessments and research related to fishery impacts on ecosystems and habitats and how environmental factors affect the fishery. The blue crab FMP has identified the most probable adverse impacts of the fishery on the ecosystem.

Impacts of Louisiana's blue crab fishery on habitat are likely minimal because fishermen set crab traps over sandy/mud bottoms, which are less affected by traps than sensitive bottom habitats such as corals or grass beds. Commercial crabbing is prohibited in coastal State and National Wildlife Refuges.

Non-target stocks are sufficiently monitored to determine the impact exerted by the fishery. The most extensive bycatch study of blue crab traps in Louisiana waters has recently been conducted by LDWF to collect and analyze data on incidental bycatch in the Louisiana blue crab trap fishery with special emphasis on diamondback terrapins. From Dec. 2012 to Jan. 2015, 7,062 traps were sampled which resulted in 37 species of finfish and invertebrates being captured and documented as bycatch, including six diamondback terrapins. Sea catfish (also called hardhead catfish) (*Ariopsis felis*) comprised the largest bycatch component, but it does not appear to be retained. Several non-target species are retained in the blue crab fishery. LDWF monitors landings and sales of these species through the state's trip ticket reporting system.

Endangered and threatened species in Louisiana as of April 2018 are listed on Fish and Wildlife Service website. Available evidence suggests that the blue crab fishery does not currently pose serious risks to any of these ETP species. Diamondback terrapin (*Malaclemys terrapin*) has been designated as a species of special concern in Louisiana's Wildlife Action Plan (primarily due to reductions in abundance in other parts of its range) and LDWF has conducted projects to better understand the current abundance and distribution of diamondback terrapin in Louisiana. Terrapins share some habitat with blue crab and may be incidentally taken in crab traps.

There are estimates of blue crab ghost fishing activity and these justify current derelict crab trap prevention and removal extension and outreach programs in Louisiana and throughout the Gulf of Mexico. Despite the likely loss of crabs to ghost fishing, the LA blue crab stock in 2017 was neither overfished nor experiencing overfishing. In response to the lost traps issue, the Louisiana Wildlife and Fisheries Commission authorized 5 crab trap closures in 2018 for the removal of derelict crab traps. Five more closures are planned for 2019.

6. Conformity statement

The assessment team recommends that the management system of the applicant fishery, the Louisiana blue crab (*Callinectes sapidus*) commercial fishery, employing baited pot/trap gears, within Louisiana State Territorial Waters, under the management of the Louisiana Department of Wildlife & Fisheries (LDWF) and Louisiana Wildlife and Fisheries Commission (LWFC), be granted continued certification. SAI Global/Global Trust duly confirms continued certification.

7. FAO-Based Conformance Criteria Fundamental Clauses for Surveillance Reporting

7.1. Section A: The Fishery Management System

7.1.1. A1 – Fundamental Clause 1

There shall be a structured and legally mandated fishery management system, and an appropriate policy, legal and institutional framework” for fisheries management based upon and respecting international, national and local fishery laws, including the requirements of any regional fisheries management organizations that manage the fisheries on the ‘stock under consideration’.

(FAO CCRF (1995) 7.1, 7.3, 7.6, 7.7, 8.4, 12; FAO Eco (2009) 28, 29)

Supporting Clauses:	1.1, 1.2, 1.3, 1.4 and sub-clauses, 1.5, 1.6 , 1.7, 1.8, 1.9, 1.10, 1.11, 1.12.			
Important Note.	<p>This surveillance assessment template is based on Version 1.2 of the GULF RFM Standard. It differs in the following way from the previous Version (v1.1).</p> <p>Clause 1.6. The review process shall be clearly linked to improvement of the management system under clause 1.2 for the applicant fishery, and based on the use of best available scientific evidence, advice and/or objectively verified information by the management system from recognized institutions and other sources, including fisheries and external bodies and shall respond in a timely manner.</p> <p>The parts in Bold are new and different. The changes are considered minor. Some additional attention shall be placed on the last addition “and shall respond in a timely manner”.</p>			
Evidence Rating:	Low <input type="checkbox"/>	Medium <input type="checkbox"/>	High <input checked="" type="checkbox"/>	
Non-conformance:	Critical <input type="checkbox"/>	Major <input type="checkbox"/>	Minor <input type="checkbox"/>	None <input checked="" type="checkbox"/>

SUMMARY EVIDENCE

Legal authority to manage the blue crab fishery is shared by the Legislature, the Louisiana Wildlife and Fisheries Commission (LWFC), and the Secretary of the Louisiana Department of Wildlife and Fisheries (LDWF). The Legislature is the primary law-making body of the state and may enact laws and regulations concerning the blue crab fishery and stock, based on recommendations from the LDWF and the LWFC. Regulations and statutes relevant to the LWFC and LDWF are provided in LA R.S. 56. Louisiana (LA) Revised Statutes (R.S.) 56:6381.5 (Saltwater Fishery Standards) defines the legislative intent, findings, purposes, policy, and standards for the conservation and management of all species of fish in Louisiana, including the prevention of overfishing. Dispute resolution through the court system is a fundamental part of the Louisiana and U.S. legal systems. Both the LWFC and the LDWF may sue and be sued if necessary to resolve disputes. Procedures and mechanisms are established within the management system to reduce conflict and legal conflicts may be resolved through the state judicial system. The LDWF is an active participant in the GSMFC which provides an excellent mechanism for sharing regional management objectives within individual states to ensure responsible management of shared stocks. The GSMFC Crab Subcommittee includes state biologists from each of the Gulf states. Several GOM blue crab fishery management plans (FMP) were developed which provided guidance to blue crab fishery managers in the Gulf coast states. The LDWF also participates with the Southeast Area Monitoring and Assessment Program (SEAMAP), a State/Federal/university program for collection, management and

dissemination of fishery-independent data and information in the Southeastern United States. Full or update LDWF stock assessments were completed in 2011, 2014, 2016, and 2018 which reviewed the status of the blue crab stock and provided the necessary guidelines to protect the blue crab resource. Any new blue crab state statute or LWFC rule requires a Fiscal and Economic Impact Statement or a Fiscal Note, respectively. Socio-economic data obtained from the trip ticket monitoring program is also used by the LDWF for research, fishery monitoring, and management recommendations. Blue crab regulations adopted in 2014 and later may have influenced overall fishing effort as measured by number of fishing trips and overall harvest.

EVIDENCE

1.1. Legal basis for management system

No significant changes have occurred in the “legal basis for the management system” clause since the blue crab first surveillance at the end of 2017.

Louisiana (LA) Revised Statutes (R.S.) 56:6381.5 (Saltwater Fishery Standards) defines the legislative intent, findings, purposes, policy, and standards for the conservation and management of all species of fish in Louisiana, including the prevention of overfishing⁴⁵. The Louisiana blue crab fishery and its industry operate under the legal authorities established by the Constitutions of the State of Louisiana and the United States of America and relevant state statutes. Legal authority to manage the blue crab fishery is shared by the Legislature, the Louisiana Wildlife and Fisheries Commission (LWFC), and the Secretary of the Louisiana Department of Wildlife and Fisheries (LDWF). The Legislature is the primary law-making body of the state and may enact laws and regulations concerning the blue crab fishery and stock, based on recommendations from the LDWF and the LWFC. The LWFC may approve or implement LDWF management activities not covered by various legislative statutes. Regulations and statutes relevant to the LWFC and LDWF are provided in LA R.S. 56⁴⁶.

The LWFC may: (a) promulgate regulations to set possession limits, quotas, places, seasons, times, size limits, and daily take limits based upon biological and technical data, for all freshwater and saltwater finfish taken or possessed in Louisiana waters. Penalties for violation of any rule or regulations adopted and promulgated by the commission under this Section constitutes a class two violation (LA RS 56:326.3)⁴⁷; (b) prohibit the taking of any species of fish in any part of the state for not more than a three-year period if it is in the best interests of the state (LA RS 56:22)⁴⁸; and, (c) set aside sanctuaries for the protection and propagation of fish and may restrict fishing (LA RS 56:315)⁴⁹.

The exclusive control of the fish having a game or commercial value in the state is vested in the commission. The department shall enforce the provisions of law regulating them. Many of the key crab regulation are listed in RS 56:332 — Crabs; release of crabs in berry stage; method of taking crabs; time limitations; by-catch; penalties; abandoned crab trap removal program⁵⁰.

⁴⁵ <https://legis.la.gov/Legis/Law.aspx?d=105461>

⁴⁶ <https://legis.la.gov/Legis/Law.aspx?d=104845>

⁴⁷ <https://legis.la.gov/Legis/Law.aspx?d=105216>

⁴⁸ <https://legis.la.gov/Legis/Law.aspx?d=105076>

⁴⁹ <https://legis.la.gov/Legis/Law.aspx?d=105190>

⁵⁰ <https://legis.la.gov/Legis/Law.aspx?d=105228>

The Louisiana Crab Task Force (CTF) and Gulf States Marine Fisheries Commission (GSMFC) may provide input to the legal authorities. The CTF operates with legislative authority described under LA R.S. 56:33151, its main function being to advise the Department of Wildlife and Fisheries and the Wildlife and Fisheries Commission on matters pertaining to the management and development of the crab industry in Louisiana. At the regional level the GSMFC operates under the Inter-jurisdictional Fisheries Act of 1986 (Title III, Public Law 99-659)⁵² and LA R.S. 56:74⁵³.

1.2. Framework/procedures for creating/amending/abolishing laws, regulations and other legal instruments

No changes have occurred in the “framework/procedures for creating/amending/abolishing laws, regulations and other legal instruments” clause since the blue crab first surveillance at the end of 2017.

The Louisiana blue crab fishery and its industry operate within a legal framework established by the Constitutions of the State of Louisiana and the United States. Various state statutes include objectives to: establish a management and administrative structure; ensure citizen rights; allow public input; resolve conflicts; and, enforce the law. The fishery management decision-making processes is well understood and used by those involved to create, amend, or abolish laws and regulations.

The Commission is empowered through LA RS 56:6⁵⁴ to promulgate rules and regulations, subject to the provisions of the Administrative Procedure Act, to set seasons, times, places, size limits, quotas, daily take, and possession limits, based upon biological and technical data, for all wildlife and fish. Any such rule or regulation shall have as its objective the sound conservation, preservation, replenishment, and management of that species for maximum continuing social and economic benefit to the state without overfishing that causes short-term or long-term biological damage to any species, and regarding all species of fish, without overfishing that leads to such damage. Any season, time, place, size, quota, daily take or possession limit currently set by law shall be superseded upon promulgation by the commission of new rules and regulations concerning a particular species.

As explained above, the blue crab management framework includes the Legislature and various state institutions and organizations. The specific legal authorities of the LWFC and LDWF Secretary are summarized under Clause 1.1. The Legislature, LWFC, and LDWF must comply with the Louisiana Administrative Procedures Act (Title 49, Chapter 13)⁵⁵, which provides an opportunity for public input into the rule-making process. The Legislative natural resources committees may review any non-emergency action of the LDWF Secretary or LWFC and consequently provide oversight. The CTF operates within the LDWF administrative framework and advises the LDWF and LWFC on matters pertaining to the management and development of the blue crab industry in Louisiana. The GSMFC

⁵¹ <https://legis.la.gov/Legis/Law.aspx?d=105226>

⁵² <https://legcounsel.house.gov/Comps/Interjurisdictional%20Fisheries%20Act%20Of%201986.pdf>

⁵³ <https://legis.la.gov/Legis/Law.aspx?d=105585>

⁵⁴ <https://legis.la.gov/Legis/Law.aspx?d=105430>

⁵⁵ https://www.lawserver.com/law/state/louisiana/la-laws/louisiana_revised_statutes_title_49_chapter_13

through the Crab Subcommittee provides additional public input into management of the Louisiana blue crab fishery.

1.3. Conflict resolution

No changes have occurred in the “conflict resolution” clause since the blue crab first surveillance at the end of 2017.

Dispute resolution through the court system is a fundamental part of the Louisiana and U.S. legal systems. Both the LWFC and the LDWF may sue and be sued if necessary to resolve disputes. Procedures and mechanisms are established within the management system to reduce conflict and legal conflicts may be resolved through the state judicial system. The LDWF and LWFC follow the Administrative Procedures Act (Title 49, Chapter 13). The Louisiana blue crab management system appears to be free of any significant legal challenges, indicating that the management system has acted proactively to avoid legal disputes.

1.4. Regional management – consultation and compatibility

No changes have occurred in the “regional management consultation and compatibility” clause since the blue crab first surveillance at the end of 2017.

Institutions that make up the regional management system includes other U.S. States, Federal agencies, and relevant regional/national fisheries management organizations. Although blue crabs primarily inhabit inshore estuarine habitats and adjacent Gulf of Mexico (GOM) state waters and do not meet the definitions of a “high seas”, “highly migratory” or “straddling”, or a “trans-boundary” species, the GSMFC considered the blue crab fishery as an “inter-jurisdictional fishery resource” (U.S. Public Law 99-659, Title III⁵⁶) in the GOM and associated waters because there exists an interstate fishery management plan⁵⁷.

The LDWF is an active participant in the GSMFC which provides an excellent mechanism for sharing regional management objectives within individual states to ensure responsible management of shared stocks. The GSMFC Crab Subcommittee includes state biologists from each of the Gulf states. Several GOM blue crab fishery management plans (FMP) were developed which provided guidance to blue crab fishery managers in the Gulf coast states⁵⁸. Numerous other publications on the blue crab fishery and management activities were developed by the Crab Subcommittee. The GSMFC also facilitates interactions and discussions between the LDWF and federal agencies and various organizations and institutions. Finally, the LDWF participates in the Federal Southeast Area Monitoring and Assessment Program (SEAMAP) in GOM waters off Louisiana. SEAMAP, which

⁵⁶ <http://uscode.house.gov/statutes/pl/99/659.pdf>

⁵⁷ https://www.gsmfc.org/publications/GSMFC%20Number%20243_web.pdf

⁵⁸ https://www.gsmfc.org/publications/GSMFC%20Number%20243_web.pdf

began over 30 years ago, is a cooperative program for the collection, management, and dissemination of fishery-independent biological and environmental data in offshore waters in the GOM⁵⁹.

1.5 and 1.6. Periodic review of the management system

The “periodic review of the management system” process has not changed since the blue crab first surveillance at the end of 2017.

The state blue crab FMP (Bourgeois et al., 2014)⁶⁰ is a cohesive plan to integrate fishing, habitat, conservation, and socio-economic factors into a balanced strategy to maintain long-term sustainability of the fishery and to implement the recommendations of LDWF stock assessments which proposes reference points and a harvest control rule. Future versions and updates of the blue crab FMP are suggested by the LDWF. Full or update LDWF stock assessments were completed in 2011, 2014, 2016, and 2018 which reviewed the status of the blue crab stock and provided the necessary guidelines to protect the blue crab resource.

Based on results of the 2018 stock assessment update⁶¹, the Louisiana blue crab stock is currently not overfished but was considered overfished in 1995, 2013, and 2015. Further, the stock is currently not experiencing overfishing, but the 2014, 2015, and 2016 fishing mortality rate estimates exceeded their target. The next stock assessment is planned for early 2019.

In addition, blue crab abundance indices and fishing effort estimates are collected annually; to monitor the status of the blue crab stock. The LWFC formally adopted a resolution in February, 2014⁶² stating that “Should the fishing mortality or exploitable biomass exceed the overfished or overfishing limits, or exceed the targets for three consecutive years, as defined in the most current Louisiana blue crab stock assessment, LDWF shall come before the Commission with an updated assessment and a series of management options for the Commission to review and act upon, intended to keep the fishery from becoming overfished, and that management options for review and action shall include provisions for emergency closures, time-based closures, and spatial closures.”

As a result of periodic reviews of the blue crab stock, the following conservation measures were adopted by the Legislature or the LWFC:

- Professionalism program beginning 11/14 2014 (Act 540, LA R.S. 305.6⁶³).
- Increase in fishing license cost 11/14.
- Ban on immature females for 2017, 2018, and 2019 except for premolts held for soft crab operations. This requirement may become permanent from 2020 onwards.

⁵⁹https://www.gsmfc.org/ann_mtgs/2015-11/Crab/OCR_ASMFC-SEAMAP%20Crustacean%20Workgroup%20and%20GSMFC%20Blue%20Crab%20Subcommittee%20Minutes%202011-3-15.pdf

⁶⁰<http://www.wlf.louisiana.gov/sites/default/files/pdf/page/37762-fishery-management-plans-marine/finalbluecrabfmp11-7-14.pdf>

⁶¹<http://www.wlf.louisiana.gov/sites/default/files/pdf/page/37756-stock-assessments/labassessment2018.pdf>

⁶²<http://www.wlf.louisiana.gov/sites/default/files/pdf/page/37756-stock-assessments/labassessment2018.pdf>

⁶³https://legis.la.gov/Legis/Laws_Toc.aspx?folder=75&level=Parent

- Seasonal fishery closures for 30 days in 2017, 60-day spring 2018 mature female restriction and 35-day fall 2019 mature female restriction. 2019 restriction options have been reviewed in 2018 using historic landing and market information.
- Ring size measures (3 rings per trap with 2 in the upper chamber; 2 3/8 inch diameter, and removal of the exemption for Lake Pontchartrain) beginning 11/17 (LA R.S. 56:332)⁶⁴.

The blue crab review process must incorporate the best available scientific advice and data from the LDWF and other institutions and agencies. LA R.S. 56⁶⁵ mandates that any rule or regulation shall be based upon biological and technical data and objectives include the sound conservation, preservation, replenishment, and management of that species for maximum continuing social and economic benefit to the state without overfishing that causes short-term or long-term biological damage to any species.

Blue crab data used in Louisiana blue crab stock assessments were largely obtained from the long term (1967-present) fisheries independent 16-trawl monitoring program, the 1999-present trip ticket fisheries dependent monitoring program, and earlier fisheries dependent landings and commercial crab fishermen license data. Both the fisheries independent sampling program and the trip ticket fisheries dependent program are recognized as being among the best in the GOM and south Atlantic states.

Details of the data used in the latest 2018 assessment are provided in the Blue Crab Stock assessment report.

1.7. Destructive fishing practices

No changes have occurred in the “destructive fishing practices” clause since the blue crab first surveillance at the end of 2017.

The Legislature has authority over blue crab harvesting gear. A state statute (LA R.S. 56:320) lists specific gear types that are legal to harvest blue crabs in Louisiana waters: crab traps; crab dropnets; trawls, skimmer nets, and butterfly nets during open shrimp seasons; hoop nets in freshwater; trotlines; handlines; bushlines; dip nets; and cast nets⁶⁶. Any gear type not listed is illegal to use. Consequently, dynamite, poisons, and other comparable destructive fishing practices are illegal to harvest blue crabs. There is no evidence that the illegal use of dynamite, poisons, and other destructive fishing practices are currently being used to harvest blue crabs.

1.8. Resourcing the management system

No changes have occurred in the “resourcing the management system” clause since the blue crab first surveillance at the end of 2017.

Adequate management resources are currently available for the LDWF to execute the blue crab management system and to demonstrate that the fishery conforms to the G.U.L.F RFM Standard. Allocation of resources for the management system is determined in part from each of three institutions (the Legislature, LWFC, and the

⁶⁴ <https://legis.la.gov/Legis/Law.aspx?d=105228>

⁶⁵ <https://legis.la.gov/Legis/Law.aspx?d=104845>

⁶⁶ <https://legis.la.gov/Legis/Law.aspx?d=105199>

LDWF). The Legislature approves the LDWF annual budget. The LDWF budget for 2017 was \$ 185 million, while the one recommended for 2018/2019 FY was \$ 175 million.⁶⁷

The Legislature and LWFC may pass blue crab management legislation or rules that require the LDWF to allocate the necessary monetary resources to comply.

1.9 Research priorities and cooperation between institutions

No changes have occurred in “research priorities and cooperation between institutions” clause since the blue crab first surveillance at the end of 2017.

Research priorities for the Louisiana blue crab fishery and stock have been identified in Guillory et al. (1996), Bourgeois et al. (2014), and West et al. (2014). According to the Blue Crab FMP by Bourgeois et al. (2014), the LDWF prioritizes future research funds according to several factors, including the following:

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

The LDWF and local universities or colleges and other GOM states through the GSMFC have partnered numerous times on blue crab fishery and resource projects. For example, one of the latest research programs is part of an effort to tag blue crab in the Gulf of Mexico. Some preliminary results have been presented at the Crab Task Force Meeting on May 8th 2018⁶⁸ by Zachary Darnell of the Gulf Coast Research Lab. For most estuaries, tagged female crabs showed a pattern of general spreading once they exited their home estuary, with crabs traveling in all directions. While crabs were primarily recaptured in the same state in which they were tagged, some crabs did cross state lines and were recaptured in neighboring states.

The LDWF also participates with the Southeast Area Monitoring and Assessment Program (SEAMAP), a State/Federal/university program for collection, management and dissemination of fishery-independent data and information in the southeastern United States⁶⁹. In the Gulf of Mexico, SEAMAP resource surveys include the Fall Shrimp/Groundfish Survey, Spring Plankton Survey, Reef Fish Survey, Summer Shrimp/Groundfish Survey, Fall Plankton Survey and plankton, and environmental data surveys.

1.10 Promotion of research priorities

No changes have occurred in the “promotion of research priorities” clause since the blue crab first surveillance at the end of 2017.

⁶⁷ https://www.doa.la.gov/opb/pub/FY19/FY19_Executive_Budget.pdf

⁶⁸ http://www.wlf.louisiana.gov/sites/default/files/crab_tagging_update_5.8.18.pdf

⁶⁹ <https://www.gsmfc.org/seamap.php>

State and Gulf-wide research relevant to blue crab has been promoted by fostering relationships and information exchange with other states, universities and colleges, and external scientific bodies and fishery organizations. Individual GOM states were encouraged to perform recommended research projects in the 2015 revision of the Gulf States Marine Fisheries Commission GOM blue crab FMP⁷⁰. Research prioritize highlighted in the GOM FMP include topics such as:

- Determine the relationship between planktonic availability of megalopae and settlement;
- Assess the effects of environmental variables on growth, size, and maturity;
- Establish standardized Gulf-wide sampling programs to obtain fishery-independent data on size and weight, sex, maturity, parasitic infection, and molt cycle stage;
- Review and expand monitoring where necessary to more accurately evaluate fluctuations in juvenile abundance indices;
- Develop suitable alternatives to traditional crab baits;
- Obtain data correlating meat yield with size, sex, and season;
- Determine the economic impact of existing and proposed management regulations on the processing and harvesting sectors;
- Obtain commercial crab harvester cost-earning economic data to determine economic performance and contribution;

This regional cooperation has resulted in numerous cooperative research projects and publications.

1.11 Monitoring of the fishery's socio-economic dimensions

The Louisiana fishery dependent trip ticket program (Bourgeois et al., 2014) monitors harvest of blue crabs at the point of initial sale and later transfers of product by wholesale/retail seafood dealers and provides valuable and previously unavailable socio-economic data for detailed economic analyses that meet the Legislature, LWFC, or LDWF needs. Any new blue crab state statute or LWFC rule requires a Fiscal and Economic Impact Statement or a Fiscal Note, respectively⁷¹. Socio-economic data obtained from the trip ticket monitoring program is also used by the LDWF for research, fishery monitoring, and management recommendations.

In 2018, historical catches in the fleet and crab ex-vessel value information were used to propose the best closure to implement in 2019⁷² that would both decrease overall catches of mature female crabs, and at the same time, minimally impact the industry.

1.12 Managing fishing capacity

No new regulations have been adopted concerning the “managing fishing capacity” clause since the blue crab first surveillance at the end of 2017.

⁷⁰ https://www.gsmfc.org/publications/GSMFC%20Number%20243_web.pdf

⁷¹ <http://lfo.louisiana.gov/files/forms/impactinstruct.pdf>

⁷² <http://www.wlf.louisiana.gov/sites/default/files/pdf/page/41762-commission-minutes-present-2016/june2018commissionminutes.pdf>

Implementation of fishing effort restrictions are available within the legal authorities of the Legislature, LWFC, and LDWF Secretary although historically there have been social and political constraints to limiting effort and access to the blue crab fishery. Except for two temporary license moratoriums and local crab trap closures to collect derelict crab traps, the Louisiana blue crab fishery has been an open-access fishery with no restrictions on total numbers of fishermen, trap limits, or seasonal closures prior to 2015. However, blue crab regulations adopted in 2014 and later may have influenced overall fishing effort as measured by number of fishing trips and overall harvest. In 2014, Legislative Act 540 provided for specific entrance education and training requirements for commercial crab trap fishermen whom did not have crab trap licenses for two years during the 2011-2014 period⁷³.

The number of commercial crab trap licenses steadily declined from 3,382 in 2014 to 2,588 in 2017. The number of recreational crab trap licenses, however, which was not included in LA RS 56:305.6⁷⁴, increased by about 10% from 6,115 in license year 2014 (7/1/14-6/30/15) to 6,761 in license year 2017 (7/1/17 to 6/30/18).

The Legislature in 2017 approved Act 153 that amended LA RS 56:332⁷⁵ relating to the release of crabs in berry stage; method of taking crabs; time limitations; by-catch; penalties; and the abandoned crab trap removal program. Furthermore, at its September 6, 2018 meeting, the Louisiana Wildlife and Fisheries Commission adopted a Notice of Intent (NOI) to change regulation (LAC 76:VII.346⁷⁶) for the recreational and commercial harvest of blue crabs in 2019. The proposed rule would change the season during which the take or possession of mature female blue crabs is prohibited, currently set for March 1 – April 30 2019, to September 9 – October 13, 2019⁷⁷. These changes are expected to result in less negative impact on the crab fishery while maintaining the same level of protection to the blue crab stock, based on an analysis of historical annual crab harvest and market information⁷⁸.

These regulations will replace the previous 30-day closure, imposed in 2017, and the 60-day mature female harvest restriction imposed in the spring of 2018, and the previously proposed restriction in spring of 2019. The NOI also sees the removal of the sunset provision on the currently established ban on the commercial harvest of immature female blue crabs (active in 2017, 2018 and 2019), making the ban permanent and extending to future years indefinitely. The proposal will also include banning the recreational harvest of female blue crab during the 2019 seasonal closure on commercial female harvest.

Finally, in 2015, the commercial gear license fee was increased from 35 to 50 dollars.

Currently, there are discussions to potentially increase this fee further in the future (pers. comm. Peyton Cagle, Crustacean Program Manager, LDFW, 11th Dec 2018).

⁷³ <https://www.lafisheriesforward.org/ldwf-reopens-lff-crab-professionalism-program/>

⁷⁴ <https://legis.la.gov/Legis/Law.aspx?d=105160>

⁷⁵ <https://legis.la.gov/Legis/Law.aspx?d=105228>

⁷⁶ http://www.wlf.louisiana.gov/sites/default/files/pdf/document/39939-title/ose_legal_forms_title_76.pdf

⁷⁷ <https://louisianadirectseafood.com/lwfc-to-modify-blue-crab-harvest-regulations/>

⁷⁸ <http://www.wlf.louisiana.gov/sites/default/files/pdf/page/41762-commission-minutes-present-2016/june2018commissionminutes.pdf>

7.1.2. A2 – Fundamental Clause 2

Gulf States fishery management organizations shall implement monitoring and control systems (MCS) to allow for effective enforcement of management measures and their associated rules and regulations.

(FAO CCRF (1995) 6.1, 6.10, 7.1, 7.7, 8.1, 8.2; FAO Eco (2009) 29.5)

Supporting Clauses:	2.1, 2.2, 2.3			
Evidence Rating:	Low <input type="checkbox"/>	Medium <input type="checkbox"/>		High <input checked="" type="checkbox"/>
Non-conformance:	Critical <input type="checkbox"/>	Major <input type="checkbox"/>	Minor <input type="checkbox"/>	None <input checked="" type="checkbox"/>

SUMMARY EVIDENCE

Effective mechanisms have been established for fisheries monitoring, surveillance, and control and to ensure compliance with the conservation and management measures for the blue crab fishery. The LDWF Law Enforcement Division (LED) is a fully-commissioned state-wide law enforcement agency with the primary mission of enforcing Legislative regulations, LWFC rules, and any LDWF Secretary actions to help protect Louisiana's natural resources. Sanctions are enforceable, adequate in severity, and have increasing levels of penalties; consequently, they are effective in securing compliance and discouraging violations. LA R.S. 56:31-37.1 defines penalties for eight classes of violations (Class 1 to 8), with increasing levels of penalty that may include fines, jail time, loss of fishing license, and forfeiture of property and catch. Compliance in this fishery remained high during 2018. The LFF program promotes public awareness and advises all sectors of Louisiana's commercial fishing industry, including fishermen, dock owners, processors, and distributors on various fishery and industry related topics. DWF provides education and training programs to improve the skills of fishers and their understanding of fisheries regulations with public outreach efforts being made in English, Spanish, and Vietnamese. New commercial crab gear requirements program was recently approved in 2014 by the State Legislature (Act 40, R.S. 56:305.6) in response to a crab industry request concerning mandatory training for new crab fisherman. Anyone wishing to obtain a commercial crab trap license must first complete a training program unless they held a commercial crab trap license in any two years from 2011 to 2014.

EVIDENCE

2.1. Fishery Monitoring, Control and Surveillance (MCS) systems

No changes have occurred in the “fishery monitoring, control, and surveillance (MSC) systems” clause since the blue crab first surveillance at the end of 2017.

Effective mechanisms have been established for fisheries monitoring, surveillance, and control and to ensure compliance with the conservation and management measures for the blue crab fishery. The LDWF Law Enforcement Division (LED) is a fully-commissioned state-wide law enforcement agency with the primary mission of enforcing Legislative regulations, LWFC rules, and any LDWF Secretary actions to help protect Louisiana's natural resources⁷⁹. LDWF also provides education and training programs which include information on blue crab regulations (see Clause 2.3 below).

Since the previous surveillance in 2017 (no. 1) there have been no significant changes to the enforcement assets deployed. Similarly, there has been a similar enforcement effort to 2017.

⁷⁹ <http://www.wlf.louisiana.gov/enforcement>

Table 6. Criminal citations (Type R) and warnings (Type W) for the Louisiana crab fishery from July 1st 2017 to July 31st 2018.

VIOLATION CODE	DESCRIPTION	TYPE	TOTAL	TYPE	TOTAL
25.1	Take / possess over limit blue crabs (144/person)	R	4		
43	Take crab with illegal gear	R	2		
60	Possess crabs in berry stage	R	5		
61	Use crab traps without required markings	R	22	W	1
62	Fail to remove unserviceable traps	0			
62.1	Intentionally discard crab trap in navigable waters	0			
62.2	Violate abandoned crab trap removal regulations	R	4		
63	Destroy legal crab traps or removing contents	R	17		
64	Set crab traps in navigable channels	R	4		
64.1	Violate crab trap escape ring requirements	R	17	W	3
81	Fail to mark crab containers	R	1		
81.1	Fail to mark softshell crab container or	R	7		
82	Tending crab traps illegal hours	R	8		
95	Theft of crab trap(s)	R	11		
96	Possess or sell undersized crabs (10% to 19%)	R	3		
96.2	Sell undersize crabs (10% to 19%)	0			
96.3	Possess over 20% undersize crabs	R	2		
96.4	Obtain license or engage in activity after	0			
96.5	Fail to comply with stone crab requirements	R	1		
96.6	Taking/Posses immature female crabs as per 76 PartVII:3	R	14	W	1
96.7	Taking crabs closed season as per 76 Part VII:346	R	13		

2.2. Sanctions for non-compliance

No changes have occurred in the “sanctions for non-compliance” clause since the blue crab first surveillance at the end of 2017.

Sanctions are enforceable, adequate in severity, and have increasing levels of penalties; consequently, they are effective in securing compliance and discouraging violations. LA R.S. 56:31-37.1⁸⁰ defines penalties for eight classes of violations (Class 1 to Class 8), with increasing levels of penalty that may include fines, jail time, loss of fishing license, and forfeiture of property and catch.

For the lowest level Class 1 sanction, RS 56:31 specifies a first offense penalty of a fine of \$50 or imprisonment for not more than fifteen days, or both⁸¹. For the highest level Class 8 violation, RS 56:37.1 specifies that the fine shall not be less than \$5,000 nor more than \$7,000 and the violator may be imprisoned in jail for not less than

⁸⁰ http://legis.la.gov/legis/Laws_Toc.aspx?folder=130&title=56

⁸¹ <http://legis.la.gov/legis/Law.aspx?d=105252>

sixty days nor more than six months⁸². Intermediate penalties apply between these two extremes. In addition, repetitive offenses for some of the class violations result in increased penalties. Compliance in this fishery remained high during 2018 (pers. comm. LTC Chad Hebert, LDWF LED, 11th December 2018).

2.3. Education and training programs

No changes have occurred in the “education and training programs” clause since the blue crab first surveillance at the end of 2017 although additional data are available.

LDWF provides education and training programs to improve the skills of fishermen and their understanding of the law through the Aquatic Outreach Section, which implements the LFF program. The LFF program promotes public awareness and advises all sectors of Louisiana’s commercial fishing industry, including fishermen, dock owners, processors, and distributors on various fishery and industry related topics.

New commercial crab gear requirements program was recently approved in 2014 by the State Legislature (Act 40, R.S. 56:305.6) in response to a crab industry request concerning mandatory training for new crab fisherman. Anyone wishing to obtain a commercial crab trap license must first complete a training program unless they held a commercial crab trap license in any two years from 2011 to 2014.⁸³

LDWF provides education and training programs to improve the skills of fishers and their understanding of fisheries regulations with public outreach efforts being made in English, Spanish, and Vietnamese.

⁸² <http://legis.la.gov/legis/Law.aspx?d=105252>

⁸³ <http://legis.la.gov/legis/Law.aspx?d=105160>

7.2. Section B. Data Collection, Stock Assessment and Scientific Advice

7.2.1. B3 – Fundamental Clause 3

Adequate data and/or information are collected, maintained and assessed in accordance with applicable international standards and practices for evaluation of the current state and trends of the stocks.

(FAO CCRF (1995) 6.4, 7.3, 7.4, 8.4, 12; FAO Eco (2009) 29, 31)

<p>Supporting Clauses:</p>	<p>3.1 and sub-clauses, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8 , 3.9 and sub-clauses</p>
<p>Important Note.</p>	<p>This surveillance assessment template is based on Version 1.2 of the GULF RFM Standard. It differs in the following way from the previous Version (v1.1).</p> <p>3.4 Data shall be collected and research advanced to improve the understanding of the biology, life-cycle and reproductive cycle of the stock under consideration, its geographic range, its habitat, the environmental factors that may influence stock abundance, and its role in the ecosystem, to improve management of the fishery.</p> <p>The part in Bold is new and different. The change is considered minor. Additional attention shall be placed on the addition “the environmental factors that may influence stock abundance”.</p> <p>-----</p> <p>3.9 The nominated scientific institutions shall use best available scientific evidence, advice, and/or objectively verified information as a basis to inform stock assessment and provide advice on the objectives of fisheries management including:</p> <ul style="list-style-type: none"> i. Management targets consistent with achieving maximum sustainable yield (MSY) (or a suitable proxy) on average, or a lesser fishing mortality if that is optimal in the circumstances of the fishery (e.g. multispecies fisheries) or to avoid severe adverse impacts on dependent predators, taking into consideration relevant economic, social, or ecological factors. ii. The application of specific limits or directions in key performance indicators, consistent with avoiding recruitment overfishing or other impacts that are likely to be irreversible or very slowly reversible, and specification of the actions to be taken if the limits are approached or the desired directions are not achieved. iii. Accordingly: the stock(s) under consideration shall not be overfished if above the associated limit reference point (or its proxy). iv. If fishing mortality (or its proxy) is above the associated limit reference point, actions shall be taken to decrease the fishing mortality (or its proxy) below that limit reference point. v. In the event that evidence shows biomass falling well below target levels, management measures shall allow for restoration within reasonable time frames, relevant to the life history characteristics of the species under consideration. vi. The structure and composition of the stock(s) under consideration, which contribute to its resilience shall be taken into account. <p>The parts in Bold are new and different. The change is considered minor and implicit in the previous version of the clause (especially “best available” information since that is always the information/data/evidence put forward or collected to address any given requirement). Some attention shall be placed on the addition “and/or objectively verified information as a basis to inform stock assessment”, specifically on the fact that such information is used to inform stock assessment.</p>

Evidence Rating:	Low <input type="checkbox"/>	Medium <input checked="" type="checkbox"/>		High <input type="checkbox"/>
Non-conformance:	Critical <input type="checkbox"/>	Major <input type="checkbox"/>	Minor (only applies to Clause 3.9 iii, all the other Clauses are in full conformance) <input checked="" type="checkbox"/>	None <input type="checkbox"/>

SUMMARY EVIDENCE

Fishery-dependent and fishery-independent data are collected in a routine and consistent manner to allow for scientifically robust assessment of 1) the state of the stock relative to the management elected reference points or suitable substitutes or other performance indicators; 2) the performance of the fishery with respect to the utilization of the resource; 3) the performance of management measures, harvest controls and associated rules that support the strategy and the defined objectives of the fishery; and 4) the impact of the fishery on the ecosystem and other identified impacts.

Data review and analysis consider and take sufficient account of all fishery removals of the target stock(s) including retained catch and discards in target and non-target fisheries. Data review and analysis consider and take sufficient account for catches and discards of other commercial and non-commercial species associated with fishing activity to the extent that impacts on these species can be understood. Data is collected and research advanced to improve the understanding of the biology, life-cycle and reproductive cycle of the stock under consideration, its geographic range, its habitat and role in the ecosystem, to improve management of the fishery.

There is a formal process by which fisher knowledge can be incorporated and influence fishery management. There is an established scientific survey and system of checks of harvest data to both generate and verify data. LDWF uses the best available scientific data and provides stock assessment information and related advice for the objectives of fisheries management.

EVIDENCE

3.1, 3.2, 3.3, 3.4, 3.5, 3.6 and 3.7. Data collection review and analysis

Several sources of information are used by LDWF to meet the preceding requirements. Annual catch is based upon the sum of commercial and recreational harvest. Annual Louisiana blue crab commercial harvest is derived from NMFS statistical records, 1968 – 1998, and the LDWF Trip Ticket program, 1999 – 2017. The validity of using these different sources of information (LDWF and NMFS) for landings data was verified in the Full Assessment Report⁸⁴. Consequently, there is high confidence in linking the two sources of data for commercial landings. Most blue crab landings come from the blue crab fishery. Landings from other gear types account for less than 0.5% of the total volume of annual blue crab landings in Louisiana. Blue crabs caught in skimmers, trawls, and butterfly nets are seldom targeted and are considered incidental catch in shrimp fisheries. A time-series of recreational harvest records currently does not exist. The recreational harvest is estimated conservatively at 5%⁸⁵ of the commercial harvest, which was deemed reasonable in the Full Assessment Report.

⁸⁴ <https://www.audubongulf.org/wp-content/uploads/2016/11/GULF-Blue-Crab-Full-Assessment-Report-Final.pdf>

⁸⁵ <http://www.wlf.louisiana.gov/sites/default/files/pdf/page/37756-stock-assessments/labassessment2018.pdf>

Blue crab abundance indices are derived from the LDWF fishery-independent trawl survey, 1967 – 2017, for life stages relative to the fishery. These include: 1) adult or exploitable crabs (i.e., ≥ 125 mm carapace width--CW), 2) juveniles or crabs that will recruit to the fishery during the survey year (i.e., by December 31st), and 3) young-of-the-year or crabs that will not recruit to the fishery during the survey year. Due to size selectivity of the survey gear, crabs < 25 mm CW are excluded from index development. Mean catch per tow and its variance are calculated by assuming a delta-lognormal distribution which is appropriate for lognormally distributed survey datasets when a high proportion of zero catches occur (Full Assessment Report).

Estimates of effort are derived from the trip ticket system. Since 1999, LDWF has monitored the harvest of blue crabs at the point of initial sale through a trip ticket program⁸⁶. This information combined with that on landings provides a measure of CPUE by the fishery, which is an indicator of the performance of the fishery in terms of its efficiency. This estimate of CPUE is based on fishery-dependent data and differs from the CPUE estimates based on the fishery-independent surveys.

The data needed to assess the effects of target and non-target fisheries upon the blue crab fishery and stock include catch and discards from target and non-target fisheries. Annual target-fishery catch is based upon the sum of commercial and recreational harvest (Full Assessment Report). Annual Louisiana blue crab commercial harvest is derived from NMFS statistical records, 1968-1998, and the LDWF Trip Ticket program, 1999-2017. Annual catch is based upon the sum of commercial and recreational harvest. Most blue crab landings come from the blue crab fishery. Landings from other gear types account for less than 0.5% of the total volume of annual blue crab landings in Louisiana⁸⁷. Approximate annual average landings from other gear types are skimmer nets (63,000 pounds), wire nets (54,000 pounds), otter trawls (38,500 pounds), butterfly nets (25,800 pounds), and trotlines (22,500 pounds). Blue crabs caught in skimmers, trawls, and butterfly nets are seldom targeted and are considered incidental catch in shrimp fisheries. A time-series of recreational harvest records currently does not exist. The recreational harvest is estimated conservatively at 5% of the commercial harvest, which was deemed reasonable in the Full Assessment Report.

Guillory et al. (1996) summarized literature and data on the biology and ecology of blue crabs in a source document for the management of the Louisiana blue crab fishery. In addition to describing the fishery and commenting on research needs, the authors described blue crab taxonomy and nomenclature; larval, juvenile and adult morphology; distribution and abundance; habitat utilization; reproduction; age and growth; trophic relationships; behavior; movement and migration; pathology and parasitology; environmental tolerances; recruitment mechanisms; and mortality. Environmental factors influencing year-class strength and the survival of recruits to exploitable life stages are not well understood. Further analysis of these factors could elucidate the link between the environment and blue crab productivity. Contributing factors could also be used in development of predictive models allowing for short-term forecasts for resource managers and industry. The addition of

⁸⁶ <http://www.wlf.louisiana.gov/fishing/trip-ticket>

⁸⁷ <http://www.wlf.louisiana.gov/sites/default/files/pdf/page/37762-fishery-management-plans-marine/finalbluecrabfmp11-7-14.pdf>

environmental data coupled with food web data may lead to a better understanding of the blue crab stock and its habitat⁸⁸.

Crab traps can catch non-targeted finfish, other vertebrates, and invertebrates. Data needed for catch and discards from target and non-target fisheries is derived from the sum of commercial and recreational harvest. LDWF has conducted studies to measure bycatch in the blue crab fishery, including short-term and state-wide projects. Recent studies of blue crab traps in Louisiana waters were recently conducted by LDWF (LDWF unpublished report, February 2015) and independent scientists (Anderson and Alford 2014; J.A. Lively⁸⁹). These surveys were designed to collect and analyze data on incidental bycatch in the Louisiana crab trap fishery with special emphasis on diamondback terrapins (*Malaclemys terrapin*). The surveys began in December 2012 within the Lake Pontchartrain, Vermilion/Teche River, and Sabine River basins and became fully implemented by January 2013 with trap sets/runs taking place in all of the major coastal basins through 2016. The initial results of the LDWF study were provided in the Full Assessment Report. LDWF provided an update on the study in 2017, for which bycatch data included species taken by crab gear and reported through the trip ticket system. The trip ticket data were compiled from all the commercial trip ticket data from Louisiana, 1999 through 2016. Values are the total landings over the 17-year period, divided into landings per year. If there were fewer than 10 reports of landings over the 17-year time period, those values were deleted to protect confidential landings information. Except for sea bobs, unclassified shad, and greater amberjack, all of those values were less than 1,000 pounds over the time span. None of the taxa exceeded 15,000 pounds over the time period. Some of those taxa (e.g. brown shrimp, white shrimp, amberjack, pompano, and crawfish) were probably taken by other gear on the trip, and only the primary gear on the trip is reported on the ticket. Bycatch information is considered adequate.

Endangered and threatened species in Louisiana as of April 2018 are listed on Fish and Wildlife Service website⁹⁰. Available evidence suggests that the blue crab fishery does not currently pose serious risks to any of these species. However, a more detailed summary of the likely impact of the blue crab fishery on diamondback terrapins, a species of special concern, is presented later in the Ecosystem Effects section of this report.

The GOM blue crab fishery is listed as a Category III (remote likelihood of/ no known interaction with marine mammals) fishery under the NMFS list of fisheries⁹¹.

Crab traps can incidentally catch undersized blue crabs. To reduce this bycatch, the state revised their requirements such that crab traps must have a minimum of three escape rings, with a minimum size of 2-3/8 inches in inside diameter, per trap, with two rings placed in the trap's upper chamber. The revised requirements also remove escape ring exemptions for crab traps placed in Lake Pontchartrain; crab traps constructed of square wire mesh of 2-5/16 inches or greater are still exempt. These new requirements are intended to reduce incidental capture of undersized blue crabs but will potentially reduce other bycatch as well.

⁸⁸ <http://www.wlf.louisiana.gov/sites/default/files/pdf/page/37756-stock-assessments/labassessment2018.pdf>

⁸⁹ [https://www.gsmfc.org/ann_mtgs/2017-](https://www.gsmfc.org/ann_mtgs/2017-10/Gen_Sess/4.%20Bycatch%20in%20the%20Commercial%20Blue%20Crab%20Fishery%20in.pdf)

[10/Gen_Sess/4.%20Bycatch%20in%20the%20Commercial%20Blue%20Crab%20Fishery%20in.pdf](https://www.gsmfc.org/ann_mtgs/2017-10/Gen_Sess/4.%20Bycatch%20in%20the%20Commercial%20Blue%20Crab%20Fishery%20in.pdf)

⁹⁰ <https://www.fws.gov/southeast/pdf/fact-sheet/louisiana-ecological-services-field-office-t-and-e-species.pdf>

⁹¹ <https://www.fisheries.noaa.gov/national/marine-mammal-protection/list-fisheries-summary-tables#table-2---commercial-fisheries-in-the-atlantic-ocean,-gulf-of-mexico,-and-caribbean>

Derelict traps are those that have been discarded, lost, or abandoned. Traps can be accidentally lost if they are separated from their buoys by storms, passing boats, or other reasons. Derelict traps can “ghost fish” and continue to capture blue crabs and other species. Louisiana implemented several management measures to minimize trap loss as well as the impact of derelict traps, including requiring proper disposal of unserviceable crab traps, mandating the use of solid floats with non-floating lines, requiring trap placement that allows vessels to safely navigate waters, requiring traps to have multiple escape rings, and sponsoring an annual derelict trap removal program. Areas chosen for crab trap cleanup are determined in several ways. One of the most important factors is having feedback from fishing grounds. These areas are also determined by the regions that typically have the largest landings of blue crab. The trap removal program includes an educational element designed to reduce the number of traps lost annually and lessen the impacts of traps in the environment and also collects data on the number and types of animals found in the recovered traps. In addition, to obtain a commercial crab trap gear license, a fisherman must either possess a valid commercial crab trap licenses during any two license years between 2011 and 2014 or enroll in and complete a professionalism program established by the Commission.

The state of Louisiana, as represented by LDWF, is a member of the Gulf States Marine Fisheries Commission, which coordinates fishery management, stock assessment and research efforts across the northern Gulf of Mexico and which has produced a regional fishery management plan for the blue crab and a Gulf-wide stock assessment for the blue crab, which contain a comprehensive summary of the life-history, biology and ecology of the blue crab relevant for fishery management. Consequently, there is significant information on the biology, life-cycle, reproductive patterns, population structure, habitat relationships and ecosystem role of the blue crab based on extensive field, lab and modeling research throughout the Gulf of Mexico.

The state of Louisiana produced a fishery management plan for its blue crab fishery (Full Assessment Report), which provided a comprehensive review of the blue crab’s stock structure, biology, life history, ecology, fishery, and ecosystem function. In addition, the LDWF has various research projects underway to fill research gaps on ecosystem effects, such as those of bycatch mortality, and it has identified the following high-priority research needs: (1) Revised estimates of natural mortality, age, growth and longevity; (2) Assessment of regional or basin-specific sub-populations; (3) Factors influencing year-class strength and the survival of recruits to exploitable life stages; (4) The relationship between wetlands losses and the continuation of fishery production within Louisiana; (5) Estimates of total mortality from all sources for use in stock assessments; (6) Development of predictive models that take into account an understanding of predator-prey relationships; (7) Understanding of the relationship between changing environmental conditions and continued production of the Louisiana blue crab fishery; and (8) Migration patterns. Some of these research needs are currently being funded through the RESTORE program, and results made available as they are produced by investigators.

The blue crab management framework consists of state, regional, and federal organizations plus an industry group. Key institutions include the LWFC and the LDWF with local input from the CTF (Crab Task Force) and regional input from the GSMFC. Both the LWFC and the LDWF must comply with the Louisiana Administrative Procedures Act which provides an opportunity for public input into the rule-making process. Meetings of the CTF are open to the public. Issues raised by the CTF are brought to the LWFC and/or LDWF if regulatory action is required. The CTF can also initiate legislation through the LWDF.

The collection of fishery-dependent and fishery-independent data is rigorous, precluding the need for scientific observer schemes (Supporting Clause 3.6). See Full Assessment Report for details.

Regarding Supporting Clause 3.7, LDWF is using specific information on the stock under consideration. As there is sufficient specific information available, there is no need to use generic evidence based on similar stock(s) and this clause is, therefore, not applicable.

3.8. Stock Assessment, Management targets and limits

The requirements of Supporting Clause 3.8 relate to the two management-elected reference points, which include a level of exploitable biomass and a corresponding fishing mortality rate based upon the history of the fishery, a surrogate for MSY derived from estimates of Spawning Stock Biomass, and estimates of effort by the fishery. See Full Assessment Report for details. The data required to meet these requirements is collected annually, as previously explained.

Assessment of stock status is conducted annually based on indices of exploitable biomass generated by the LDWF fishery-independent blue crab survey, and on estimates of fishing mortality generated using harvest data from the LDWF Trip Ticket system and exploitable biomass estimates. The data and information are used in stock assessments conducted at regular intervals (West et al. 2011, 2014), and in updates. The most recent update stock assessment was conducted in early 2018 due to the overfished status of the fishery in 2015 and to high fishing mortality near the limit in 2014. Since 2016 the stock has not been overfished nor has overfishing occurred (West et al. 2018). A full stock assessment will be conducted in 2019.

The stock assessments use a catch-survey/Collie-Sissenwine analysis (Collie and Sissenwine 1983). The model is intended for data moderate situations where a full age structure is lacking, and it balances the number of individuals from the juvenile life stage to that for exploitable-size crabs, given constant natural mortality, while scaling these values to harvest. The data requirements are a time-series of landings and corresponding abundance indices for juvenile and adult life stages, an estimate of instantaneous natural mortality, and the relative selectivity of the juvenile and adult life stages to the survey gear. Assumptions of the catch-survey model are: (i) the stock is closed to migration, (ii) natural mortality occurs at a constant rate, and (iii) all surviving recruits will grow into the fully-recruited stage within the model year. Survey indices of abundance are assumed proportional to absolute abundance. Crabs greater than 25 mm in carapace width are assumed to be equally vulnerable to the survey gear.

The previous assessments (West et al. 2011, 2014) established precautionary limits to fishing by requiring that exploitable biomass not fall below the three lowest levels observed (1968 – 2009) where the stock demonstrated sustainability (i.e., no observed declines in recruitment over a wide-range of exploitable biomasses). This is equivalent to maintaining the stock above a limit spawning potential ratio (SPR; Goodyear, 1993).

Louisiana blue crab data does not allow for reliable estimates of MSY. The assessments, therefore, define a limit based upon the history of the fishery (i.e., a 19.1% SPR_{limit}). The fishing mortality rate limit F_{limit} and SSB_{limit} that are equivalent to this SPR_{limit} were estimated as 0.98 year^{-1} and 16.4 million pounds, respectively (West et al. 2014). To define the targets of fishing, (i.e., SSB, F, and SPR) sufficiently far from the limits as a buffer from random variability of the environment, the biomass target reference point (SSB_{target}) is defined as $SSB_{limit} \times 1.5 = 24.6$ million pounds. This biomass is achieved when there is an equilibrium SPR_{target} of 28.7% and F_{target} of 0.75 year^{-1} .

3.9. (i) and (ii) Appropriateness of management targets and limits

The Louisiana Wildlife and Fisheries Commission adopted a resolution on February 6, 2014 establishing the following policy based on the overfishing and overfished limits and targets of fishing described above: “Should the fishing mortality or exploitable biomass exceed the overfished or overfishing limits, or exceed the targets for three consecutive years, as defined in the most current Louisiana blue crab stock assessment, LDWF shall come before the Commission with an updated assessment and a series of management options for the Commission to review and act upon, intended to keep the fishery from becoming overfished, and that management options for review and action shall include provisions for emergency closures, time-based closures, and spatial closures.”

The blue crab is a short-lived, highly productive species. SSB_{limit} was set so as to ensure the stock does not fall below the three lowest levels observed (1968 – 2009) where the stock demonstrated sustainability (i.e. no observed declines in recruitment over a wide-range of exploitable biomasses). While the 2015 estimate was the lowest level recorded in the time series, the stock has previously recovered from SSB levels around SSB_{limit} , and did so once again in 2016 and 2017. Therefore the SSB_{limit} can be considered to be precautionary and set above the point at which recruitment is likely be impaired.

3.9. (iii) and (iv) Current Overfished and Overfishing status

The 2018 updated stock assessment provided information on the time series of Louisiana blue crab landings, fishing effort, fishing mortality rates and exploitable biomass relative to the targets and limits of each reference point (Fig. 8). Landings have been relatively stable since 2011. Fishing effort required to reach the landings rose significantly from 2011 through 2014 but then declined to average levels for the time frame from 2005 through 2017.

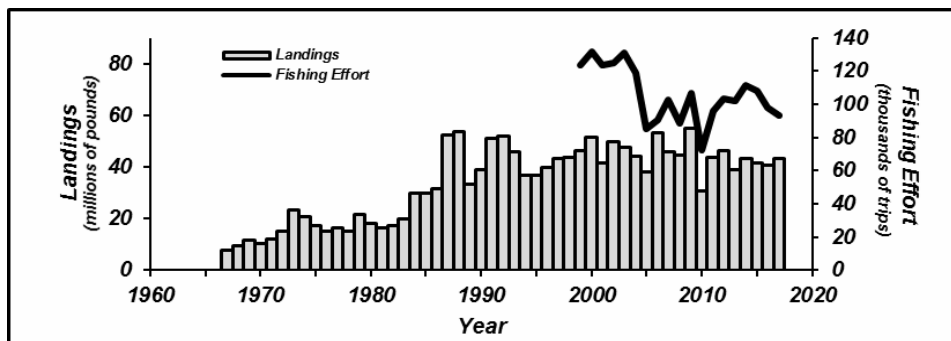


Figure 8. Landings and fishing effort of Louisiana blue crab. Figure from 2018 updated stock assessment (West et al. 2018).

Hence, Catch Per Unit Effort declined substantially from 2011 through 2014, but rose to average levels since 2014 (Figure 9).

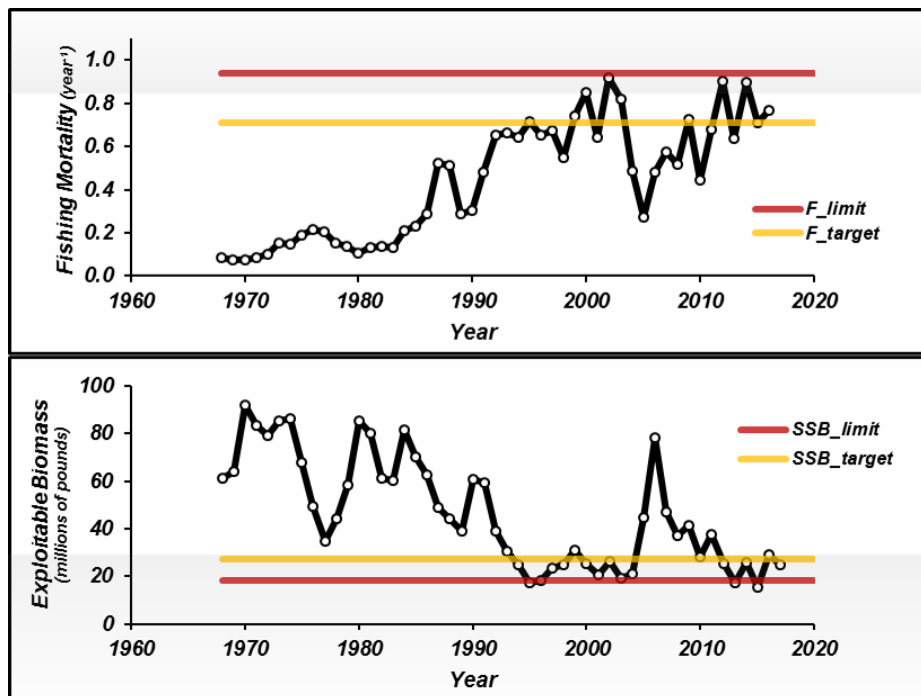


Figure 9. Fishing mortality rates and exploitable biomass over time relative to the targets and limits of each reference point. Figure from 2018 updated stock assessment (West et al. 2018)

Fishing mortality rates exceeding F_{limit} (or ratios of $F/F_{limit} > 1.0$) indicate overfishing; stock biomasses below SSB_{limit} (or ratios of $SSB/SSB_{limit} < 1.0$) indicate an overfished condition. The 2015 and 2016 estimates of F/F_{limit} were near the target and far lower than the limit (Figure 9), suggesting that the stock has not been experiencing overfishing recently. Similarly, the 2016 and 2017 estimates of SSB/SSB_{limit} were also near the target and higher than the limit, suggesting that the stock had not been overfished recently. These current estimates of fishing mortality and exploitable biomass appear to suggest that the fishery is sustainably exploiting the blue crab stock and that recent management measures may have had some positive effects, although the low juvenile index of abundance indicates (i.e. lowest values in the time series) that cautious management should be employed.

Despite the increased abundance and biomass of adults, recruitment has not recovered, which may be due to various factors including decreases in larval subsidies from other states in the Gulf of Mexico due to the connectedness of blue crab populations west of the Apalachicola River. We also note that significant barriers (salinity and circulatory) at the Mississippi River may separate many sub-populations of fish species. Given that the stock was not overfished in 2016 and 2017, overfishing was not occurring in 2015 and 2016, and considering the short generation time and highly productive nature of blue crab which can stimulate rapid recovery in recruitment, and the environmentally driven nature of blue crab recruitment, the Assessment Team considers that management is on a good trajectory, but recommends that **Minor Non-conformance #4 be maintained until the 2019 stock assessment demonstrates continued sustainable exploitation.**

3.9. (v) and (vi) Rebuilding measures and consideration of structure and composition of stock

To promote recovery and reduce the risk of future declines of the blue crab stock, management has enacted a set of corrective actions designed to decrease fishing mortality and enhance exploitable biomass, including:

- Professionalism program (Initiated November 2014 and on-going)
- License fee increases (Initiated November 2014)
- Ban on immature females (initiated January 2017 through to 2019)
- Fishery Closure (3rd week of February to 2nd week of March for 2017, female ban period in spring 2018 and fall 2019)
- Escape ring measures (implemented November 2017)
 - Increase from 2 to 3 rings per trap
 - Placement 2 to be in upper chamber
 - Increase from 2 5/16 inch to 2 3/8 inch
 - Removal of exemption for Lake Pontchartrain
- Full stock assessment in early 2019

These corrective actions are collectively considered by the Assessment Team as being at least partially responsible for shifting fishing mortality rates and stock abundance away from the limits and close to the targets, and sufficient to justify a well-based expectation of continuing stock recovery. Corrective actions by management have been formulated in consideration of relevant life history characteristics of the blue crab, taking into account the structure and composition of the blue crab stock which contribute to its resilience, as explained below.

7.3. Section C: Management Objectives for the Stock

7.3.1. C4 – Fundamental Clause 4

The management system shall specify management objectives to achieve optimal utilization of the resource and ensure that the stock is not overfished and that overfishing is not occurring.

(FAO CCRF (1995) 6, 7.2, 7.3; FAO Eco (2009) 28, 29)

Supporting Clauses:	4.1, 4.2 , 4.3, 4.4, 4.5 and sub clauses, 4.6 and sub-clauses, 4.7 and sub-clauses			
Important Note.	<p>This surveillance assessment template is based on Version 1.2 of the GULF RFM Standard. It differs in the following way from the previous Version (v1.1).</p> <p>4.2 In the event of overfishing, there shall be objectives for the management system and actions taken to reduce fishing mortality to levels that have been identified as appropriate for high productivity and long term conservation and implemented in a timely manner.</p> <p>The part in Bold is new and different. The change is considered minor. Additional attention shall be placed on the addition “and implemented in a timely manner”.</p>			
Evidence Rating:	Low <input type="checkbox"/>	Medium <input type="checkbox"/>	High <input checked="" type="checkbox"/>	
Non-conformance:	Critical <input type="checkbox"/>	Major <input type="checkbox"/>	Minor <input type="checkbox"/>	None <input checked="" type="checkbox"/>

SUMMARY EVIDENCE

The management system specifies management objectives to achieve optimal utilization of the resource and ensure that the stock is not overfished and that overfishing is not occurring. These objectives are outlined in the blue crab FMP which integrates fishing, habitat, conservation, and socio-economic factors into a balanced strategy to maintain the long-term sustainability of the fishery. The provisions of the blue crab FMP act to ensure that short term considerations do not compromise the long-term management objectives for the resource. The mechanisms for controlling harvest are identified, formally established and implemented in accordance with the best available scientific information. The last stock assessment of blue crab (West et al., 2018) found that the blue crab stock was not overfished and overfishing was not occurring. Prior to this assessment, the earlier assessment (West et al. 2016) indicated that the stock was overfished and overfishing was occurring, which initiated effective corrective actions by management. Management’s response to the blue crab stock consisted of corrective actions intended to allow the stock to rebuild to target reference points and not exceed limit reference points. The Assessment Team views that management’s response to the overfished status and overfishing of the blue crab stock demonstrated that measures, harvest control mechanisms and associated actions were sufficiently formalized so that management was able to effectively respond and take action to situations of impaired recruitment, overfishing and overfished status. Given the elimination of overfished status and overfishing in recent years, the Assessment Team considers that the management actions were at least in part responsible for the recovery of the stock and fishery. Given that the recovery has occurred only over 2-3 years, the long-term effectiveness of the harvest control mechanisms need to be evaluated after the 2019 stock assessment and at future surveillance audits.

EVIDENCE

A brief synopsis of evidence relating to each supporting clause to Fundamental Clause 4 of the G.U.L.F. Standard is outlined below (note: some closely related sub-clauses have been grouped). These synopses are intended to address each of the supporting clauses and focus on areas where there have been any changes since the initial assessment/last surveillance audit and/or where weaknesses have previously been identified.

4.1. Management objectives

For the stock under consideration, documented management approaches and objectives are available that are expected to assist management in delivering long-term conservation objectives for the stock. Specific management objectives are outlined in the 2014 FMP (Bourgeois et al. 2014) which integrates fishing, habitat, conservation, and socio-economic factors into a balanced strategy to maintain long-term sustainability of the fishery. The 2011, 2014, 2016, and 2018 stock assessments provide the necessary guidelines to protect the blue crab resource (West et al. 2011; 2014; 2016; and 2018). Blue crab stock assessments are expected to be updated every three years and blue crab abundance indices and fishing effort estimates are to be summarized annually and compared with stock assessment reference points. The next stock assessment will be conducted in early 2019 with the aim of assessing whether corrective measures enacted by management in 2016 are promoting continued recovery of the stock.

4.2 and 4.3. Rebuilding objectives

In the event of overfishing, there are objectives for the management system and actions taken to reduce fishing mortality to levels that have been identified as appropriate for high productivity and long term conservation. In addition, where evidence shows biomass falling to levels where recruitment is impaired, there are objectives for the management system to allow for restoration of the stock.

The Louisiana Crab FMP details objectives to maintain fishing mortality and stock biomass at levels that have been identified as appropriate for long term conservation. These objectives are measured against limit and target reference points proposed in West et al., (2011) and approved by the LWFC in a Resolution in 2014. The Resolution states that:

“should the fishing mortality or exploitable biomass exceed the overfished or overfishing limits or exceed the targets for three consecutive years, the LDWF must appear before the LWFC to provide an update the stock assessment and recommend a series of management options (including emergency closures, time-based closures, and spatial closures) intended to keep the fishery from becoming overfished by increasing the biomass to the minimum limit level and to reduce fishing mortality to the maximum limit level”.

The above statement effectively represents the harvest control rule (HCR) for the blue crab fishery and contains objectives for the management system to reduce fishing mortality/increase stock biomass to levels that have been identified as appropriate for high productivity and long term sustainable exploitation.

As of the latest stock assessment (West et al., 2018), the blue crab stock was above the abundance limit reference point and near the target, such that the stock was not considered to be overfished in 2016 and 2017. Moreover, the blue crab stock was below the fishing mortality limit reference point and near the target, such that overfishing of the stock was not occurring in 2015 and 2016. Prior to these years the stock was overfished and overfishing was occurring such that managers enacted a number of measures to promote the rebuilding of the blue crab stock, which were apparently effective. These measures constituted a set of corrective actions designed to meet non-conformances raised during the initial assessment of the blue crab fishery through subsequent surveillance audits.

A new stock assessment, updating stock status with information to the end of 2018, is expected in Spring 2019, the results of which will be examined at the next surveillance audit.

4.4 and 4.5. Objectives/goals for long-term sustainable use

The Louisiana blue crab FMP (Bourgeois et al. 2014) defines long-term objectives for the fishery which act to ensure that short term considerations do not compromise the long-term sustainable use of the blue crab resource. These objectives include the maintenance of the stock at or above the levels necessary to ensure its continued biological productivity (Objectives 1 and 2) and the minimization of the negative impacts of fishing on the physical environment (Objective 6) and non-target species (Objective 4). The seven defined objectives are outlined below:

1. Prevent overfishing and ensure crabs 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 while addressing other potentially related issues at the same time.
3. Minimize conflicts among user groups.
4. Minimize fishery impacts on undersized blue crabs and other non-targeted species.
5. Continue to collect fishery dependent and independent data to support blue crab stock assessments, especially with regard to estimating total mortality.
6. Promote research to better understand the impact of environmental factors on blue crab populations as well as the blue crab fishery's impacts on the ecosystem.
7. Promote research to improve knowledge of the commercial and recreational fisheries for blue crab, including harvest data and socioeconomic information, and enhance social and economic benefits derived from the use of the resource.

4.6. Formulation of management measures

Management takes into account total fishing mortality from all significant sources, the size and health and relevant environmental, biological, technological, economic, cultural, social, and commercial aspects when determining suitable conservation and management measures. During the first surveillance audit of the fishery, two minor non-conformances were maintained due to previous overfishing and overfished status of the fishery. Management measures apparently eliminated overfishing and overfished status at least in part, and lead to cautious optimism about sustainable exploitation of the blue crab stock.

4.7. Management measures consistency with achieving MSY (or a suitable proxy)

Louisiana blue crab data do not allow for reliable estimates of MSY. The assessments, therefore, define⁹² a limit based upon the history of the fishery (i.e., a 19.1% SPR_{limit}). The fishing mortality rate limit F_{limit} and SSB_{limit} that are equivalent to this SPR_{limit} were estimated as 0.98 year^{-1} and 16.4 million pounds, respectively (West et al. 2014). To define the targets of fishing (i.e., SSB , F , and SPR) sufficiently far from the limits as a buffer from random variability of the environment, the biomass target reference point (SSB_{target}) is defined as $SSB_{limit} \times 1.5 = 24.6$ million pounds. This biomass is achieved when there is an equilibrium SPR_{target} of 28.7% and F_{target} of 0.75 year^{-1} . Management measures are therefore based on maintaining the stock above a recruitment overfishing threshold based upon the history of the stock and fishery and defined in terms of a spawning potential ratio limit. In addition,

⁹² <http://www.wlf.louisiana.gov/sites/default/files/pdf/page/37756-stock-assessments/labassessment2018.pdf>

there appears to be sufficient data to assess the state of the stock under consideration and management measures take into account the structure and composition of the stock under consideration, which contributes to its resilience. Limit reference points in place are considered suitable proxies for MSY given that the stock demonstrated sustainability in recent years (i.e., stock not overfished and overfishing not occurring). LDWF continues to look for model improvements to enable stock assessments to better take uncertainty into account in the model fitting process and in estimating stock status parameters.

7.3.2. C5 – Fundamental Clause 5

A suitable mechanism shall exist to allow the harvest to be increased or decreased in accordance with the objectives for achieving maximum sustainable yield (or a suitable proxy) or optimal yield, depending on the nature and state of the resource (s) and taking into consideration environmental, social and economic factors.

(FAO CCRF (1995) 7.5, 7.6)

Supporting Clauses:	5.1, 5.2.			
Important Note.	<p>This surveillance assessment template is based on Version 1.2 of the GULF RFM Standard. It differs in the following way from the previous Version (v1.1).</p> <p>5.2 Measures, harvest control mechanisms and associated actions shall be designed for when overfished conditions are approached and these shall be sufficiently formalized so that management can effectively respond and take action to situations of impaired recruitment, overfishing or increasing risk of exceeding these or other negative outcomes, in a timely manner.</p> <p>The part in Bold is new and different. The change is considered minor. Additional attention shall be placed on the addition “in a timely manner”.</p>			
Evidence Rating:	Low <input type="checkbox"/>	Medium <input checked="" type="checkbox"/>		High <input type="checkbox"/>
Non-conformance:	Critical <input type="checkbox"/>	Major <input type="checkbox"/>	Minor (Only applies to Clause 5.2) <input checked="" type="checkbox"/>	None <input type="checkbox"/>
SUMMARY EVIDENCE				
<p>The mechanism for controlling harvest is identifiable, formally established and implemented in accordance with the best available scientific information. There is an adopted harvest control rule aimed at preventing overfishing or an overfished stock. After the stock was overfished and overfishing was occurring through 2016 and 2015, respectively, corrective actions were put into place beginning in 2016 and which apparently promoted recovery of the stock which is no longer overfished and for which overfishing is not occurring. Consequently, the harvest control rules in force appear to be sufficiently precautionary to avoid overfishing and an overfished stock, as opposed to taking action once overfishing is occurring or the overfished condition is actually reached.</p>				
EVIDENCE				
<u>5.1. Mechanism for controlling harvest</u>				
<p>The Louisiana Department of Wildlife and Fisheries (LDWF) most recently assessed the blue crab stock in Louisiana waters in 2018 (West et al. 2018) and will be conducting a full stock assessment in early 2019. The assessment defines exploitable biomass as crabs 125 mm (4.9 inches) in carapace width or larger (the regulatory size limit is 5 inches) and uses exploitable biomass as a measure for spawning stock biomass in the development of reference points.</p> <p>A fishing mortality rate (F) exceeding F_{limit} indicates overfishing. As this limit is defined in the most recent assessment, the Louisiana blue crab stock is not currently experiencing overfishing, and the estimated F for 2016 is near the target, indicating that corrective measures implemented since 2016 may have promoted stock recovery. Trends in fishing effort have declined recently whereas CPUE in the fishery has increased, suggesting that fishing mortality in 2017 is likely to be near the target once again.</p>				

A spawning stock biomass (SSB) level below SSB_{limit} indicates that the blue crab stock is overfished. As this limit is defined in the most recent assessment, the Louisiana blue crab stock was overfished in 2015 but has not been overfished in 2016 and 2017 since corrective actions were implemented. Moreover, the 2016 and 2017 estimates of exploitable biomass were near or exceeded SSB_{target} .

The Commission adopted a resolution on February 6, 2014 establishing an initial harvest control rule and with the following policy based on these reference points for overfishing and overfished limits: “Should the fishing mortality or exploitable biomass exceed the overfished or overfishing limits, or exceed the targets for three consecutive years, as defined in the most current Louisiana blue crab stock assessment, LDWF shall come before the Commission with an updated assessment and a series of management options for the Commission to review and act upon, intended to keep the fishery from becoming overfished, and that management options for review and action shall include provisions for emergency closures, time based closures, and spatial closures” (Louisiana Wildlife and Fisheries Commission 2014). It appears that the adopted harvest control rules have been effective to some degree, though at least 2-3 more years of continuing status near the reference point targets is needed to be confident in the harvest control rules and corrective actions.

The stock assessment is updated every three years and blue crab abundance indices and the number of fishing trips by blue crab trap fishermen are summarized annually. Recently the assessments have been conducted more frequently (2014, 2016, 2018) due to the recent overfished and overfishing status of the stock, and another will be conducted in early 2019. Indices of abundance are produced annually. These indices indicate a recent upward trend in adults and exploitable biomass, but a disconcerting long-term downward trend for juveniles through 2017. These trends are consistent with stabilization of the fishery through recent management measures, but also indicate that the measures may not be sufficient to enhance recruitment.

5.2. Management response to overfished/overfishing situations

As reported in the previous clause, the Commission adopted a resolution on February 6, 2014 establishing an initial harvest control rule and with the following policy based on these reference points for overfishing and overfished limits: “Should the fishing mortality or exploitable biomass exceed the overfished or overfishing limits, or exceed the targets for three consecutive years, as defined in the most current Louisiana blue crab stock assessment, LDWF shall come before the Commission with an updated assessment and a series of management options for the Commission to review and act upon, intended to keep the fishery from becoming overfished, and that management options for review and action shall include provisions for emergency closures, time based closures, and spatial closures” (Louisiana Wildlife and Fisheries Commission 2014).

The 2016 update stock assessment indicated that the stock was overfished in 2015 and fishing mortality was near the limit in 2014 (West et al. 2016). Consequently, several corrective measures were undertaken, including:

- Professionalism program (Initiated November 2014 and on-going)
- License fee increases (Initiated November 2014)
- Ban on immature females (initiated January 2017 through to 2019)
- Fishery Closure (3rd week of February to 2nd week of March for 2017, female ban period in spring 2018 and fall 2019)

- Escape ring measures (implemented November 2017)
- Increase from 2 to 3 rings per trap
- Placement 2 to be in upper chamber
- Increase from 2 5/16 inch to 2 3/8 inch
- Removal of exemption for Lake Pontchartrain
- Full stock assessment in early 2019

These corrective actions are collectively considered by the Assessment Team as being at least partially responsible for shifting fishing mortality rates and stock abundance away from the limits and close to the targets, and sufficient to justify a well-based expectation of continuing stock recovery. Corrective actions by management were formulated in consideration of relevant life history characteristics of the blue crab, taking into account the structure and composition of the blue crab stock which contribute to its resilience. The harvest control rules in force appear to be sufficiently precautionary to avoid overfishing and an overfished stock, though more years near the targets are necessary to assure confidence in management's response effectiveness. The currently adopted harvest control rules are sufficiently formalized so that management can effectively respond to situations of overfished status and overfishing, though the ongoing decline in recruitment needs further resolution.

As such, **Clause 5.2's Minor Non-conformance #1 remains open but on-track.**

7.4. Section D: The Precautionary Approach

7.4.1. D6 – Fundamental Clause 6

The precautionary approach shall be implemented for the conservation of the “stock under consideration” and for avoiding long term, irreversible or slowly reversible effects on the aquatic environment.

(FAO CCRF (1995) 6.5, 7.5; FAO Eco 2009 29.6, 30.4, 31.4, 32)

Supporting Clauses:	6.1, 6.2, 6.3, 6.4, 6.5			
Evidence Rating:	Low <input type="checkbox"/>	Medium <input type="checkbox"/>		High <input checked="" type="checkbox"/>
Non-conformance:	Critical <input type="checkbox"/>	Major <input type="checkbox"/>	Minor <input type="checkbox"/>	None <input checked="" type="checkbox"/>
SUMMARY EVIDENCE				
<p>The LDWF 2011 and 2014 stock assessments proposed maximum fishing mortality rates and minimum biomass levels to serve as proxies for maximum sustainable yield (MSY); these reference points are consistent with the precautionary approach. Any perceived uncertainty concerning the status of the Louisiana blue crab stock is adequately addressed through the LDWF stock assessment models and supported by other considerations that support the thesis that the current precautionary approach is adequate.</p>				
EVIDENCE				
<p><u>6.1 and 6.2. Accounting for uncertainty</u></p> <p>FAO Guidelines for the precautionary approach for fisheries management (FAO 1995) advocate a comprehensive management process that includes data collection, monitoring, research, enforcement, and review. More specifically, prior identification of desirable (target) and undesirable (limit) outcomes must be carried out and measures are required that will avoid undesirable outcomes with high probability and correct them promptly should they occur. The most recent Louisiana blue crab stock assessments were completed in 2011, 2014, 2016 and 2018 (West et al. 2011; 2014; 2016; 2018). These stock assessments were the first to use an analytical model of stock dynamics of the Louisiana crab stock, which represents a credible, science-based approach to optimize utilization and to set reference points. Louisiana blue crab data does not allow for reliable estimates of MSY. The assessments, therefore, define a limit based upon the history of the fishery (i.e., a 19.1% SPR_{limit}). The fishing mortality rate limit F_{limit} and SSB_{limit} that are equivalent to this SPR_{limit} were estimated as 0.98 year^{-1} and 16.4 million pounds, respectively (West et al. 2014). To define the targets of fishing, (i.e., SSB, F, and SPR) sufficiently far from the limits as a buffer from random variability of the environment, the biomass target reference point (SSB_{target}) is defined as $SSB_{limit} \times 1.5 = 24.6$ million pounds. This biomass is achieved when there is an equilibrium SPR_{target} of 28.7% and F_{target} of 0.75 year^{-1}. The targets of fishing (i.e., SSB, F, yield, and SPR) were not set so close to the limits that they would be exceeded by random variability of blue crab populations due to other unmeasured factors. Additionally, the model applies a precautionary approach by setting targets at a higher (x 1.5) level.</p> <p>The LWFC adopted a resolution on February 6, 2014 establishing the following policy based on the proposed limits and targets of fishing: “Should the fishing mortality or exploitable biomass exceed the overfished or overfishing limits, or exceed the targets for three consecutive years, as defined in the most current Louisiana blue crab stock assessment, LDWF shall come before the Commission with an updated assessment and a series of management options for the Commission to review and act upon, intended to keep the fishery from becoming overfished, and</p>				

that management options for review and action shall include provisions for emergency closures, time-based closures, and spatial closures.”

A fishing mortality rate (F) exceeding F_{limit} indicates overfishing. As this limit is defined in the most recent assessment, the Louisiana blue crab stock is not currently experiencing overfishing nor is the stock overfished. Moreover, the most recent estimates of fishing mortality and exploitable biomass indicate that both reference points have been near the target for the past two years (West et al. 2018).

Due to the recent situation where (i) the stock is not overfished and overfishing is not occurring, (ii) effort is decreasing, and (iii) indices of abundance for adults has been increasing, the Assessment Team expresses cautionary optimism that the harvest control rules in force appear to be sufficiently precautionary to avoid future overfishing and an overfished stock. In contrast, the Assessment Team is concerned about the continuing decline in the index of abundance for juveniles which has not stopped declining, and which has reached a record low level in the time series. Unfortunately, given that recruitment into the population is likely to receive subsidies from other states in the northern Gulf of Mexico, the harvest control rules may not be able to promote enhanced recruitment without equivalent harvest control rules by other states or favorable environmental conditions.

The preservation and enhancement of essential estuarine habitats to maintain or increase blue crab carrying capacity and reduce juvenile mortality to increase recruitment of blue crabs into the fishery should also be part of a long-term precautionary management strategy.

Uncertainty is accounted for through the (i) current stock assessment methodology, (ii) periodic stock assessments (2011, 2014, 2016, 2018, 2019), (iii) annual updates of blue crab abundance indices, and (iv) annual updates of commercial fishing effort. Several other considerations support the thesis that the current precautionary approach can account for some of the uncertainty, such as newly adopted precautionary management regulations, closure of substantial coastal areas to commercial crabbing, and blue crab life history traits.

6.3 and 6.4. Substitutes and proxies

The LDWF blue crab stock assessments are based on a Collie-Sissenwine Catch Survey model that is widely accepted. This model is intended for data moderate situations where a full age structure is lacking and is appropriate for stocks with a weak stock-recruitment relationship, such as the blue crab. This model does not generate maximum sustainable yield (MSY) estimates. Consequently, substitutes or proxies for MSY are used in the stock assessments. The current management system has implemented management actions according to the control rules.

6.5. Actions in the absence of adequate scientific information

The monitoring data provided in Louisiana’s programs provides sufficient data for use in stock assessments and basic fisheries and resource monitoring. Additionally, The LDWF Office of Fisheries has extensive experience and expertise concerning responses to environmental incidents, user group conflicts, and biological resource issues.

7.5. Section E: Serious Impacts of the Fishery on the Ecosystem

7.5.1. E7 – Fundamental Clause 7

Adverse impacts of the fishery on the ecosystem shall be appropriately assessed and effectively addressed. Assessment shall be based on best available science, local knowledge where it can be objectively verified and using a suitable risk based management approach appropriate to the data available for determining most probable adverse impacts and taking into account the relevant environmental, economic, technological, social, and cultural aspects.

(FAO CCRF (1995) 6, 7.2, 7.6, 8.4, 8.5, 12; FAO Eco (2009) 31)

<p>Supporting Clauses:</p>	<p>7.1, 7.2, 7.3, 7.4 and sub-clauses, 7.5 and sub-clauses, 7.6 and sub-clauses, 7.7 and sub-clauses, 7.8, 7.9.</p>
<p>Important Note.</p>	<p>This surveillance assessment template is based on Version 1.2 of the GULF RFM Standard. It differs in the following way from the previous Version (v1.1).</p> <p>7.1 The most probable adverse impacts of the fishery on the ecosystem shall be considered, evaluated and effectively addressed. Evaluation shall be based on best available scientific evidence, advice and/or objectively verified information; including traditional, fisher and community knowledge.</p> <p>The parts in Bold are new and different. The change is considered moderate. The assessment team can assess the clause here but shall ensure that the most probable adverse impacts of the fishery on the ecosystem are “evaluated and effectively addressed. Evaluation shall be... based on ... advice...”.</p> <p>7.6 With regard to species that have been recognized as endangered, threatened or protected:</p> <ul style="list-style-type: none"> i. Consistent with A1, fishery management systems shall give formal recognition of populations of species identified as endangered, threatened and/or protected (ETP) in the geographic location of the fishery by international, national or state authorities within the context of the likely risk posed by the fishery under consideration. ii. The fishery management system shall act to avoid adverse impact on the populations of ETP species. iii. Evaluation and monitoring procedures and activities shall be implemented to determine both the current status of the impact on ETP’s caused by the fishery and to monitor the effectiveness of avoidance and mitigation measures that are implemented to minimize further impact on the mortality of those populations of ETP species. iv. Monitoring procedures and activities shall be robust enough to allow for objective and scientific verification of the risks and outcomes. <p>The parts in Bold are new and different. The changes are considered minor. Additional attention shall be placed on the addition “Evaluation and” monitoring procedures...</p> <p>Note, point i. now specifies “fishery” management systems while the previous version of the clause mentioned “Gulf State” management systems. These terms are equivalent for assessment purposes.</p> <p>Also, the previous version of the clause had additional wording on point ii. “The fishery management system shall act to avoid impact on the populations of ETP species such that it does not undermine the ability for those ETP populations to recover.” This wording (in bold) is not present in the new version of the clause. However, the requirement is implicit because ETP</p>

	<p>species are by definition species (i.e. already depleted) in need of recovery/under recovery strategies, hence avoiding adverse impacts on such species includes the avoidance of effects that may hinder their recovery. This point is further evaluated under point iii of clause 7.6.</p>			
	<p>The previous version of clause 7.7 included the following point: ii. As appropriate, the environmental factors that may influence stock abundance shall be considered when determining stock status and determination of exploitation rates.</p> <p>This point is <u>not present</u> in the current clause 7.7.</p>			
Evidence Rating:	Low <input type="checkbox"/>	Medium <input type="checkbox"/>		High <input checked="" type="checkbox"/>
Non-conformance:	Critical <input type="checkbox"/>	Major <input type="checkbox"/>	Minor <input type="checkbox"/>	None <input checked="" type="checkbox"/>
SUMMARY EVIDENCE				
<p>LDWF conduct assessments and research related to fishery impacts on ecosystems and habitats and how environmental factors affect the fishery. The blue crab FMP has identified the most probable adverse impacts of the fishery on the ecosystem. Impacts of Louisiana’s blue crab fishery on habitat are likely minimal because fishermen set crab traps over sand/mud bottoms, which are less affected by traps than sensitive bottom habitats such as corals or grass beds. Commercial crabbing is prohibited in coastal State and National Wildlife Refuges. Non-target stocks are sufficiently monitored to determine the impact exerted by the fishery. The most extensive bycatch study of blue crab traps in Louisiana waters has recently been conducted by LDWF to collect and analyze data on incidental bycatch in the Louisiana blue crab trap fishery with special emphasis on diamondback terrapins. From Dec. 2012 to Jan. 2015, 7,062 traps were sampled which resulted in 37 species of finfish and invertebrates being captured and documented as bycatch, including six diamondback terrapins. Sea catfish (also called hardhead catfish) (<i>Ariopsis felis</i>) comprised the largest bycatch component, but it does not appear to be retained. Several non-target species are retained in the blue crab fishery. LDWF monitors landings and sales of these species through the state’s trip ticket reporting system. Endangered and threatened species in Louisiana as of April 2018 are listed on Fish and Wildlife Service website. Available evidence suggests that the blue crab fishery does not currently pose serious risks to any of these ETP species.</p> <p>Diamondback terrapin (<i>Malaclemys terrapin</i>) has been designated as a species of special concern in Louisiana’s Wildlife Action Plan (primarily due to reductions in abundance in other parts of its range) and LDWF has conducted projects to better understand their current abundance and distribution in Louisiana. Terrapins share some habitat with blue crab and may be incidentally caught in crab traps. Despite the likely loss of crabs to ghost fishing, the LA blue crab stock in the most recent years was neither overfished nor experiencing overfishing. In response to the lost traps issue, the Louisiana Wildlife and Fisheries Commission authorized 5 crab trap closures in 2018 for the removal of derelict crab traps. Five more closures are planned for 2019.</p>				
EVIDENCE				
<p><u>7.1, 7.2 and 7.3. Monitoring fishery’s ecosystem impacts</u></p> <p>No changes have occurred in the “monitoring of fishery’s ecosystem impacts” clause since the blue crab first surveillance at the end of 2017.</p>				

LDWF conduct assessments and research related to fishery impacts on ecosystems and habitats and how environmental factors affect the fishery. The blue crab FMP has identified the most probable adverse impacts of the fishery on the ecosystem⁹³.

The potential ecosystem impacts of the blue crab fishery pertain to habitat, the food web and its function, species of concern, and endangered, threatened or protected species. As in previous audits, the results on Serious Impacts of the Fishery on the Ecosystem are well defined. The main impact areas are detailed below.

Habitats

Critical habitats in coastal Louisiana include salt marshes and mangroves, oyster reefs, and seagrass beds. In general, sandy bottom and muddy bottom habitats⁹⁴, where most crabbing activities occur, are less affected by traps than sensitive habitats such as seagrass beds or non-vegetated live bottom including stony corals, gorgonians and sponges. Salt marshes are widespread throughout the Louisiana coastal zone, but the blue crab fishery does not operate within the salt marshes and is thus not a concern.

There is very little mangrove habitat along the Louisiana coast and is also not a concern because the blue crab fishery does not operate within mangroves as with salt marshes. Oyster reefs occur patchily throughout Louisiana's shallow waters. Although there is the potential for impacts by the blue crab trap fishery on oyster reefs due to their co-occurrence in shallow coastal waters and embayments, crabbers will typically not set traps on the reefs because of probable damage to their vessels and because the reefs attract blue crabs which then will be available to enter crab traps. Hence, impacts to the oyster reefs by crabbing are minimized.

Seagrass beds only occur along the western shore of the Chandeleur Islands in Louisiana. The most likely impacts of the crab trap fishery on seagrass beds in this region would be either through vessel propeller damage or through scouring by traps moved by the currents. Derelict traps may also have a smothering effect on seagrass beds, similar to the damage caused by active traps. Given that crabbers need to handle their traps when the water depth is adequate for their vessel, it is not likely that propeller damage is significant. Regarding the effects of crab trap scouring by derelict and active crab traps, there is no specific information for the effects of the blue crab fishery on Louisiana seagrass beds, but this issue has not been identified as one of concern either in the Gulf of Mexico or along the Atlantic Ocean⁹⁵.

All in all, impacts of Louisiana's blue crab fishery on benthic habitat are considered to be low, mainly because fishermen set crab traps over sandy/mud bottoms, which are less affected by traps than sensitive bottom habitats such as corals or grass beds. Commercial crabbing is prohibited in large areas within coastal State and National Wildlife Refuges⁹⁶. Commercial fishing is prohibited in:

⁹³ <http://www.wlf.louisiana.gov/sites/default/files/pdf/page/37762-fishery-management-plans-marine/finalbluecrabfmp11-7-14.pdf>

⁹⁴ <http://www.wlf.louisiana.gov/fishery-information>

⁹⁵ <https://www.audubongulf.org/wp-content/uploads/2016/11/GULF-Blue-Crab-Full-Assessment-Report-Final.pdf>

⁹⁶ www.wlf.louisiana.gov/sites/default/files/pdf/page/41407-regulations/commercialfishingbrochure201810-30-18.pdf

Wildlife Management Areas (WMAs) and Refuges

Commercial crabbing is prohibited in large areas of Louisiana within coastal State and National Wildlife Refuges⁹⁷. Allowances are made for recreational crabbing. The closures provide refuge for blue crab and other species including diamondback terrapins and their habitat. Please refer to the [background section](#) for updated details.

Food Web

There is some understanding of the potential role of blue crabs in the Gulf of Mexico ecosystem (Guillory 2001, Hines 2007, Lipcius et al. 2007). The general food web of the blue crab is complex and involves a diverse set of predator-prey linkages. Numerous fish species, approx. 67 different species according to Guillory and Elliot (2001) are potential predators of blue crabs (particularly juvenile crabs). The same study for that, red drum, sea catfish, black drum, sheepshead and spotted seatrout had the highest frequency of occurrence of blue crab in their diet. In addition to the 67 fish species identified, Guillory and Elliot (2001) also listed 12 known or potential invertebrate predators (including other blue crab), as well as 3 species of reptiles, 11 birds, and three mammals as predators on blue crabs⁹⁸.

Bycatch (Incidental Non-Target Species)

Non-target stocks are sufficiently monitored to determine the impact exerted by the fishery. Crab traps can catch non-targeted finfish, other vertebrates, and invertebrates. The most common bycatch in crab traps includes small volumes of stone crabs (*Menippe adina*) and finfish including black drum, Atlantic croaker (*Micropogonias undulates*), southern flounder, spotted seatrout, and occasionally gag grouper (*Mycteroperca microlepis*). The crab trap fishery does not significantly affect any of these species—volumes of retained species make up less than five percent in weight of the total catch, and the low quantities of bycatch species pose no serious threat to the status of these species⁹⁹.

The most extensive bycatch study of blue crab traps in Louisiana waters has recently been conducted by LDWF (LDWF unpublished report, February 2015). This survey was designed to collect and analyze data on incidental bycatch in the Louisiana crab trap fishery with special emphasis on diamondback terrapins, and to collect and analyze blue crab sex, stage and size frequency distribution. From Dec. 2012 to Jan. 2015, 7,062 traps were sampled which resulted in 37 species of finfish and invertebrates being captured and documented as bycatch, including six diamondback terrapins¹⁰⁰.

⁹⁷ www.wlf.louisiana.gov/sites/default/files/pdf/page/41407-regulations/commercialfishingbrochure201810-30-18.pdf

⁹⁸ <http://www.wlf.louisiana.gov/sites/default/files/pdf/page/37762-fishery-management-plans-marine/finalbluecrabfmp11-7-14.pdf>

⁹⁹ <http://www.wlf.louisiana.gov/sites/default/files/pdf/page/37762-fishery-management-plans-marine/finalbluecrabfmp11-7-14.pdf>

¹⁰⁰ <https://www.audubongulf.org/wp-content/uploads/2016/11/GULF-Blue-Crab-Full-Assessment-Report-Final.pdf>

Sea catfish (also called hardhead catfish) (*Ariopsis felis*) comprised the largest bycatch component (also confirmed here¹⁰¹), but it does not appear to be a retained or consumed species¹⁰², although it appears to be used as bait by some crab fishermen.

Several non-target species are retained in the blue crab fishery and LDWF monitors landings and sales of these species through the state's trip ticket reporting system. The fishery retains about 1,500 pounds of Gulf stone crab (*Menippe adina*) claws per year; these stone crab prefer higher salinity than blue crab and different habitats. With an estimated catch of 30-50 mill pounds of blue crab per year, this would equate to less than 0.005% of the overall catch. In addition, only stone crab claws are retained and the crab is released alive with very high chance of survival. The main retained finfish species are black drum, which comprises less than 0.23% of total crab trap catch by weight, and flounder, which comprises up to 0.01% of total crab trap catch by weight. All other retained finfish species contribute less than 0.01% of the total crab trap catch by weight¹⁰³.

The GOM blue crab fishery is listed as a Category III (remote likelihood of/ no known interaction with marine mammals) fishery under the NMFS list of fisheries¹⁰⁴.

There is no new bycatch information for this fishery for 2017 or 2018.

Endangered, Threatened and Protected Species

Endangered and threatened species in Louisiana as of April 2018 are listed on Fish and Wildlife Service website¹⁰⁵. Available evidence suggests that the blue crab fishery does not currently pose serious risks to any of these species. However, a more detailed summary of the likely impact of the blue crab fishery on diamondback terrapins, a species of special concern, is presented below.

Diamondback Terrapins

Diamondback terrapins (*Malaclemys terrapin*) share some habitat with blue crab and may be incidentally in crab traps. Drowning of diamondback terrapins incidentally caught in crab traps has been identified as a concern in studies conducted in other states (Bishop 1983, Seigel and Gibbons 1995). A Florida study (Gandy and Turner 2014) found that habitat is likely the largest contributing factor for potential interactions with diamondback terrapins in the crab trap fishery with there being a significant catch rate of diamondback terrapins in the intertidal zone but otherwise minimal interaction.

¹⁰¹https://www.gsmfc.org/ann_mtgs/2017-10/Gen_Sess/4.%20Bycatch%20in%20the%20Commercial%20Blue%20Crab%20Fishery%20in.pdf

¹⁰²<http://fishbase.org/summary/Ariopsis-felis.html>

¹⁰³<http://www.wlf.louisiana.gov/sites/default/files/pdf/page/37762-fishery-management-plans-marine/finalbluecrabfmp11-7-14.pdf>

¹⁰⁴<https://www.fisheries.noaa.gov/national/marine-mammal-protection/list-fisheries-summary-tables#table-2---commercial-fisheries-in-the-atlantic-ocean,-gulf-of-mexico,-and-caribbean>

¹⁰⁵<https://www.fws.gov/southeast/pdf/fact-sheet/louisiana-ecological-services-field-office-t-and-e-species.pdf>

Diamondback terrapin has been designated as a species of special concern in Louisiana's Wildlife Action Plan¹⁰⁶ (primarily due to reductions in abundance in other parts of its range) and following the plan, LDWF has conducted projects to better understand the current abundance and distribution of diamondback terrapin in Louisiana. As discussed previously, the most extensive bycatch study of blue crab traps in Louisiana waters was conducted by LDWF from 2012 to 2015 (LDWF unpublished report, February 2015) which placed a special emphasis on incidental bycatch of diamondback terrapins. The survey began in December 2012 within the Lake Pontchartrain, Vermilion/Teche River, and Sabine River basins and became fully implemented by January 2013 with trap sets/runs taking place in all of the major coastal basins. Preliminary results through January 2015 from a total of 7,062 trap hauls showed a total of 6 diamondback terrapins being caught incidentally.

The Louisiana Wildlife Action plan also highlighted that in some ecoregions conservation of coastal dune habitat was paramount to diamondback terrapin reproduction as well as continued removal of abandoned crab traps will drastically reduce incidental mortality. LDWF has implemented an effective program for derelict trap removal in Louisiana waters. Five new closures are planned for 2019.

There are also extensive Wildlife Management Areas and Refuges in Louisiana that offer additional protection from commercial crabbing and other fishing activities. Details of these 14 WMAs and Refuges have been provided earlier on under the *Habitat* section.

Ghost fishing bycatch

Derelict crab traps impact the coastal ecosystem through continued catch of target species and species of conservation, economic, or recreational importance. During volunteer-supported crab trap clean-ups in 2012 and 2013, Anderson and Alford (2014)¹⁰⁷ quantified ghost fishing activity in derelict crab traps in coastal Louisiana through a citizen scientist program. They detected a significant difference in the number of blue crabs in actively ghost fishing derelict traps across removal locations with estimated catches varying between 2.4 and 3.5 crabs/trap. Their instantaneous estimates of ghost fishing activity were greater than those previously thought in Louisiana, further justifying the LDWF derelict crab trap prevention and removal extension and outreach programs in Louisiana and throughout the Gulf of Mexico. The widespread use of vinyl coated wire traps in the Louisiana blue crab fishery and subsequently lower trap deterioration rates, increases in the number of traps used in the fishery, and the large numbers of traps lost by fishermen make derelict traps and ghost fishing a significant issue for the Louisiana crab fishery. It is worth noting that even when ghost fishing mortality is taken into account, since 2016 the stock has not been overfished nor has overfishing occurred (West et al. 2018)¹⁰⁸.

However, in a more direct response to the lost traps issue, the Louisiana Wildlife and Fisheries Commission authorized 5 crab trap closures in 2018 for the removal of derelict crab traps. Five more closures are planned for

¹⁰⁶ http://www.wlf.louisiana.gov/sites/default/files/pdf/page_wildlife/32937-Wildlife%20Action%20Plan/2015_wap_final_draft.pdf

¹⁰⁷ <https://www.ncbi.nlm.nih.gov/pubmed/24360333>

¹⁰⁸ <http://www.wlf.louisiana.gov/sites/default/files/pdf/page/37756-stock-assessments/labassessment2018.pdf>

2019. Since the Derelict Crab Trap Removal Program began in 2004, volunteers have helped remove more than 37,000 abandoned/lost traps. Of these, volunteers removed 2,580 traps in 2016, 5,674 traps in 2017 and 4,061 traps in 2018¹⁰⁹. Areas for removal are selected based on a) highest blue crab landings and b) highest loss of traps (as reported by industry).

Additional research on bycatch and ghost fishing in the blue crab fishery

During the October 2017 GFMC meeting Dr. Roosenburg noted the lack of diamondback terrapins showing up in the derelict traps in the Gulf of Mexico and reported that they have studied the deterioration rates of carcasses in unfished traps¹¹⁰. He indicated that in Maryland, they rot very quickly and the shells and skeletons disarticulate within about 30 days. The remains end up falling through the mesh when the trap is recovered during a clean-up and therefore, are not likely to be recorded. He indicated that, with the warmer waters in the Gulf, the process could be much faster and that mortality may be missing when conducting clean-ups. Dr. Roosenburg challenged the group to consider putting TEDs in our crab traps Gulf-wide. When asked what would help the state agencies to better address the diamondback terrapin issue, all the states representatives stated that they need information on where the diamondback terrapin populations are and where the best potential nesting habitats currently exist.

During the same meeting Dr Julie Lively recently summarised¹¹¹ current research efforts on blue crab bycatch, ghost fishing and diamondback terrapin interactions in Louisiana. There are no final results yet but the main conclusions are that the interactions are localized and linked with seasonal conditions and are similar that the data obtained by fishery dependent data. If available, publication of this research work will be appropriately analysed at the next surveillance audit (i.e. 3rd Surveillance).

As there is sufficient specific information available to assess the ecosystem effects of the fishery, clauses 7.2 and 7.3 (on the use generic evidence based on similar fishery situations) are not applicable to the LA blue crab fishery.

7.4. Fishery's impacts on non-target species

LDWF has conducted a number of studies to measure bycatch in the blue crab fishery (see clause 7.1). For example, short-term projects have provided information on harvest and bycatch in the blue crab fishery. Non-target catches; including discards are monitored to determine the impact exerted by the blue crab fishery. There is evidence to suggest that the blue crab fishery does not threaten non-target stocks with recruitment overfishing or other similar impacts. Monitoring procedures and activities allow for objective and scientific verification of the risks and outcomes related to the blue crab fishery.

The most common incidental bycatch in crab traps includes small volumes of stone crabs and finfish including black drum, Atlantic croaker, southern flounder, spotted seatrout, and occasionally gag grouper while several non-target species, including stone crab, white and brown shrimp, black drum and flounder, are also retained in

¹⁰⁹ <http://www.wlf.louisiana.gov/fishing/derelict-crab-trap-removal>

¹¹⁰ <https://www.gsmfc.org/publications/GSMFC%20Number%20270.pdf>

¹¹¹ https://www.gsmfc.org/ann_mtgs/2017-10/Gen_Sess/4.%20Bycatch%20in%20the%20Commercial%20Blue%20Crab%20Fishery%20in.pdf

the blue crab fishery (Guillory and Elliot, 2001; Guillory et al. 1996). However, the crab trap fishery does not significantly affect any of these species—volumes of retained species/bycatch make up less than five percent¹¹² in weight of the total catch, and the low quantities of bycatch species pose no serious threat to the status of these species. From the last surveillance audit there is no new bycatch data available.

7.5. Fishery's habitat interactions

Blue crabs inhabit estuarine and coastal waters throughout Louisiana. Juveniles are found in upper estuaries with marsh, oyster reefs, and soft mud bottoms. Adult blue crabs are widely distributed over a variety of bottom types in fresh, estuarine, and shallow oceanic waters. Females are typically found in the higher salinity waters of coastal lakes and bays, while males can tolerate extremely low salinities and can be found in many tidally influenced freshwater bodies in Louisiana. They have been found as far north as 190 miles upstream in the Atchafalaya River¹¹³.

Impacts of Louisiana's blue crab fishery on habitat are likely minimal, because fishermen set crab traps over oyster reefs and sand/mud bottoms, which are less affected by traps than sensitive bottom habitats such as corals or grass beds.

Furthermore, commercial crabbing is prohibited in 15 coastal State and National Wildlife Refuges and Wildlife Management Areas¹¹⁴. These closures (list updated in January 2019) provide refuge for blue crab and other important species, as well as protection for diamondback terrapins and their habitats (i.e. brackish water of salt marshes, estuaries, and tidal creeks). Please refer to the background [section](#) for an update description of these closures.

7.6. Fishery's impacts on Endangered, Threatened and Protected (ETP) species

There is formal recognition of populations of species identified as endangered, threatened and/or protected (ETP) in the geographic location of the fishery by national and state authorities within the context of the likely risk posed by the fishery under consideration. The only ETP species that might potentially interact with the blue crab fishery are the manatee (*Trichechus manatus*), bottlenose dolphin (*Tursiops truncatus*, not endangered or threatened, but protected under the [Marine Mammal Protection Act](#)¹¹⁵), and diamondback terrapin (a species of concern). However, available evidence suggests that the blue crab fishery does not currently pose serious risks to these species.

¹¹² <http://www.wlf.louisiana.gov/sites/default/files/pdf/page/37762-fishery-management-plans-marine/finalbluecrabfmp11-7-14.pdf>

¹¹³ www.wlf.louisiana.gov/sites/default/files/pdf/document/37780-fisheries-brochures/blue_crab_front.pdf

¹¹⁴ www.wlf.louisiana.gov/sites/default/files/pdf/page/41407-regulations/commercialfishingbrochure201810-30-18.pdf

¹¹⁵ <https://www.fisheries.noaa.gov/species/common-bottlenose-dolphin>

Diamondback terrapin has been designated as a species of special concern in Louisiana's Wildlife Action Plan¹¹⁶ (primarily due to reductions in abundance in other parts of its range). LDWF has been working to close the data issue of diamondback terrapin dynamics (e.g. abundance, distribution, and reproductive productivity) throughout the state's coastal zone, and recently provided an introductory evaluation of terrapin abundance and distribution throughout the state's coastal zone (Pearson and Wiebe, 2014; Selman et al., 2014).

Selman et al (2014)¹¹⁷ found that of their 16 sample site in Southwest Louisiana (the Chenier Plain), several sample sites would be classified as having "locally abundant" diamondback terrapin populations, whereas at other sites yielded a smaller number or no individuals. The 3 sites with the highest CPUEs were generally associated with large areas of unmanaged salt and brackish marsh, whereas lower abundances were typically associated with 1) smaller marsh areas, 2) channels that no longer have permanent connection to the Gulf of Mexico, and 3) crab traps. For the latter, a high CPUE for terrapins was found at only 1 of 4 sites with crab traps present, whereas the other 3 sites had a low CPUE (0.1 terrapins per net day) or terrapins were absent. The authors suggested that: "future studies in Louisiana should investigate the interaction between diamondback terrapins and crab traps because terrapin crab trap mortality has been found to be significant in other parts of their range".

There is an apparently limited area of potential interaction between the blue crab fishery and diamondback terrapins, and LDWF biologists are researching their distribution and abundance throughout coastal LA. In this respect, LDWF implemented a multi-year (2013–2015) project which evaluated diamondback terrapin nesting ecology along Louisiana's coastline, principally within the Deltaic Plain.

Pearson et al. (2018a)¹¹⁸ in their resulting analysis and publication of the Deltaic Plain study (which includes about half of the Louisiana coastline extending roughly from the centre of the Louisiana coast past the Mississippi border and East into Alabama) found a patchy distribution with local areas of abundance in Louisiana's Deltaic marshes similar to those described in the Chenier Plain by Selman et al. (2014) (note the Chenier Plain includes about half of the Louisiana coastline extending roughly from the center of the Louisiana coast West into Texas). Together, the Deltaic and Chenier Plains include most of the Louisiana coastline. The Pontchartrain, Terrebonne and Barataria Basins are within the Deltaic Plain of Louisiana and occupy the vast majority in it. In Pontchartrain and Terrebonne basins, the highest diamondback terrapin CPUE sites were within remote locations. In contrast, the site with the highest CPUE in Barataria Basin was in relative proximity to anthropogenic development (e.g., boat launch, fishing communities); however, this site was in an area where trapping for blue crab (*Callinectes sapidus*) is prohibited. Higher CPUE at these sites is likely attributable to the improved habitat quality with higher salinity near the Gulf of Mexico, proximity to nesting habitats, or to reduced pressure from fisheries in or around these sites. The authors highlighted that additional research was needed to further determine the drivers of terrapin abundance within Louisiana's Deltaic Plain coastal regions. The Selman et al (2014) and Pearson et al. (2018a) studies now provide distribution data on terrapins along most of the coastline in Louisiana.

¹¹⁶ <http://www.wlf.louisiana.gov/wildlife/wildlife-action-plan>

¹¹⁷ <https://doi.org/10.2744/CCB-1102.1>

¹¹⁸ <http://www.bioone.org/doi/full/10.1655/Herpetologica-D-17-00057.1>

In another study on the ecology of diamondback terrapins across Louisiana's coast based on a 2012-2015 survey, Pearson and Wiebe (2018b)¹¹⁹ showed the distribution and the ecological factor for nesting areas and that throughout their range many different biotic and abiotic factors have been shown to influence terrapin abundance, distribution, and nesting success. The study focused on identifying nest site locations, nest predators and predation rates, nest surface characteristics, nest depth, clutch size, egg morphometrics, nest and nest survivorship. The results indicate that diamondback terrapin nesting occurs coast-wide in locations where suitable nesting substrates exist. Depredation rates range between 50 and 100 percent depending on nesting beach location. These results provide Louisiana's first evaluation of diamondback terrapin nesting ecology critical for determining the conservation status of diamondback terrapins within Louisiana.

Since 2010, Louisiana has made great strides in describing diamondback terrapin populations, nesting ecology and interactions with crab fisheries. These efforts have helped determine that terrapin populations exist in Louisiana and that nesting successfully occurs across the coastline, but that current threats to terrapin populations are largely caused by anthropogenic activities such as land development, commercial fishing, and oil spills. These findings provide natural resource managers with critical life history information that will be incorporated into current and future coastal restoration plans to benefit diamondback terrapins, as well as to better inform their interactions with the blue crab fishery (Pearson and Wiebe, 2018)¹²⁰.

Current regulation relative to diamondback terrapin interactions with this fishery include the following:

§56/635¹²¹. Diamondback terrapins; trapping; turtle eggs

A. No person shall take diamondback terrapins by means of traps of any kind, and no person shall take the eggs of any species of turtle, except the red ear (*Trachemys Scripta*), wherever found.

B. No person shall ship diamondback terrapins out of the state between the fifteenth of April and the fifteenth of June. All diamondback terrapins caught by any means whatsoever during that period shall be immediately returned to the water alive.

Acts 1992, No. 256, §1, eff. July 1, 1993; Acts 1995, No. 604, §1.

Active Wildlife Management Area and Refuges benefiting diamondback terrapins and other species

- 1) Bayou Sauvage National Wildlife Refuge (23,000 acres).
- 2) Big Branch Marsh NWR (15,000 acres).
- 3) Breton National Wildlife Refuge (6,100 acres).
- 4) Delta National Wildlife Refuge (48,800 acres).
- 5) Elmer's Island Wildlife Refuge (1,145 acres).
- 6) Marsh Island Wildlife Refuge (76,664 acres).
- 7) Rockefeller Wildlife Refuge (76,042 acres).

¹¹⁹ <https://doi.org/10.1016/j.ocecoaman.2018.01.017>

¹²⁰ <https://www.sciencedirect.com/science/article/pii/S0964569117305781>

¹²¹ http://www.wlf.louisiana.gov/sites/default/files/pdf/document/39939-title/ose_legal_forms_2015title56.pdf

- 8) Salvador Wildlife Management Area (34,520 acres).
- 9) Bayou Teche NWR (9,028-acres).
- 10) Mandalay NWR (4,416 acres).
- 11) State Wildlife Refuge (13,000 acres).
- 12) Isle Derniers Barrier Island Refuge (1,900 acres).
- 13) Pass-a-Loutre WMA – POINTE-AUX-CHENES (115,000 acres).
- 14) Barataria Preserve, National Park Service, Crown Point (23,000 acres).

The removal of derelict traps during the yearly derelict traps closure will also reduce the risk of bycatch of diamondback terrapins, among other species.

7.7. Fishery's ecosystem interactions

Blue crab larvae feed on plankton but eat larger prey as they settle to the bottom. Adult and juvenile crabs use their walking legs to dig in bottom sediments for aquatic plants, organic debris, snails, oysters, clams, shrimp, fish, and nearly anything else they can find. Blue crabs are highly cannibalistic, with some studies indicating that blue crabs make up as much as 13% of the diet in other blue crabs¹²².

In the blue crab FMP, its role in the food web has been considered where the author report that Guillory and Elliot (2001) conducted an extensive literature review of blue crab predators and identified 93 species of invertebrates, fish, reptiles, birds and mammals that prey upon blue crab zoea, megalopae, juveniles, and adults. Red drum, sea catfish, black drum, sheepshead, and spotted seatrout are the dominant predators of blue crab, and they could potentially affect the blue crab population, however, it is not a preferred prey item for any single predator species, such that it is highly unlikely that reductions in blue crab abundance would lead directly to reductions of any specific predator species. Furthermore, as long as the blue crab stock is maintained at sustainable levels, as determined through the stock assessment, there should be sufficient blue crab prey to satisfy the demands of its predators. Accordingly, and based on results of the 2018 assessment update¹²³, the Louisiana blue crab stock is currently not overfished, but was considered overfished in 1995, 2013, and 2015. Further, the stock is currently not experiencing overfishing, but the 2014, 2015, and 2016 fishing mortality rate estimates exceeded their target.

Other factors considered in the FMP under the ecosystems interactions were the incidental catch of blue crab by the shrimp fishery, ghost fishing, invasive species, diseases, and parasites. LDWF also maintains a working relationship with LSU School of Veterinary Sciences Pathology Lab to evaluate any reports of pathogens or disease that could impact blue crab stocks in the wild.

7.8 and 7.9. Habitat enhancement

The Louisiana blue crab fishery is **not** an enhanced fishery, these clauses are NOT APPLICABLE.

¹²² www.wlf.louisiana.gov/sites/default/files/pdf/document/37780-fisheries-brochures/blue_crab_front.pdf

¹²³ <http://www.wlf.louisiana.gov/sites/default/files/pdf/page/37756-stock-assessments/labassessment2018.pdf>

7.5.2. E8 – Fundamental Clause 8

Where fisheries enhancement is utilized, assessment and monitoring shall consider natural reproductive components of the stock under consideration and ecosystem impacts.

(FAO CCRF (1995) 9.1. 9.3)

Supporting Clauses:	8.1, 8.2, 8.3.			
Important Note.	<p>This surveillance assessment template is based on Version 1.2 of the GULF RFM Standard. It differs in the following way from the previous Version (v1.1).</p> <p>8.1 Stock introductions and transfers of juveniles from enhancement activities shall be from species that are native to the fishery’s geographic area.</p> <p>8.2 Stock assessment shall consider the separate contributions from both natural and enhanced components. Furthermore, the natural reproductive components of the Stock(s) under consideration shall be maintained.</p> <p>The new clause 8.1 has separated in two (i.e. 8.1 and 8.2). The part in Bold is new and different. The change is considered moderate. The assessment team can assess the clause here but shall ensure that the requirement “Stock assessment shall consider the separate contributions from both natural and enhanced components.” is properly assessed.</p>			
Evidence Rating:	Low <input type="checkbox"/>	Medium <input type="checkbox"/>	High <input type="checkbox"/>	
Non-conformance:	Critical <input type="checkbox"/>	Major <input type="checkbox"/>	Minor <input type="checkbox"/>	None <input type="checkbox"/>
SUMMARY EVIDENCE				
The Louisiana blue crab fishery is not an enhanced fishery, this clause is NOT APPLICABLE.				
EVIDENCE				
The Louisiana blue crab fishery is not an enhanced fishery, this clause is NOT APPLICABLE.				
<u>8.1. Stock introductions and transfers of juveniles</u>				
The Louisiana blue crab fishery is not an enhanced fishery, this clause is NOT APPLICABLE.				
<u>8.2. Stock assessment of natural and enhanced components</u>				
The Louisiana blue crab fishery is not an enhanced fishery, this clause is NOT APPLICABLE.				
<u>8.3. Impacts from enhancement activities,</u>				
The Louisiana blue crab fishery is not an enhanced fishery, this clause is NOT APPLICABLE.				

8. Performance specific to agreed corrective action plans

During the initial Full Assessment of the blue crab fishery in 2016 scores were generally high against the conformance criteria contained in the G.U.L.F. RFM Standard. There were initially four non-conforming areas recorded by the Assessment Team. Two of these were addressed through the submission of further evidence.

Corrective actions were implemented by managers to address the remaining two non-conforming areas. The ongoing effectiveness of these corrective actions will be reviewed annually at surveillance audits. The four non-conformances raised during the initial Full Assessment of the fishery, along with the current status of each, is presented below.

8.1. Non-conformances

- **Non-conformance #1 (Clause 5.2: Minor Non-conformance)**

Harvest control mechanisms and associated actions shall be sufficiently formalized so that management can effectively respond and take action to situations of impaired recruitment, overfishing or increasing risk of exceeding these or other negative outcomes.

Status: Corrective Actions in place to be reviewed annually at surveillance audits (see below).

- **Non-conformance #2 (Clause 4.6: Minor Non-conformance)**

The determination of suitable conservation and management measures shall take account of total fishing mortality from all sources, including discards, unobserved mortality, incidental mortality, unreported catches and catches in other fisheries (when assessing the stock under consideration).

Status: Closed during full assessment following the submission of further evidence.

- **Non-conformance #3 (Clause 7.4: Minor Non-conformance)**

With regard to the bycatches of diamondback terrapin turtles. The monitoring procedures and activities shall be robust enough to allow for objective and scientific verification of the risks and outcomes. Monitoring frequency may not be sufficient to ensure that the fishery does not threaten non-target stocks over intervening periods.

Status: Closed during full assessment following the submission of further evidence.

- **Non-conformance #4 (Clause 3.9(iii): Minor Non-conformance)**

As of the latest estimate (West et al. 2016) the blue crab stock is below the associated management elected limit reference point ($SSB/SSB_{limit} = 0.83$). The current status of the stock may result from anthropogenic (fishing) pressure, environmental pressure (causing reduced productivity) or some combination thereof. Regardless of the cause, however, once below management elected limit reference points the stock is considered to be in an overfished condition. According to the harvest control mechanism for the fishery, when the stock is shown to be in an overfished condition and/or overfishing is occurring, corrective action(s) are required of management. This corrective action (s) shall be sufficient to justify a well-based expectation of successful stock recovery.

Status: Corrective Actions in place to be reviewed annually at surveillance audits (see below).

The collection of measures described below constitute corrective actions in response to non-conformances #1 and #4 assigned during the full assessment of the blue crab fishery with progress against these corrective actions being assessed at annual surveillance audits to; 1) confirm implementation and 2) evaluate their effectiveness over time as information becomes available.

8.2. Corrective Actions

In 2016, LDWF had identified a set of corrective actions:

Professionalism program

- Initiated November 2014 and on-going
- Estimated effect: Unknown

License fee increases

- Initiated November 2014
- Estimated effect: Unknown

Ban on immature females

- To be implemented January 2017
- Estimated effect: 5% decrease in total landings, 12.4% decrease in female landings

Fishery Closure

- To be implemented 3rd week of February to 2nd week of March beginning in 2017
- Estimated effect: 3% decrease in landings

Ring size measures

- To be implemented November 2017
- Increase from 2 to 3 rings per trap
- Estimated effect: unknown magnitude, likely positive
- Placement: 2 to be in upper chamber
- Estimated effect: unknown magnitude, likely positive
- Increase from 2 5/16 inch to 2 3/8 inch
- Estimated effect: 11% decrease in sub-legal landings
- Removal of exemption for Lake Pontchartrain
- Estimated Effect: Brings Pontchartrain which accounts for approx. 35% of annual landings on average under the regulation for the first time

Off-schedule stock assessment

- To be moved up from 2019 to early 2018 incorporating full data from 2017.

The 2018 stock assessment has been published. Stock status and fishing pressure are within elected reference points. A 2019 stock assessment is scheduled to be published in the first half of 2019.

8.3. Non Conformance and Progress at Surveillance Audit

Non-conformance #1 (1 of 2 with corrective actions in place)	
Applicable clause	5.2 Measures, harvest control mechanisms and associated actions shall be designed for when overfished conditions are approached and these shall be sufficiently formalized so that management can effectively respond and take action to situations of impaired recruitment, overfishing or increasing risk of exceeding these or other negative outcomes.
Non-conformance	Minor Non-conformance Harvest control mechanisms and associated actions shall be sufficiently formalized so that management can effectively respond and take action to situations of impaired recruitment, overfishing or increasing risk of exceeding these or other negative outcomes. Although overfishing is not occurring, and the fishery is not currently overfished, recruitment is at its lowest over the time series, and only 2 years have passed since the fishery was overfished.
Corrective actions	After the Full Assessment Report in 2016 LDWF identified a set of corrective actions, some of which were already in place and others which were to be implemented including: <ul style="list-style-type: none"> ▪ Professionalism program (Initiated November 2014 and on-going) is to be required of all new license holders. ▪ License fee increases in November 2014. ▪ Ban on immature females to be implemented in 2017, 2018 and 2019. ▪ Fishery Closure for 30 days in February and March for 2017, 2018 and 2019. ▪ Escape ring measures were to be implemented in 2017, including an increase from 2 to 3 rings per trap, placement 2 to be in upper chamber, size Increase from 2 5/16 inch to 2 3/8 inch, and removal of exemption for Lake Pontchartrain. ▪ Stock assessment to be conducted early-2018. ▪ Derelict trap removal program, initiated 2004, proposed to continue in 2018 and 2019.
Progress Surveillance 2	<ul style="list-style-type: none"> ▪ Professionalism program initiated November 2014 is on-going and required of all new license holders. ▪ License fee increases in November 2014 are continuing. ▪ Ban on immature females was initiated January 2017, was in place in 2018, and is planned for implementation in 2019. ▪ Fishery Closure for 30 days was in place from 3rd week of February to 2nd week of March in 2017. There is no 30-day full closure of the commercial crab season in 2018 and 2019. Instead, commercial harvest of female blue crabs in Louisiana waters is prohibited from March 1 through April 30, 2018 and March 1 through April 30, 2019 (but will likely be shifted to a 35 days mature female restriction in September-October 2019). ▪ A licensed commercial crab fisherman is allowed an incidental take of mature female crabs during March and April and/or immature female crabs in an amount not to exceed two percent of the total number of crabs in their possession. ▪ Both the ban on the harvest of immature females and seasonal closures were enacted through the Louisiana Administrative Code, meaning they were enacted through the rule-making processes of the LWFC. ▪ Escape ring measures were implemented November 2017, including an increase from 2 to 3 rings per trap, placement 2 to be in upper chamber, size Increase from 2 5/16 inch to 2 3/8 inch, and removal of exemption for Lake Pontchartrain. These are ongoing. The revised escape ring measures came into force in November 2017 following a three-year

	<p>lead-in period, which was designed to coincide with the expected lifespan of a commercial crab trap and give fishermen the chance to bring their traps in line with the new regulations when they replaced their traps. LDWF LED agents suggested that the majority of traps had been in line with the new regulations long before they legally came into force.</p> <ul style="list-style-type: none"> ▪ One stock assessment was conducted in 2018 and another one will be conducted in 2019. ▪ Derelict trap removal program: Initiated 2004, was held in 2018 and will be held in 2019. LDWF will again host its annual Derelict Crab Trap Rodeo in 2019 with two volunteer cleanup events during February. The Derelict Crab Trap Removal Program was initiated in 2004 to address the removal of derelict and abandoned crab traps, which cause ghost-fishing mortality of blue crabs and other species captured incidentally. The volunteer-based program is funded through commercial fishermen gear fees, and since its inception has disposed of more than 37,000 derelict crab traps. In 2018, LDWF, Lake Pontchartrain Basin Foundation members, volunteers, BTNEP, CCA and members of the recreational fishing community retrieved more than 4,000 abandoned crab traps. In 2019, crabbing will be prohibited for 10-14 days when derelict trap removal takes place in five areas: (1) Upper Barataria Basin, (2) Lake Pontchartrain, (3) Terrebonne Basin, (4) Pontchartrain Basin, and (5) Sabine Basin. These are heavily crabbed areas where highest incidental crab mortality is likely to occur.
<p>Conclusions Surveillance 2</p>	<p>During the initial assessment of the blue crab fishery an evaluation of the potential impacts of the additional management measures was conducted. A brief analysis of the potential impacts of each of the three new measures that came into force in 2017 is presented below.</p> <p>Ban on immature females LDWF figures indicate that the prohibition on the harvest of immature females will likely lead to an approximate 5% decrease in overall landings. Importantly, however, all of this 5% decrease in overall landings will be to the benefit of immature females. It is therefore estimated that the measure should lead to an approximate 12.4% reduction in female mortality given a 60:40 male: female ratio in catches with resulting increases in the number of females surviving to maturity and an increased SPR ratio. Estimated effect: 5% decrease in total landings, 12.4% decrease in female landings, but increased landings in 2017 relative to 2016 is inconsistent with this estimate.</p> <p>Feb/March closure LDWF initially estimated (3/13/18) that this could lead to a 3% reduction in landings. The most recent update of landings indicated that landings in 2017 (43.9 million lbs) were higher than in 2016 (40.6 million lbs) and just below the average from 2000-2016 (44.5 million lbs). This represents a 1.3% decrease in landings relative to the average, but a 9.6% increase over 2016. These results suggest that effort may have been displaced and that the closure may have had little impact on landings. This further justifies the continuing minor non-conformance #1. Estimated effect: 1.3% decrease in landings relative to the long-term average.</p> <p>Ring size The new escape ring rule increasing rings from 2 to 3, with 2 to be in the upper chamber, and the minimum size from 2 5/16 inch to 2 3/8 inch may substantially decrease retention of</p>

sublegal blue crabs and subsequent capture and handling mortalities of larger sublegal blue crabs.

In a study conducted in 1999 Guillory *et al.*, compared two escape ring sizes (these were the old (2 5/16 inches) and new (2 3/8 inches) ring sizes). The study found that the percentage of sublegal catch was significantly greater in traps with 2 5/16 inches rings (i.e. the old ring size) than in traps with the 2 3/8 inches rings (i.e. the new ring size). Sublegal catches were reduced by 67.3% and 78.4% in traps with the small and large rings, respectively when compared to control traps with no escape rings. Therefore the percent reduction of sublegal catch in the traps with the new ring size was approx. 11% greater than in the traps with the old ring size.

Estimated effect: 11% decrease in sublegal (particularly large sublegal) landings, but this can be hard to measure since only legal size crab can be landed.

While it is not possible to quantify the positive influence of the increased ring size on overall mortality of blue crabs, the use of the larger ring size should reduce the numbers of large sublegal crabs being retained. Total mortality of larger sublegal blue crabs is lower than smaller individuals and should result in more individuals being recruited into the fishery. In addition to changing the size of the escape ring, the new regulations also increased the required number of rings (from 2 to 3) and required that in a two-chambered pot 2 of these be placed in the upper chamber. The impacts of the increased number of rings and the requirement to have 2 rings in the upper chamber are difficult to quantify but in all likelihood should be positive.

Estimated Effect: Unknown but in all likelihood positive.

The regulation does allow fishermen to obstruct escape ring openings from April 1st through June 30th and from September 1st through October 31st to facilitate the harvest of soft-shell crabs. The old regulations also allowed this but additionally included August as a period in which obstructing escape rings was permissible. While technically escape rings may be theoretically obstructed for 5 months of the year it is likely that only fishers targeting peeler crabs, which account for approximately 1% of total landings, will block the escape rings during permissible periods while the others may not.

The revised escape ring regulations that came into effect in November 2017 also removed for the first time the exemption to escape ring regulations for fishermen operating in Lake Pontchartrain, meaning that for the first time they have to use escape rings in their traps.

Estimated Effect: Brings Pontchartrain, which accounts for approximately 35% of annual landings on average, under the regulation for the first time.

The Assessment Teams notes that increased landings after corrective actions may have resulted from higher exploitable biomass, through additional yield per female recruit from allowing growth to the terminal molt rather than harvest of immature females of legal size, a potential effect of recent management measures, and that the higher landings do not necessarily reflect ineffective management actions.

In 2018, LDWF conducted an update stock assessment for blue crab with relatively positive stock status /harvest results. Another assessment is scheduled for 2019 and will provide an up-to-date status for the blue crab stock with respect to management elected reference

	<p>points and help determine whether the corrective actions implemented are assisting in stock recovery.</p> <p>Current harvest control mechanisms and associated actions are sufficiently formalized and management appears to be responding with some effectiveness to past situations of impaired recruitment, overfishing or increasing risk of exceeding these.</p> <p>The Assessment Team has determined that managers have implemented the corrective actions scheduled for 2017/2018. The results of the 2019 stock assessment of blue crab will be reviewed when they become available but in the interim managers remain on target in their implementation of the agreed-upon corrective actions.</p>
Status	Corrective Actions in place to be reviewed annually at surveillance audits

Non-conformance #4 (2 of 2 with corrective actions in place)	
Applicable clause	3.9 (iii) Accordingly: the “stock under consideration” shall not be overfished if it is above the associated limit reference point (or its proxy).
Non-conformance	<p>Minor Non-conformance</p> <p>As of the latest estimate (West et al. 2018) the blue crab stock was overfished in 2016 but is no longer overfished. The recovery of the stock may have resulted from corrective actions implemented in 2017 by management. However, only 2 years have passed and additional years of the stock not being in an overfished status are required for confidence that management has been effective.</p>
Corrective actions	<p>After the Full Assessment Report in 2016 LDWF identified a set of corrective actions, some of which were already in place and others which were to be implemented including:</p> <ul style="list-style-type: none"> ▪ Professionalism program (Initiated November 2014 and on-going) is to be required of all new license holders. ▪ License fee increases in November 2014. ▪ Ban on immature females to be implemented in 2017, 2018 and 2019. ▪ Fishery Closure for 30 days in February and March for 2017, 2018 and 2019. ▪ Escape ring measures were to be implemented in 2017, including an increase from 2 to 3 rings per trap, placement 2 to be in upper chamber, size Increase from 2 5/16 inch to 2 3/8 inch, and removal of the exemption for Lake Pontchartrain. ▪ Stock assessment to be conducted early-2018. ▪ Derelict trap removal program: Initiated 2004, is proposed to continue in 2018 and 2019.
Progress Surveillance 2	<ul style="list-style-type: none"> ▪ Professionalism program initiated November 2014 is on-going and required of all new license holders. ▪ License fee increases in November 2014 are continuing. ▪ Ban on immature females was initiated January 2017, was in place in 2018, and is ongoing in 2019. ▪ Fishery Closure for 30 days was in place from 3rd week of February to 2nd week of March in 2017. There is no 30-day full closure of the commercial crab season in 2018 and 2019. Instead, commercial harvest of mature female blue crabs in Louisiana waters is prohibited from March 1 through April 30, 2018 and March 1 through April 30, 2019 (but will likely be shifted to a 35 days mature female restriction in September-October 2019).

	<ul style="list-style-type: none"> ▪ A licensed commercial crab fisherman is allowed an incidental take of mature female crabs during March and April and/or immature female crabs in an amount not to exceed two percent of the total number of crabs in their possession. ▪ Both the ban on the harvest of immature females and seasonal closures were enacted through the Louisiana Administrative Code, meaning they were enacted through the rule-making processes of the LWFC. ▪ Escape ring measures were implemented November 2017, including an increase from 2 to 3 rings per trap, placement 2 to be in upper chamber, size increase from 2 5/16 inch to 2 3/8 inch, and removal of exemption for Lake Pontchartrain. These are ongoing. The revised escape ring measures came into force in November 2017 following a three-year lead-in period, which was designed to coincide with the expected lifespan of a commercial crab trap and give fishermen the chance to bring their traps in line with the new regulations when they replaced their traps. LDWF LED agents suggested that the majority of traps had been in line with the new regulations long before they legally came into force. ▪ Stock assessment was conducted in 2018 and will be conducted again in 2019. <p>Derelict trap removal program, Initiated 2004, was held in 2018 and will be held in 2019. LDWF will again host its annual Derelict Crab Trap Rodeo in 2019 with two volunteer cleanup events during February. The Derelict Crab Trap Removal Program was initiated in 2004 to address the removal of derelict and abandoned crab traps, which cause ghost-fishing mortality of blue crabs and other species captured incidentally. In 2018, LDWF, Lake Pontchartrain Basin Foundation members, volunteers, BTNEP, CCA and members of the recreational fishing community retrieved more than 4,000 abandoned crab traps. In 2019, crabbing will be prohibited for 10-14 days when derelict trap removal takes place in five areas: (1) Upper Barataria Basin, (2) Lake Pontchartrain, (3) Terrebonne Basin, (4) Pontchartrain Basin, and (5) Sabine Basin. These are heavily crabbed areas where highest incidental crab mortality is likely to occur.</p>
<p>Conclusions Surveillance 2</p>	<p>Please refer to the conclusion and analysis provided above for clause 5.2.</p> <p>In 2018, LDWF conducted an updated stock assessment for blue crab. Based on results of this assessment update, the Louisiana blue crab stock is currently not overfished but was considered overfished in 1995, 2013, and 2015. Further, the stock is currently not experiencing overfishing, but the 2014, 2015, and 2016 fishing mortality rate estimates exceeded their target. Another assessment is scheduled for 2019 and will provide an up-to-date status for the blue crab stock with respect to management elected reference points and help determine whether the corrective actions implemented are assisting in stock recovery.</p> <p>The Assessment Team has determined that managers have implemented the corrective actions scheduled for 2017. The results of the 2019 stock assessment of blue crab will be reviewed when they become available but in the interim managers remain on target in their implementation of the agreed-upon corrective actions.</p>
<p>Status</p>	<p>Corrective Actions in place to be reviewed annually at surveillance audits</p>

9. Unclosed, new non-conformances and new corrective action plans

Not applicable. There are no unclosed, new non-conformances and new corrective action plans.

10. Future Surveillance Actions

The Assessment Team will continue to review non-conformances and associated corrective actions throughout the lifespan of this certificate. In particular, once management measures and fishery performance information for 2019, and an updated stock assessment become available in 2019, a new determination will be made in relation to the status of the two minor Non-Conformances.


Related to the non-conformances identified in the original Full Assessment report as addressed through appropriate corrective actions up until the time of this surveillance, a number of generally relevant areas will be reviewed in upcoming surveillance audits including:

1. New research and/or publication of analysis relating to diamondback terrapins and ghost fishing^{124 125};
2. Results of the planned 2019 stock assessment;
3. Blue crab juvenile abundance trends (for surveillance audits where new stock assessments are not available);
4. Management performance vs management objectives as they relate to a) abundance of the blue crab stock and b) fishing effort reduction;
5. Future implementation of harvest control measures including closures and harvest bans on adult and immature female crab;
6. Blue crab mortality sources (including potential blue crab catches in shrimp or other non-directed fisheries and/or ghost fishing effect from derelict traps);
7. Information collection/records relating to routinely encountered bycatch, retained catches, bait species usage, and interactions with Endangered, Threatened, Protected (ETP) species.

¹²⁴https://www.gsmfc.org/ann_mtg/2017-10/Gen_Sess/4.%20Bycatch%20in%20the%20Commercial%20Blue%20Crab%20Fishery%20in.pdf

¹²⁵ <https://www.stevenhpearson.com/publications> : Pearson SH and Wiebe JJ. Interactions between Diamondback Terrapins (*Malaclemys terrapin*) and the Crab Industry in Terrebonne Bay, Louisiana: Do Ghost Traps Impact Terrapin Populations within Coastal Louisiana? To be submitted to Marine Pollution

11. Client signed acceptance of the action plan



State of Louisiana
DEPARTMENT OF WILDLIFE AND FISHERIES

JOHN BEL EDWARDS
GOVERNOR

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Ref: fm13/ANI/BLCR/001.4/2016

August 9, 2016

Dear Sir:

Thank you for your recent communications regarding the assessment of Louisiana Blue Crab.

Concerning the new Non-Conformance, referred to as Non-conformance #4, we acknowledge and agree that all previous responses and correspondence relating to Non-conformance #1, and any subsequent corrective actions arising, be taken as corrective actions addressing Non-conformance #4 and assessed as such.

We have identified a set of corrective actions, some of which are already in place and others which will be implemented as appropriate.

- **Professionalism program**
 - Initiated November 2014 and on-going
 - Estimated effect: Unknown
- **License Fee Increase**
 - Initiated August 2015
 - Estimated effect: Unknown
- **Ban on Immature Females**
 - To be implemented January 2017
 - Estimated effect: 5% decrease in total landings, 12.4% decrease in female landings
- **Fishery Closure**
 - To be implemented 3rd week of February to 2nd week of March beginning in 2017
 - Estimated effect: 3% decrease in landings
- **Ring size measures**
 - To be implemented November 2017

- Increase from 2 to 3 rings per trap
- Estimated effect: unknown magnitude, likely positive

- Placement 2 to be in inner chamber
- Estimated effect: unknown magnitude, likely positive

- Increase from 2 5/16 inch to 2 3/8 inch
- Estimated effect: 11% decrease in sub-legal landings

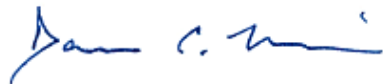
- Removal of exemption for Lake Pontchartrain
- Estimated Effect: Brings Pontchartrain which accounts for approx. 35% of annual landings on average under the regulation for the first time

- **Off-schedule stock assessment**
 - To be moved up from 2019 to early 2018 incorporating full data from 2017

We hope these actions will suffice for the resolution of the outstanding non-conformances.

Should you have any other questions or comments, please do not hesitate to contact me.

Best regards,



Damon C. Morris

12. Recommendation and Determination

The assessment team recommends that the management system of the applicant fishery, the Louisiana blue crab (*Callinectes sapidus*) commercial fishery, employing baited pot/trap gears, within Louisiana State Territorial Waters, under the management of the Louisiana Department of Wildlife & Fisheries (LDWF) and Louisiana Wildlife and Fisheries Commission (LWFC), is granted continued certification. SAI Global/Global Trust duly confirms continued certification.

13. References

Anderson J., A., and Alford A., B. Ghost fishing activity in derelict blue crab traps in Louisiana. <i>Mar Pollut Bull.</i> 2014 Feb 15;79(1-2):261-7. doi: 10.1016/j.marpolbul.2013.12.002.	https://www.ncbi.nlm.nih.gov/pubmed/24360333
ASMFC. 2017. Menhaden Assessment Overview August 2017. Atlantic States Marine Fisheries Commission.	https://www.asmfc.org/uploads/file//598e214eMenhadenAssessmentOverview_Aug2017.pdf
ASMFC/SEAMAP CRUSTACEAN WORKGROUP AND GSMFC BLUE CRAB SUBCOMMITTEE MEETING MINUTES Tuesday, November 3, 2015 St. Augustine, Florida.	https://www.gsmfc.org/ann_mtgs/2015-11/Crab/OCR_ASMFC-SEAMAP%20Crustacean%20Workgroup%20and%20GSMFC%20Blue%20Crab%20Subcommittee%20Minutes%2011-3-15.pdf
Bayou Sauvage Hunting and Fishing Regulations 2018-2019.	https://www.fws.gov/southeast/pdf/regulations/bayou-sauvage-national-wildlife-refuge-hunt.pdf
Bayou Teche National Wildlife Refuge Louisiana. About. Accessed on 15 January 2019.	https://www.fws.gov/refuge/Bayou_Teche/about.html
Bayou Teche National Wildlife Refuge Public Use Regulations 2018-2019.	https://www.fws.gov/southeast/pdf/regulations/bayou-teche-national-wildlife-refuge-hunt-fish.pdf
Betancur, R. 2015. <i>Ariopsis felis</i> . The IUCN Red List of Threatened Species 2015: e.T190456A1952682. http://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T190456A1952682.en . Downloaded on 15 January 2019.	https://www.iucnredlist.org/species/190456/1952682#population
Big Branch Marsh National Wildlife Refuge General Hunting and Fishing Regulations 2018-19.	https://www.fws.gov/southeast/pdf/regulations/big-branch-marsh-national-wildlife-refuge-hunt-fish.pdf
Bishop, J.M. 1983. Incidental capture of diamondback terrapin by crab pots. <i>Estuaries</i> 6(4):426-430.	https://link.springer.com/article/10.2307/1351402
Bourgeois, M., J. Marx, and K. Semon. 2014. Louisiana blue crab fishery management plan. Louisiana Department of Wildlife and Fisheries, Report.	http://www.wlf.louisiana.gov/sites/default/files/pdf/page/37762-fishery-management-plans-marine/finalbluecrabfmp11-7-14.pdf

Breton National Wildlife Refuge Louisiana. Rules and Regulations. Accessed on 15 January 2019.	https://www.fws.gov/refuge/Breton/visit/rules_and_regulations.html
Collie, J.S. and M.P. Sissenwine. 1983. Estimating population size from relative abundance data measured with error. Canadian Journal of Fisheries and Aquatic Sciences 40: 1871-1879.	http://www.nrcresearchpress.com/doi/abs/10.1139/f83-217
Courtney J et. al. 2012. Weight-Length Relationships in Gafftopsail Catfish (<i>Bagre marinus</i>) and Hardhead Catfish (<i>Ariopsis felis</i>) in Louisiana Waters.	https://arxiv.org/ftp/arxiv/papers/1210/1210.3062.pdf
Darnell, Z. 2018. Update on Gulf-wide Blue Crab Mark-Recapture Study. Gulf Coast Research Lab. The University of Southern Mississippi.	http://www.wlf.louisiana.gov/sites/default/files/crab_tagging_update_5.8.18.pdf
Delta National Wildlife Refuge Louisiana. Rules and Regulations. Accessed on 15 January 2019.	https://www.fws.gov/refuge/Delta/about.html
Delta National Wildlife Refuge General Fishing and Hunting Regulations 2018 - 2019	https://www.fws.gov/southeast/pdf/regulations/delta-national-wildlife-refuge-hunt-fish.pdf
Elmer's Island Refuge Management Plan Louisiana Department of Wildlife and Fisheries December 15, 2016.	http://www.wlf.louisiana.gov/sites/default/files/pdf/refuge/32508-elmers-island-wildlife-refuge/elmers_island_management_plan_final.pdf
FAO 1995. Code of conduct for responsible fisheries. FAO Report.	http://www.fao.org/3/a-v9878e.htm
FAO 2005 Guidelines for Ecolabeling of Fish and Fishery Products from Marine Capture Fisheries as updated in 2009).	http://www.fao.org/docrep/012/i1119t/i1119t.pdf
FWS. 2018. ENDANGERED, THREATENED, AND CANDIDATE SPECIES OF LOUISIANA as of April 26, 2018. Fish and Wildlife Service.	https://www.fws.gov/southeast/pdf/fact-sheet/louisiana-ecological-services-field-office-t-and-e-species.pdf
Gandy, R.L. and W.M. Turner. 2014. Investigations into the interaction between terrapins and crab traps. Final Report to the Wildlife Foundation of Florida, Project #CWT 1213-08. Florida Fish and Wildlife Research Institute.	

<p>Goodyear, C.P. 1993. Spawning stock biomass per recruit in fisheries management: foundation and current use. pp. 67-81. In S.J. Smith, J.J. Hunt, and D. Rivard (eds.). Risk evaluation and biological reference points for fisheries management. Canadian Special Publication of Fisheries and Aquatic Sciences. 442 pp.</p>	<p>https://www.researchgate.net/profile/C_Goodyear/publication/251832024_Spawning_Stock_Biomass_per_Recruit_in_Fisheries_Management_Foundation_and_Current_Use/links/0c960536124e8ab733000000/Spawning-Stock-Biomass-per-Recruit-in-Fisheries-Management-Foundation-and-Current-Use.pdf</p>
<p>GSMFC. Southeast Area Monitoring and Assessment Program (SEAMAP) webpage. Accessed on 15 January 2019.</p>	<p>https://www.gsmfc.org/seamap.php</p>
<p>Guillory, V. 1989. An evaluation of different escape vents in blue crab traps. Proceedings of the Louisiana Academy of Science 52:29-34.</p>	<p>https://www.researchgate.net/publication/288163048_A_review_and_evaluation_of_escape_rings_in_blue_crab_traps</p>
<p>Guillory, V. 2001. A review of incidental fishing mortalities of blue crabs (<i>Callinectes sapidus</i>). Pages 28-41 in V. Guillory, H.M. Perry and S. Vanderkooy (eds.). Proceedings of the Blue Crab Mortality Symposium. Gulf States Marine Fisheries Commission, Publication Number No. 90.</p>	<p>https://www.gsmfc.org/publications/GSMFC%20Number%20090.pdf</p>
<p>Guillory, V. and M. Elliott. 2001. A review of blue crab predators. Pages 69-83 in V. Guillory, H. Perry, and S. Vanderkooy (editors). Proceedings: Blue Crab Mortality Symposium. Gulf States Marine Fisheries Commission, Publication Number 90.</p>	<p>https://www.gsmfc.org/publications/GSMFC%20Number%20090.pdf</p>
<p>Guillory, V., H. Perry, and S. Vanderkooy (eds.). 2001b. The blue crab fishery of the Gulf of Mexico United States: a regional management plan. Gulf States Marine Fisheries Commission, Publication Number 96.</p>	<p>https://www.researchgate.net/publication/281822733_The_blue_crab_fishery_of_the_Gulf_of_Mexico_United_States_A_regional_management_plan</p>
<p>Hines, A.H., 2007. Ecology of juvenile and adult blue crabs. The Blue Crab, <i>Callinectes sapidus</i>. University of Maryland Sea Grant Press, College Park, MD, pp.565-654.</p>	<p>https://repository.si.edu/handle/10088/18447</p>
<p>Holcomb et al. 2015. Louisiana Wildlife Action Plan. LOUISIANA DEPARTMENT OF WILDLIFE AND FISHERIES.</p>	<p>http://www.wlf.louisiana.gov/sites/default/files/pdf/page_wildlife/32937-Wildlife%20Action%20Plan/2015_wap_final_draft.pdf</p>
<p>INTERJURISDICTIONAL FISHERIES ACT OF 1986. Title III of Public Law 99-659, Approved Nov. 14, 1986, 100 Stat. 3731.</p>	<p>https://legcounsel.house.gov/Comps/Interjurisdictional%20Fisheries%20Act%20of%201986.pdf</p>

Justia US Law. Louisiana Laws Revised Statutes TITLE 56 — Wildlife and fisheries (and articles within). Accessed on 15 January 2019.	https://legis.la.gov/Legis/Law.aspx?d=104845
Justia US Law. 2018. Louisiana Laws Revised Statutes.	https://legis.la.gov/Legis/Laws_Toc.aspx?folder=75&level=Parent
Law Server. 2018. Louisiana Laws. Revised Statutes. Title 49: Chapter 13 – Administrative Procedure. Accessed on 15 January 2019.	https://www.lawserver.com/law/state/louisiana/laws/louisiana_revised_statutes_title_49_chapter_13
LDS. 2018. Commercial Harvest of Blue Crab REGULATIONS for 2018-2019 Season. Louisiana Direct Seafood.	http://www.wlf.louisiana.gov/sites/default/files/pdf/page/41845-current-commercial-crab-regulations/lffcommcrabregs2018-19.pdf
LDS. 2018. LWFC to Modify Blue Crab Harvest Regulations. Louisiana Direct Seafood. Accessed on 15 January 2019.	https://louisianadirectseafood.com/lwfc-to-modify-blue-crab-harvest-regulations/
LDWF. 2018. Commercial and For-Hire Fisheries Rules and Regulations 2018. Louisiana Department of Wildlife and Fisheries.	http://www.wlf.louisiana.gov/sites/default/files/pdf/page/41407-regulations/commercialfishingbrochure201810-30-18.pdf
LDWF. 2018. Marsh Island Wildlife Refuge. Louisiana Department of Wildlife and Fisheries. Accessed on 15 January 2019.	http://www.wlf.louisiana.gov/refuge/marsh-island-wildlife-refuge
LDWF. 2019. 2019 LEEC Regional Short Courses. Accessed on 15 January 2019.	http://www.wlf.louisiana.gov/2019-leec-regional-short-courses
LDWF. 2019. Current Commercial Crab Regulations. Accessed on 15 January 2019.	http://www.wlf.louisiana.gov/current_commercial_crab_regulations
LDWF. 2019. Derelict Crab Trap Removal. Accessed on 15 January 2019. Louisiana Department of Wildlife and Fisheries	http://www.wlf.louisiana.gov/fishing/derelict-crab-trap-removal
LDWF. 2019. Law Enforcement Division. Accessed on 15 January 2019.	http://www.wlf.louisiana.gov/enforcement

LDWF. 2019. Pass-a-Loutre WMA. Accessed on 15 January 2019.	http://www.wlf.louisiana.gov/wma/2786
LDWF. 2019. Salvador/Timken WMA. Accessed on 15 January 2019.	http://www.wlf.louisiana.gov/wma/2765
LDWF. 2019. State Wildlife Refuge. Accessed on 15 January 2019.	http://www.wlf.louisiana.gov/refuge/state-wildlife-refuge
LDWF. 2019. Trip Tickets. Accessed on 15 January 2019.	http://www.wlf.louisiana.gov/fishing/trip-ticket
LFF. 2016. LDWF Reopens LFF Crab Professionalism Program. Louisiana Fisheries Forward. Accessed on 15 January 2019.	https://www.lafisheriesforward.org/ldwf-reopens-lff-crab-professionalism-program/
Lipcius, R., D. Eggleston, K. Heck, R. Seitz, and J. van Montfrans. 2007. Post-settlement abundance, survival, and growth of postlarvae and young juvenile blue crabs in nursery habitat. Pages 535-564 in V. Kennedy and L. Cronin, editors. The Blue Crab <i>Callinectes sapidus</i> . Maryland Sea Grant.	https://www.researchgate.net/publication/284418968_Ecology_of_postlarval_and_young_juvenile_blue_crabs
List of Fisheries Summary Tables. Table 2 - Commercial Fisheries in the Atlantic Ocean, Gulf of Mexico, and Caribbean in 2018. NOAA Fisheries. Accessed on 15 January 2019.	https://www.fisheries.noaa.gov/national/marine-mammal-protection/list-fisheries-summary-tables#table-2--commercial-fisheries-in-the-atlantic-ocean,-gulf-of-mexico,-and-caribbean
Lively J, A. 2017. Presentation: Bycatch in the Commercial Blue Crab Fishery in Louisiana. Louisiana Sea Grant and LSU AgCenter. GSMFC Terrapins & Crab Traps.	https://www.gsmfc.org/ann_mtgs/2017-10/Gen_Sess/4.%20Bycatch%20in%20the%20Commercial%20Blue%20Crab%20Fishery%20in.pdf
Louisiana Fishing Regulations on Wildlife Management Areas, Refuges & Federal Lands webpage. Accessed on 15 January 2019.	http://www.eregulations.com/louisiana/fishing/w-m-a-s-refuges-federal-lands/
LWFC. 2018. Louisiana Wildlife and Fisheries Commission meeting minutes, June 7 2018.	http://www.wlf.louisiana.gov/sites/default/files/pdf/page/41762-commission-minutes-present-2016/june2018commissionminutes.pdf

Mandalay National Wildlife Refuge Louisiana. About. Accessed on 15 January 2019.	https://www.fws.gov/refuge/Mandalay/about.html
Mandalay National Wildlife Refuge Public Use Regulations 2018-2019.	https://www.fws.gov/southeast/pdf/regulations/mandalay-national-wildlife-refuge-hunt-fish.pdf
NatureServe 2013. <i>Dorosoma cepedianum</i> . The IUCN Red List of Threatened Species 2013: e.T191210A15364728. http://dx.doi.org/10.2305/IUCN.UK.2013-1.RLTS.T191210A15364728.en . Downloaded on 15 January 2019.	https://www.iucnredlist.org/species/191210/15364728#population
NOAA. 2019. Marine Mammal Protection Act. List of Fisheries Summary Tables. Commercial fisheries in the Atlantic ocean, Gulf of Mexico, and Caribbean. Accessed on 15 January 2019.	https://www.fisheries.noaa.gov/national/marine-mammal-protection/list-fisheries-summary-tables#table-2--commercial-fisheries-in-the-atlantic-ocean,-gulf-of-mexico,-and-caribbean
NOAA. Common Bottlenose Dolphin. NOAA Fisheries. Accessed on 15 January 2019.	https://www.fisheries.noaa.gov/species/common-bottlenose-dolphin
Pearson SH and Wiebe JJ. 2018. Distribution, Sex Ratios and Size Distribution of Diamondback Terrapins (<i>Malaclemys terrapin</i>) in the Deltaic Plain of Louisiana. <i>Herpetologica</i> 74 (2):135-140.	https://docs.wixstatic.com/ugd/715cb1_9b0127520e9f419db6ac6380cdc5e72d.pdf
Pearson SH and Wiebe JJ. 2018. Considering diamondback terrapin (<i>Malaclemys terrapin</i>) nesting habitat and reproductive productivity in the restoration of Gulf of Mexico coastal ecosystems. <i>Ocean and Coastal Management</i> 155, 8-14.	https://docs.wixstatic.com/ugd/715cb1_9b0127520e9f419db6ac6380cdc5e72d.pdf
Pearson, S.H., Wiebe, J., 2014. Evaluation of diamondback terrapin (<i>Malaclemys terrapin</i>) abundance, distribution and reproduction throughout coastal Louisiana 2014 research. In: Management and Wildlife Education Symposium, Baton Rouge, LA.	
PUBLIC LAW 99-659—NOV. 14, 1986. TITLE I—FISHERIES CONSERVATION AND MANAGEMENT.	http://uscode.house.gov/statutes/pl/99/659.pdf

Rockefeller Wildlife Refuge. Public Use. Accessed on 15 January 2019.	https://www.rwrefuge.com/public-use.html
Schueller A. 2016. GDAR 02 Gulf Menhaden stock assessment 2016 Udate. NOAA Fisheries.	https://www.gsmfc.org/publications/GSMFC%20Number%20254.pdf
Seigel, R.A. and J.W. Gibbons. 1995. Workshop on the ecology, status, and management of the diamondback terrapin (<i>Malaclemys terrapin</i>), Savannah River Ecology Laboratory, 2 August 1994: final results and recommendations. <i>Chelonian Conservation Biology</i> 1(13):240-243.	https://bioone.org/journals/Chelonian-Conservation-and-Biology/volume-5/issue-2/1071-8443(2006)5[331:TWOTES]2.0.CO;2/Third-Workshop-on-the-Ecology-Status-and-Conservation-of-Diamondback/10.2744/1071-8443(2006)5[331:TWOTES]2.0.CO;2.short
Selman, W., Baccigalopi, B., Baccigalopi, C., 2014. Distribution and abundance of diamondback terrapins (<i>Malaclemys terrapin</i>) in southwestern Louisiana. <i>Chelonian Conserv. Biol.</i> 13, 131–139.	https://bioone.org/journals/Chelonian-Conservation-and-Biology/volume-13/issue-2/CCB-1102.1/Distribution-and-Abundance-of-Diamondback-Terrapins-iMalaclemys-terrapin-i-in/10.2744/CCB-1102.1.short
State of Louisiana GOVERNOR’S EXECUTIVE BUDGET FISCAL YEAR 2017-2018.	https://www.doa.la.gov/opb/pub/FY19/FY19_Executive_Budget.pdf
STATE OF LOUISIANA. 2013. Fiscal and Economic Impact Statements. Legislative Fiscal Office BATON ROUGE.	http://lfo.louisiana.gov/files/forms/impactinstruct.pdf
The University of Southern Mississippi. 2019. Hardhead catfish webpage. Gulf Coast Research Laboratory, 703 East Beach Drive, Ocean Springs, MS 39564. Accessed on 15 January 2019.	http://gcrl.usm.edu/public/fish/hardhead.catfish.php
TITLE 56 - Wildlife and Fisheries RS 56:305.6 - Commercial crab fishing; apprentice license; requirements. Accessed on 15 January 2019.	https://law.justia.com/codes/louisiana/2016/code-revisedstatutes/title-56/rs-56-305.6/
Title 76 WILDLIFE AND FISHERIES Part I. Wildlife and Fisheries Commission and Agencies Thereunder.	http://www.wlf.louisiana.gov/sites/default/files/pdf/document/39939-title/ose_legal_forms_title_76.pdf
VanderKooy S., J. and Smith J., W. 2015. THE MENHADEN FISHERY OF THE GULF OF MEXICO,. UNITED STATES: A Regional Management Plan. 2015 Revision. Gulf States Marine Fisheries Commission 2404 Government Street Ocean Springs, Mississippi 39564.	https://www.gsmfc.org/publications/GSMFC%20Number%20240.pdf

West, J., H. Blanchet, J. Marx 2016. Update Assessment of Blue Crab in Louisiana Waters 2016 Louisiana Department of Wildlife and Fisheries, Report.	http://www.wlf.louisiana.gov/sites/default/files/pdf/page/37756-stock-assessments/labassessment2016.pdf
West, J., H. Blanchet, M. Bourgeois, and J.E. Powers. 2011. Assessment of Blue Crab Callinectes sapidus in Louisiana Waters. Louisiana Department of Wildlife and Fisheries, Report.	http://www.wlf.louisiana.gov/sites/default/files/pdf/document/37757-stock-assessments/2011_assessment_of_la_blue_crab.pdf
West, J., H. Blanchet, M. Bourgeois, and J.E. Powers. 2014. Assessment of Blue Crab Callinectes sapidus in Louisiana Waters. Louisiana Department of Wildlife and Fisheries, Report.	http://www.wlf.louisiana.gov/sites/default/files/pdf/page/37762-fishery-management-plans-marine/finalbluecrabfmp11-7-14.pdf
West, J., H. Blanchet, P. Cagle. 2018. Update Assessment of Blue Crab in Louisiana Waters 2018 Louisiana Department of Wildlife and Fisheries, Report.	http://www.wlf.louisiana.gov/sites/default/files/pdf/page/37756-stock-assessments/labassessment2018.pdf
WLF. 2015. TITLE 56 WILDLIFE AND FISHERIES CHAPTER 1. GENERAL PROVISIONS FOR WILDLIFE AND FISHERIES PART I. WILDLIFE AND FISHERIES COMMISSION.	http://www.wlf.louisiana.gov/sites/default/files/pdf/document/39939-title/ose_legal_forms_2015title56.pdf
WLF. 2016. Isles Dernieres Barrier Islands Refuge 2016 Regulations.	http://www.wlf.louisiana.gov/sites/default/files/pdf/refuge/32512-isle-dernieres-barrier-islands-refuge/isles_dernieres_regulations_-_may_2016.pdf

14. Appendix 1. Surveillance Assessment Team Bios

Based on the technical expertise required to carry out the above fishery assessment, Global Trust Certification Ltd., is pleased to confirm the Surveillance Assessment team members for the fishery as follows.

Vito Romito, Lead Assessor

Vito holds a BSc (Hons) in Ecology and an MSc in Coastal Management from Newcastle University in the U.K. Between his degrees he spent a year in Tanzania, carrying out biodiversity assessments and monitoring studies of pristine and dynamited coral reef, mangrove, and seagrass ecosystems.

For five years, with Global Trust Certification Ltd, he headed and managed the FAO-based Responsible Fisheries Management (RFM) Assessment and Certification Program for 3 jurisdictions, covering all the fisheries assessments in Alaska, Iceland and Louisiana, as Lead Assessor. He has also carried out several IFFO Responsible Supply (RS) forage fisheries assessments in Chile, Peru, Europe and other verification assessments in Atlantic and Pacific Canada. To date, Vito has headed and conducted numerous fishery assessments involving 40 + different species including salmonid, groundfish, pelagic, flatfish, crustacean, cephalopod and forage species. He is a Lead, third party IRCA ISO 14001:2004 & OHSAS 18001:2007 approved auditor, and an MSC V2.1 trained Lead Assessor.

For three years, Vito worked with RS Standards Ltd, where he was primarily involved with leading the development of the Alaska RFM Program (Standard and Scoring Guidance to Version 2.0) and with the IFFO RS Improver program, on projects related to the assessment of a number of Southeast Asia multispecies trawl fisheries. In late 2018 Vito re-joined SAI Global.

Rom Lipcius, Assessor

Dr. Lipcius is a Professor of Marine Science at the Virginia Institute of Marine Science (VIMS), College of William & Mary (Virginia, USA), where he has been on the faculty in the Department of Fisheries Science since 1986. He received a Ph.D. (major: Biological Science; minor: Statistics) from Florida State University in 1984, and was awarded Postdoctoral Fellowships by the Smithsonian Institution (1984-85) and US National Research Council (1985-86) before joining the faculty. His main interest is in Marine Conservation Ecology and Fisheries Management, and has over 30 years of experience conducting basic and applied research on blue crab, eastern oyster, Caribbean spiny lobster, queen conch, Nassau grouper and various marine bivalves. He has 28 years of experience as the state's expert on blue crab ecology and management by providing formal management advice to the Virginia Marine Resources Commission, Chesapeake Bay Commission, Chesapeake Bay Stock Assessment Committee, and Chesapeake Bay Program Fisheries Goal Implementation Team, and 10 years of experience serving as scientific advisor on oyster restoration to US Army Corps of Engineers, NOAA Chesapeake Bay Office, and Chesapeake Bay Program Fisheries Goal Implementation Team. He has been Chief Scientist of the Blue Crab Winter Dredge Survey for 25 years, Co-Principal Investigator of the Blue Crab Stock Assessment in Chesapeake Bay, and served on the review panel of the 2013 Gulf of Mexico Blue Crab Stock Assessment. Dr. Lipcius has 97 publications in peer-reviewed scientific journals, as well as numerous technical reports. Besides his postdoctoral fellowships, he has been awarded two Outstanding Faculty Awards at VIMS (1993, 2002), and a Coastal America Award (2009) by the Executive Office of the President of the US. He has also been selected

as a Senior Postdoctoral Fellow of the Smithsonian Institution (1997-99), Aldo Leopold Leadership Fellow (2006), and US National Academy of Sciences Kavli Fellow (2009).

Virginia Polonio, Assessor

Dr. Virginia Polonio, has a B.Sc. in Environmental Sciences and a M.Sc. in Fisheries Management and Aquaculture, both from the University of Cádiz. She also obtained her PhD in Biodiversity and Natural resources from the University of Oviedo during which she gained experience in the field of research of fisheries and protection of Vulnerable Marine Ecosystems such as coral reefs. During her thesis she wrote several articles describing new species of corals and developed skills in the fields of benthic ecology and ecosystem management. Before her PhD, Virginia was contracted as technician in the Spanish Oceanographic Institute where she realized work at sea and gained field experience to assess fisheries stocks. She participated in the Spanish National Basic Plan of Data to collect and evaluate the fishing in the ICES and CECAF areas. During this period, she carried out feeding habit and age/size studies of *Pagellus Bogaraveo* and others commercial species (hake, anchovy, sharks, mackerel, squid, etc.) to implement an ecosystem approach in relation to commercial fisheries in the Gulf of Cadiz and the strait of Gibraltar.

Virginia has also extensive experience working on MSC assessments as both a team member and lead assessor. She has worked on several full assessments such as ISF Capelin, ISF Mackerel, CSHMAC herring, Cantabrian sardine, North Atlantic albacore, squat lobster, blue sharks and swordfish, among others and is a full-time employee at SAI Global.