

Marine Fisheries and the COVID-19 Pandemic: Interim Survey Data and Analysis

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Abstract

Participants in the nation's marine fisheries typically must address a variety of operational challenges as they work to harvest, process, and distribute seafood, and provide fishing experiences to American consumers. The arrival and spread of COVID-19 early in 2020 quickly posed a new range of problems and issues, intensifying pre-existing challenges within and across our domestic fleets, firms, and regions. This report draws on a large-scale survey effort administered by NOAA Fisheries economists and anthropologists to specifically examine pandemic impacts among fisheries along the Eastern Seaboard and Gulf of Mexico, and in Puerto Rico and the U.S. Virgin Islands. Analysis of the resulting data makes clear the dramatic dampening effect of the initial phase of the event on commercial and for-hire fleets and seafood processing and distribution firms around the regions. The survey database and this report may be seen as valid sources of information for better understanding social and economic change associated with the pandemic, and an essential first step for accurately gauging its regional fishery impacts as they manifest in the months and years to come.

1. Introduction

This report describes an initial phase of research designed to better understand and monitor the effects of the COVID-19 pandemic on commercial and for-hire marine fisheries and seafood processing and distribution firms in the United States. The work is being implemented by the U.S. Department of Commerce, NOAA Fisheries, as an important part of the agency’s mission. This mission prioritizes productive and sustainable fisheries, safe sources of seafood, the recovery and conservation of protected resources, and healthy marine ecosystems. By examining pandemic-related changes in regional fisheries, the work provides fishery managers, scientists, and stakeholders with information about the status of domestic fisheries in the context of the pandemic, and an initial baseline for evaluating pandemic impacts in the future.

Having produced a long series of disaster assessments over past decades, NOAA Fisheries’ social scientists undertook large-scale examination of pandemic effects soon after it was realized that the novel coronavirus COVID-19 was likely to create profound challenges for fishing industries across the nation’s coastal regions. A survey instrument¹ was subsequently administered by mail and phone to business owners and/or operators in the commercial, for-hire, and seafood processing and distribution sectors in the New England, Mid-Atlantic, South Atlantic, Caribbean, and Gulf of Mexico fishery management regions (see Fig. 1 below).² The effort yielded a total sample of over 2,100 respondents. The following pages comprise an initial report regarding the nature of pandemic impacts in the fishery regions of interest. Subsequent survey work will enable increasingly comprehensive analysis and concluding discussion of a particularly challenging period in the history of the nation and its marine fisheries.

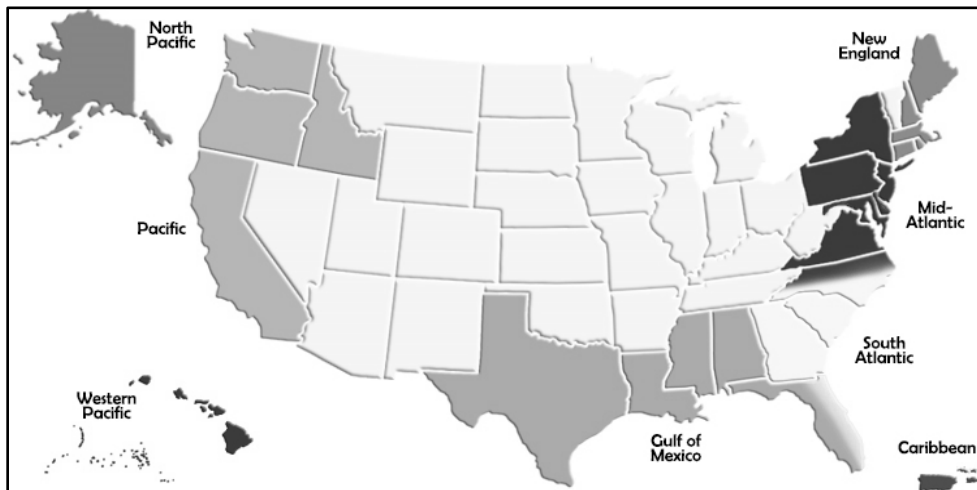


Figure 1. Geographic purview of the U.S. Regional Fishery Management Councils.

¹ Questionnaires providing interview content for each sector were developed by NOAA Fisheries and approved by the Office of Management and Budget (OMB Control Number 0648-0767).

² The study regions equate with those administered by the nation’s regional fishery management councils. These incorporate the U.S. territories of Puerto Rico and the U.S. Virgin Islands (St. Thomas, St. John, and St. Croix), along with the following states: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina (included in the South Atlantic), South Carolina, Georgia, Florida (also included in the South Atlantic), Alabama, Mississippi, Louisiana, and Texas.

1.1 Scope and Intent of the Report

The intent of this initial report is necessarily modest in analytical terms. The pandemic continues to impact the nation, and the ways it is affecting marine fisheries are many, complex, and continually changing. The principal focus of the following pages is to provide data and basic analysis that are indicative of changes occurring in multi-region commercial and for-hire fisheries during the first six months of the event in the U.S. Essential background context is provided where possible. As such, the report provides early insight into a novel source of change in critical sectors and regions of the nation's domestic fisheries. As noted in NOAA Fisheries' pandemic update³, impacts on commercial and for-hire fisheries in other regions, and on the nation's recreational fisheries, are also being examined and monitored by the agency. The massive scale of recreational fisheries and related business activity in the study regions exceeds the scope of the current study.⁴

1.2 The Virus and Pandemic

Pandemic disease is not uncommon in human history. The most recent prior event with widespread impacts in the United States was an H1N1 avian-borne virus, colloquially known as the Spanish flu. Between 1918 and 1920, the event infected some 500 million persons and took the lives of more than 50 million worldwide, including some 675,000 persons in the U.S. (Centers for Disease Control and Prevention, 2020).

Viral proteins have little significance of themselves. But when linked to a human host, replication can be rapid and extensive, prompting a debilitating immune response in certain people. This is presently occurring around the world in association with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2, also known as COVID-19) and its emerging variants. Spread of COVID-19 has been rapid among human populations,⁵ causing physical suffering and death, financial hardship, and major challenges to systems of industry, health care, education, and governance, among others. Originating in China, COVID-19 spread quickly to other parts of the world, including the United States. The first domestic case was documented in January 2020, with the first known death occurring during February 2020 in Washington state.

The data collection phase of the survey discussed in this report was completed during mid-September 2020. At that point, the daily number of reported coronavirus cases in the U.S. was estimated to be around 35,000, after a previous peak of some 75,000 daily cases during mid-July. Cases and deaths rose precipitously during October, and by the one-year mark of the pandemic in February 2021, over 27 million cases of the virus had been identified around the nation. The

³ NOAA Fisheries Coronavirus (COVID-19) Update. <https://www.fisheries.noaa.gov/national/about-us/noaa-fisheries-coronavirus-covid-19-update>

⁴ Although assessment of pandemic-related changes in the recreational fishing industry exceeds the scope of this project, the event observably led to increases in the sale of new vessels and fishing gear in the Southeast U.S. during the summer months of 2020. This may relate to the apparent interest of coastal residents in outdoor activities that could be undertaken in solitude or with trusted friends and family members.

⁵ COVID-19 is the seventh coronavirus known to impact humans. Four such viruses (229E, NL63, OC43, and HKU1) cause symptoms of the common cold, while MERS-CoV, SARS-CoV, and SARS-CoV-2 can induce severe immune response problems and sometimes death, with rates of fatality reaching 5, 10, and 37 percent respectively (Huang et al., 2020).

official death toll then exceeded 463,000 persons (Centers for Disease Control and Prevention, 2021a).

From a public health perspective, every human behavior that enables unhindered movement of the virus between host and prospective host is highly problematic. Of importance in the context of the current pandemic, the situation has led to a reordering of the way people can or do interact. That is, public health measures advocated or established to quell transmission of the virus, such as stay-at-home orders, distancing between individuals, and the wearing of masks to diminish the chance of infection, unavoidably disrupt normal human behaviors that developed over millennia (Hall, 1959; Welsch et al., 2020). People around the world, including those involved in marine fisheries, are presently adjusting to greater and lesser degrees to this major change.

1.3 Initial Months of the Pandemic in the Context of Marine Fisheries

The effects of past pandemics on domestic fisheries are not well-documented. Regarding the Spanish flu pandemic, it is known that the virus reached the Bristol Bay region of Alaska in 1919, just as indigenous fishermen began to undertake socially interactive summer fishing activities around the region. According to deValpine (2015), by the end of the salmon season that year, as many as 1,000 Nushagak villagers had died from the disease, leaving behind 238 parentless children (Riggs, 1919; VanStone, 1967). As asserted by Greenberger (2018), key lessons from the Spanish flu include the fundamental value of avoiding infection through physical distancing and the use of masks. A vaccine for influenza was not licensed for public use until 1945 (Centers for Disease Control and Prevention, 2021b).

The act of fishing and conducting seafood-related business involves extensive social interaction, often in close physical proximity. As such, the present-day pandemic, and response strategies deemed essential for containing the virus, have led to various challenges in the nation's marine fisheries. Problems occur most directly when commercial harvesters, guides, processors, and/or other participants do not or cannot conduct normal activities due to: (a) decisions and/or guidelines intended to prevent infection of self and others; (b) the actual infection of self or others and the constraints this sets in motion; (c) changes in incentive, such as those related to constrained channels of seafood distribution⁶ and shifting market conditions; and (d) changes in capacity, as imposed by missing personnel, and diminished availability of essential supplies and services such as gear, bait, and vessel and engine parts and maintenance.

Each of the problems above relates in some way to the basic difficulty of maintaining enough physical distance and/or a sufficient respiratory barrier between people so that viral transmission is minimized. Social interactions were dramatically limited in parts of the nation during early periods of uncertainty about the pandemic, as when state governments encouraged or mandated stay-at-home policies and/or closures of restaurants, bars, and other businesses. During the late winter and early spring months of 2020, such measures had a major effect on commercial fisheries, given the close connection between eateries and all sectors of the seafood industry.

⁶ The term "distribution" is used throughout this document to represent the marketing, sale, and transportation of seafood from source to wholesaler and/or retailer to secondary markets to the consumer's table.

Similarly, for-hire fisheries were constrained by mandate and the underlying need for additional space between clients, and between clients and captain and crew fishing from small vessels.

Based on regional landings and revenue data, NOAA Fisheries (2021) makes clear the extent of early pandemic impacts on the commercial sector, noting that early closures and stay-at-home orders triggered a series of economic shockwaves across the seafood industry. These began in March 2020, as domestic commercial landings revenue in total fell 19% below the monthly average for the previous five years. The situation continued to deteriorate across the nation's commercial fisheries into mid-summer, with landings revenue plummeting to 45% below baseline in July.⁷

A similar pattern of decline was noted in for-hire fisheries in the study regions (NOAA Fisheries, 2021). For example, for-hire fisheries in New England and the Mid-Atlantic were impacted by a second (post-initial) economic shock between March and April 2020, when social congregation was most stringently restricted in the states comprising these regions. Combined rates of for-hire fishing activity in New England and the Mid-Atlantic fell from a 2015-2019 early spring baseline average of some 26,700 angler trips to a mere 714 trips for the same period in 2020. Diminished activity continued in these regions during May and June, when some 212,000 angler trips were taken—35% below the seasonal baseline average of 327,500 trips. For-hire fishing trips and revenue declined significantly during this period in the Southeast region as well. There, charter fishing revenue fell 72% below the March through April baseline average for the period 2017 to 2019.

When the economic implications of full closures came into focus, and as physical distancing and masking gradually became more commonplace around the U.S. during late summer 2020, eating establishments reopened, or partially reopened, depending on state rules and guidelines. This led to some rebounding of business activity among commercial harvesters and seafood processors and dealers between mid- and late summer 2020. But a variety of factors continued to alter normal patterns of fishing and seafood transactions throughout the period and into the autumn months of 2020, when the pandemic began to worsen across the nation. These included lingering public fear of infection, regional waves of increasing hospitalization and death, and the persistent message from public health officials that Americans should limit all unnecessary direct social interaction.⁸

1.4 Rationale and Methods

The expansive scope and scale of pandemic impacts to fishing and seafood businesses during the initial months of the COVID-19 pandemic were considered by NOAA Fisheries staff to be worthy of rapidly implemented research and long-term monitoring. Based on a growing literature and deepening knowledge of the social and economic implications of disasters among individuals and communities involved in marine fisheries, NOAA Fisheries scientists in the

⁷ Annual commercial landings revenue averaged \$5.8 billion in the U.S. during the period 2015 to 2019 (NOAA Fisheries, 2021).

⁸As of February 1, 2021, the Centers for Disease Control and Prevention issued a requirement that masks be universally worn on all public conveyances, including commercial and for hire-fishing vessels (Centers for Disease Control and Prevention, 2021c).

study regions collaborated to refine survey instruments that could indicate the nature and scale of impacts resulting from the pandemic in the commercial harvest, for-hire, and seafood processing and distribution sectors of the overall industry. The instruments facilitated collection of basic information about the economic and social status of the businesses prior to and during the first six months of the event, with the understanding that the topics could be revisited with respondents at later points in time.

Databases requested from the Atlantic Coast Cooperative Statics Program (ACCSP) and Gulf States Fisheries Information Network (Gulf FIN), along with NOAA Fisheries permit data, were consulted to draw randomized samples of prospective survey respondents in each commercial sector from each study region. Regional survey specialists then used the survey protocol to implement the work with full assurance of respondent anonymity and confidential treatment of all project data. Response rates were deemed suitable for representing trends and pandemic effects in all study regions.

2. Interim Survey Findings

This interim report presents key findings from survey-based research of pandemic impacts, as conducted during the mid- and late summer months of 2020. The work was undertaken in collaboration with persons who maintain commercial and for-hire fishing operations, and seafood processing and distribution businesses along the U.S. East Coast, the Gulf of Mexico, Puerto Rico, and the U.S. Virgin Islands. Of note, while there can be considerable overlap between harvest and processing/distribution sectors in certain regions, they are treated here as distinct for purposes of sampling, data collection, and analysis. Overlapping participation in commercial and for-hire fishing is also common in the study regions, and effort is taken here to differentiate survey results between those who do and do not engage in both types of activity.

As indicated in Tables 2.2 and 2.20, survey participants tend to be well-tenured overall, with more than 20 years of fisheries experience reported on average. Further, as revealed during many interviews, business owners and operators are often knowledgeable not only of their own specialties, but of the regional industry in general. These factors increase the likelihood that the sampling approach has yielded valid and useful responses to the survey.

Section 2.1 below provides basic descriptive statistics to represent: (a) core characteristics of commercial and for-hire fishing operations maintained by respondents in each fishery management region; and (b) the nature of operational responses to the pandemic. Section 2.2 provides the same forms of information to describe characteristics of the sampled seafood processing and distribution firms, and the nature of initial impacts in that sector of the industry. Discussion of important differences in response between regions is provided where possible. Notable in the section is the profound dampening effect of the pandemic on virtually all fishing operations within and across the regions and sectors of interest.

2.1 Commercial Harvest and For-Hire Fishing Operations

The nature of commercial marine fisheries varies extensively across the study regions. A wide variety of species are pursued with many types of gear and operating strategies, and varying investment of time and resources. For-hire or charter fishing is a common pursuit in all regions, though Caribbean fisheries often tend to be artisanal in nature. The survey samples capture such differences to greater and lesser extents—as enabled by the survey time frame, the availability of resources for conducting the work, and the availability and willingness of commercial harvesters and for-hire operators to take time for the interview.

2.1.1 Characteristics of the Sample

Tables 2.1 and 2.2 depict basic aspects of the commerce-generating fishing operations maintained by survey participants in the various regional fisheries. Sample sizes in the Caribbean reflect the limited extent of for-hire fishing in the overall region and the relatively expansive extent of commercial fishing in Puerto Rico. Readers should note that the category titled “Both” in Table 2.1 and subsequent tables refers to respondents who engage in both commercial and for-hire fishing operations during the course of a given year. Percentages provided in the tables are followed by valid sample sizes for each group in each region and overall. Not all participants responded to every question, with sample sizes for any given question varying accordingly.

Table 2.1 Participation in the commercial harvest and for-hire sectors by region*

| Region | % Commercial Harvesters | % For-Hire Operators | % Both | valid <i>n</i> |
|----------------|-------------------------|-----------------------|-----------------------|----------------|
| Caribbean | 92.7 (<i>n</i> =381) | 5.6 (<i>n</i> =23) | 1.7 (<i>n</i> =7) | 411 |
| Gulf of Mexico | 36.4 (<i>n</i> =221) | 52.6 (<i>n</i> =319) | 10.9 (<i>n</i> =66) | 606 |
| Mid-Atlantic | 37.0 (<i>n</i> =190) | 46.1 (<i>n</i> =237) | 16.9 (<i>n</i> =87) | 514 |
| New England | 40.7 (<i>n</i> =66) | 37.0 (<i>n</i> =60) | 22.2 (<i>n</i> =36) | 165 |
| South Atlantic | 38.6 (<i>n</i> =142) | 48.4 (<i>n</i> =178) | 13.0 (<i>n</i> =48) | 368 |
| Across Regions | 49.1 (<i>n</i> =1,000) | 37.9 (<i>n</i> =817) | 12.9 (<i>n</i> =244) | 2,061 |

*Based on the question “What kind of fishing operation do you engage in?”

Table 2.2 Respondent’s tenure by type of operation and region*

| Region | Commercial Harvesters | For-Hire Operators | Respondents Active in Both Sectors | valid <i>n</i> overall |
|----------------|------------------------|------------------------|------------------------------------|------------------------|
| Caribbean | 18.51 (<i>n</i> =359) | 17.13 (<i>n</i> =23) | 18.29 (<i>n</i> =7) | 389 |
| Gulf of Mexico | 26.67 (<i>n</i> =195) | 23.94 (<i>n</i> =312) | 23.10 (<i>n</i> =66) | 573 |
| Mid-Atlantic | 30.98 (<i>n</i> =178) | 25.61 (<i>n</i> =236) | 25.78 (<i>n</i> =86) | 500 |
| New England | 30.21 (<i>n</i> =62) | 25.10 (<i>n</i> =60) | 23.97 (<i>n</i> =34) | 156 |
| South Atlantic | 28.45 (<i>n</i> =135) | 22.16 (<i>n</i> =174) | 20.51 (<i>n</i> =47) | 356 |
| Across Regions | 26.96 (<i>n</i> =929) | 22.78 (<i>n</i> =805) | 22.33 (<i>n</i> =240) | 1,974 |

*Based on the question “How many years have you been a vessel owner?”

Tables 2.3 and 2.4 below depict additional aspects of the fleets and sample. Table 2.3 makes clear the predominance of fishing as the respondent’s primary source of income among the Caribbean and Gulf of Mexico samples, and its greater tendency to be combined with other sources of income in the Mid-Atlantic region. Compared to commercial harvesters, reliance on fishing income tended to be lower among for-hire operators—particularly among those in New England and the Mid-Atlantic. Most participants represented in Table 2.4 reported fishing both in state waters (0 to three miles offshore) and federal waters (beyond three miles from the states and U.S. Virgin Islands, and beyond nine miles from Puerto Rico). Very few participants in any study region reported fishing in federal waters only.

Table 2.3 Percent of respondents for whom fishing is the primary source of income*

| Region | % Commercial Harvesters | % For-Hire Operators | % Respondents Active in Both Sectors | valid <i>n</i> overall |
|----------------|-------------------------|-----------------------|--------------------------------------|------------------------|
| Caribbean | 70.9 (<i>n</i> =376) | 87.0 (<i>n</i> =23) | 85.7 (<i>n</i> =7) | 406 |
| Gulf of Mexico | 80.3 (<i>n</i> =218) | 74.3 (<i>n</i> =307) | 87.9 (<i>n</i> =66) | 591 |
| Mid-Atlantic | 57.4 (<i>n</i> =183) | 31.9 (<i>n</i> =230) | 48.3 (<i>n</i> =85) | 498 |
| New England | 72.7 (<i>n</i> =66) | 36.7 (<i>n</i> =58) | 47.2 (<i>n</i> =36) | 160 |
| South Atlantic | 69.5 (<i>n</i> =140) | 52.8 (<i>n</i> =172) | 75.0 (<i>n</i> =46) | 358 |
| Across Regions | 70.2 (<i>n</i> =983) | 56.5 (<i>n</i> =790) | 68.8 (<i>n</i> =240) | 2,013† |

*Based on the question “Is fishing your primary source of income?”

†Commercial and/or for-hire fishing are the primary sources of income for 63.5% of the overall sample.

Table 2.4 Jurisdictional waters where participants conduct fishing operations†**

| Region | State/Territorial | | Federal | | Both Zones | | valid <i>n</i> |
|----------------|---------------------------|---------------------------|--------------------------|--------------------------|---------------------------|---------------------------|-------------------|
| | Commercial | For-Hire | Commercial | For-Hire | Commercial | For-hire | |
| Caribbean | 53.1% (<i>n</i> =381) | 13.0% (<i>n</i> =23) | 0.5% (<i>n</i> =381) | 0.0% (<i>n</i> =23) | 86.3% (<i>n</i> =381) | 87.0% (<i>n</i> =23) | 404 |
| Gulf of Mexico | 45.3% (<i>n</i> =222) | 34.3% (<i>n</i> =317) | 8.1% (<i>n</i> =222) | 4.7% (<i>n</i> =317) | 46.2% (<i>n</i> =222) | 60.7% (<i>n</i> =317) | 539 |
| Mid-Atlantic | 69.8% (<i>n</i> =188) | 32.2% (<i>n</i> =235) | 1.1% (<i>n</i> =188) | 1.3% (<i>n</i> =235) | 28.6% (<i>n</i> =188) | 66.1% (<i>n</i> =235) | 423 |
| New England | 34.8% (<i>n</i> =66) | 26.7% (<i>n</i> =58) | 12.1% (<i>n</i> =66) | 5.0% (<i>n</i> =58) | 53.0% (<i>n</i> =66) | 65.0% (<i>n</i> =58) | 124 |
| South Atlantic | 56.6% (<i>n</i> =139) | 37.2% (<i>n</i> =176) | 4.3% (<i>n</i> =139) | 5.6% (<i>n</i> =176) | 36.4% (<i>n</i> =139) | 62.9% (<i>n</i> =176) | 315 |
| Across Regions | 51.9% (<i>n</i> =996) | 28.7% (<i>n</i> =809) | 5.2% (<i>n</i> =996) | 3.3% (<i>n</i> =809) | 50.1% (<i>n</i> =996) | 68.3% (<i>n</i> =809) | 1,805 |

*Based on the question “Do you fish in state/territorial waters, federal waters, or both?”

†The majority of operators who work in both the commercial and for-hire sectors also report fishing in both jurisdictions, with corresponding percentages reaching 100% (*n*=7) in the Caribbean; 81.8% (*n*=66) in the Gulf; 74.7% (*n*=87) in the Mid-Atlantic; 91.4% (*n*=35) in New England; and 85.4% (*n*=48) in the South Atlantic.

Finally, Table 2.5 depicts the mean number of crew members reported to be working on the respondents’ fishing vessel(s) at the time of the survey. The data provide a basic indication of the size and nature of the sampled fishing operations, most of which require relatively few crew members. Although relatively small crew sizes typify the vast majority of commerce-generating fishing operations across the study regions, somewhat larger operations are also active in certain regions and were therefore included in the sample.

Of specific relevance in the context of this report, crew size indicates the number of persons potentially exposed to COVID-19 while fishing, transiting, or conducting shore-side aspects of the operation. The size and configuration of vessel and operation come into play here, with more densely occupied vessels and socially interactive operations obviously more problematic than vessels operated alone or with relatively few trusted crew members. Certain surveyed commercial and for-hire captains mentioned that, as the pandemic took hold, and as understanding of viral transmission improved, they began fishing with the smallest number of crew members possible, hoping to minimize the possibility of infection while retaining some level of productivity.⁹

Based on survey results, at an average of nearly three crew members per commercial harvest vessel, crew size for this sector is greatest in the Gulf of Mexico. At nearly 2.26 persons, crew size among for-hire vessels is greatest in the Caribbean. While crew sizes typify fishing operations in the study regions, certain commercial vessels call for a larger number of crew members onboard. For instance, scallop operations in the Mid-Atlantic region typically involve numerous line workers, since shucking is done by hand at sea.

⁹ Such strategies were and remain commonplace among respondents. But it should be noted that it can be difficult to maintain productivity in certain fisheries without sufficient crew—with potentially serious implications for those who do participate during the pandemic. See Addetia et al. (2020) and (Doughton, 2020) for more detail about these difficulties.

Table 2.5 Crew employment in the commercial harvest and for-hire sectors*

| Region | Mean Number of Employed Crew Members | | | valid <i>n</i> overall |
|----------------|--------------------------------------|-----------------------|------------------------------------|------------------------|
| | Commercial | For-Hire | Respondents Active in Both Sectors | |
| Caribbean | 1.24 (<i>n</i> =350) | 2.26 (<i>n</i> =23) | 1.86 (<i>n</i> =7) | 380 |
| Gulf of Mexico | 2.84 (<i>n</i> =178) | 1.66 (<i>n</i> =291) | 1.38 (<i>n</i> =63) | 532 |
| Mid-Atlantic | 1.44 (<i>n</i> =145) | 1.30 (<i>n</i> =198) | 1.28 (<i>n</i> =74) | 417 |
| New England | 2.24 (<i>n</i> =51) | 1.16 (<i>n</i> = 50) | 1.27 (<i>n</i> =30) | 131 |
| South Atlantic | 1.48 (<i>n</i> =105) | 1.36 (<i>n</i> =155) | 1.31 (<i>n</i> =42) | 302 |
| Across Regions | 1.84 (<i>n</i> =829) | 1.55 (<i>n</i> =717) | 1.42 (<i>n</i> =216) | 1,762 |

*Based on the question “How many crew/employees do you currently employ on all your vessels combined (not including yourself)?”

2.1.2 Initial Pandemic Impacts on Regional Commercial and For-Hire Fishery Sectors

Based on discussions with survey respondents, the pandemic initially generated large-scale fishery impacts across the study regions. That is, most survey participants reported at least some operational effects during the initial months of the virus and pandemic (Table 2.6). Given the resulting loss of revenue in the near-term, and potential loss of future business clients, cessation of for-hire fishing activities is clearly among the most significant of such impacts. These were reported as having occurred at least once during the first six months of the pandemic across all regions (Table 2.7). As can be noted in Table 2.8, problems endured throughout this period, and the vast majority of all respondents accordingly reported major reductions in fishing activity, compared to the same time frame in 2019.

Table 2.6 Commercial and for-hire operators reporting pandemic impacts*

| Region | % Commercial Harvesters Reporting Impacts | % For-Hire Operators Reporting Impacts | % Respondents Active in Both Sectors Reporting Impacts | valid <i>n</i> overall |
|----------------|---|--|--|------------------------|
| Caribbean | 94.2 (<i>n</i> =379) | 100 (<i>n</i> =23) | 100 (<i>n</i> =7) | 409 |
| Gulf of Mexico | 93.7 (<i>n</i> =221) | 97.8 (<i>n</i> =318) | 98.5 (<i>n</i> =66) | 605 |
| Mid-Atlantic | 81.6 (<i>n</i> =188) | 89.5 (<i>n</i> =235) | 92.0 (<i>n</i> =87) | 510 |
| New England | 87.9 (<i>n</i> =65) | 86.7 (<i>n</i> =58) | 97.2 (<i>n</i> =36) | 159 |
| South Atlantic | 81.7 (<i>n</i> =142) | 90.4 (<i>n</i> =173) | 91.7 (<i>n</i> =48) | 363 |
| Across Regions | 87.8 (<i>n</i> =995) | 92.8 (<i>n</i> =807) | 95.8 (<i>n</i> =244) | 2,046 |

*Based on the question “Has your fishing operation been affected by the COVID-19 pandemic?”

Table 2.7 Commercial and for-hire harvesters ceasing operations due to the pandemic*

| Region | % Commercial Harvesters Who Stopped Fishing | % For-Hire Operators Who Stopped Fishing | % Respondents in Both Sectors Who Stopped Fishing | valid <i>n</i> overall |
|----------------|---|--|---|------------------------|
| Caribbean | 80.6 (<i>n</i> =356) | 91.3 (<i>n</i> =23) | 100.0 (<i>n</i> =7) | 386 |
| Gulf of Mexico | 88.3 (<i>n</i> =201) | 88.1 (<i>n</i> =311) | 95.4 (<i>n</i> =65) | 577 |
| Mid-Atlantic | 79.2 (<i>n</i> =150) | 89.3 (<i>n</i> =204) | 86.1 (<i>n</i> =11) | 365 |
| New England | 77.6 (<i>n</i> =58) | 82.7 (<i>n</i> =52) | 85.3 (<i>n</i> =34) | 144 |
| South Atlantic | 83.9 (<i>n</i> =112) | 86.9 (<i>n</i> =158) | 93.2 (<i>n</i> =44) | 314 |
| Across Regions | 81.9 (<i>n</i> =877) | 87.6 (<i>n</i> =748) | 92.0 (<i>n</i> =161) | 1,786 |

*Based on the question “Did you stop fishing (operating) for any period of time due to the COVID-19 pandemic?”

Table 2.8 Reductions in fishing activity during the first six months of the pandemic*

| Region | % Reduction in Commercial Harvesting | % Reduction in For-Hire Fishing | % Reduction among Respondents in Both Sectors | valid <i>n</i> overall |
|----------------|--------------------------------------|---------------------------------|---|------------------------|
| Caribbean | -61.7 (<i>n</i> =348) | -81.3 (<i>n</i> =23) | -78.6 (<i>n</i> =7) | 378 |
| Gulf of Mexico | -59.0 (<i>n</i> =183) | -51.0 (<i>n</i> =295) | -51.1 (<i>n</i> =60) | 538 |
| Mid-Atlantic | -52.0 (<i>n</i> =140) | -58.2 (<i>n</i> =200) | -55.6 (<i>n</i> =7) | 347 |
| New England | -44.9 (<i>n</i> =54) | -62.9 (<i>n</i> =49) | -64.8 (<i>n</i> =31) | 134 |
| South Atlantic | -48.7 (<i>n</i> =103) | -38.0 (<i>n</i> =155) | -52.0 (<i>n</i> =42) | 300 |
| Across Regions | -53.3 (<i>n</i> =828) | -52.3 (<i>n</i> =722) | -60.4 (<i>n</i> =147) | 1,697 |

*Based on the question “On a scale of 0% to 100%, at what level of fishing activity are you operating now in comparison to June/July of last year (2019)?”

Table 2.9 below provides insight into the operational effects of the pandemic among respondents involved in the harvest of marine resources around the study regions. The most commonly reported problems among the commercial harvest and for-hire fleets involved a reduction in the number of fishing trips taken during the initial months of viral transmission in the U.S. Such reductions obviously generated a range of economic difficulties for the participants.

Supply chain problems are also indicated here, as is the reported need of Caribbean-based participants to find alternative seafood buyers. The latter problem might be expected, given the close linkage between island economies and the tourism industry, which was heavily impacted by travel restrictions during initial and subsequent months of the pandemic. Travel to and from coastal tourist destinations was limited in all study regions during this period, and thus patronage of hotels, restaurants, and bars declined precipitously. This, in turn, disrupted formerly reliable economic connections between commercial harvesters, seafood dealers, and restaurateurs. Linkages between hotel owner-operators, and owners and operators of deep-sea and inshore or nearshore charter fishing businesses were similarly disrupted at this time.

The category termed “Other Effects” or “Other Factors” as provided in subsequent tables relates to the nature of the survey instrument, which encouraged discussion of additional impacts and effects of perceived importance to respondents. Coding and analysis of such open-ended responses is being undertaken to expand understanding of the full range of pandemic challenges initially encountered by fishing and seafood business owners and operators in the study regions.

Table 2.9 Initial fishing-specific effects of the pandemic*

| Type of Effect/Impact on Fishing Operations | % of Respondents Reporting Specific Pandemic Impacts by Region | | | | | |
|---|--|---------------------------------|-------------------------------|------------------------------|---------------------------------|----------------------------|
| | Caribbean Region <i>n</i> =417 | Gulf of Mexico <i>n</i> =583 | Mid-Atlantic <i>n</i> =443 | New England <i>n</i> =146 | South Atlantic <i>n</i> =318 | Overall <i>n</i> =1,907 |
| Had to Shift to Different Fisheries | 8.6 | 4.3 | 9.0 | 10.3 | 7.2 | 7.3 |
| Had to Find New Markets | 30.9 | 8.1 | 14.0 | 15.1 | 12.6 | 15.7 |
| Had to Reduce Number of Trips | 81.5 | 85.4 | 66.6 | 66.5 | 73.6 | 76.9 |
| Had Problems Finding Bait | 19.9 | 18.0 | 16.7 | 17.8 | 15.1 | 17.6 |
| Had Problems Finding Supplies† | 19.4 | 30.9 | 21.7 | 23.3 | 30.8 | 25.6 |
| Other Effects | 40.8 | 36.2 | 45.4 | 40.4 | 39.9 | 40.3 |

*Based on the question “How were your normal business operations affected by the COVID 19 pandemic compared to the same time period last year (January-June 2019), even if only temporarily? (check all that apply)”

†Including fishing gear, ice, parts, and other elements essential to commercial and for-hire fishing operations.

Business owners or operators in both the commercial harvest and for-hire sectors also weighed in on which pandemic-generated factors had the greatest effect on their fishing operations during the first months of the event in the U.S. (Table 2.10). Factors deemed by respondents to be particularly impactful across the regions include: (a) government restrictions that tend to incorporate requisite health and safety measures; (b) various seafood marketing and pricing problem, and, with regard to the for-hire component of the sample; and (c) a lack of patrons able or willing to go fishing with a guide or charter captain and crew during the initial months of the pandemic.

Table 2.10 Principal pandemic-related factors impacting commercial and for-hire operations*

| Factors Impacting Fishing Operations | % of Commercial Harvesters and For-Hire Operators Reporting Factor as Most Impactful | | | | | |
|--------------------------------------|--|---------------------------------|-------------------------------|------------------------------|---------------------------------|----------------------------|
| | Caribbean Region <i>n</i> =418 | Gulf of Mexico <i>n</i> =575 | Mid-Atlantic <i>n</i> =435 | New England <i>n</i> =138 | South Atlantic <i>n</i> =312 | Overall <i>n</i> =1,878 |
| Government Restrictions | 71.8 | 64.5 | 57.0 | 52.9 | 59.6 | 62.7 |
| Lack of Charter Patrons | 19.1 | 63.3 | 46.4 | 42.8 | 55.1 | 46.7 |
| No Seafood Buyers | 71.1 | 34.3 | 38.9 | 43.5 | 29.8 | 43.5 |
| Implementing Health/Safety Measures | 49.5 | 39.5 | 24.8 | 21.7 | 33.0 | 35.9 |
| Low Seafood Prices | 19.6 | 24.5 | 24.8 | 39.1 | 17.0 | 23.3 |
| Instructed Not to Fish by Dealer | 14.8 | 18.8 | 14.9 | 18.8 | 13.1 | 16.1 |
| Loss of Crew | 4.3 | 5.6 | 6.4 | 9.4 | 6.1 | 5.9 |
| Crew not Available | 3.1 | 7.0 | 4.4 | 8.0 | 5.4 | 5.3 |
| Other Factors | 25.8 | 18.3 | 17.2 | 13.8 | 18.3 | 19.4 |

*Based on the request “Choose the top three COVID 19 pandemic factors that have had the largest impact on your business.”

Tables 2.11 and 2.12 below address the issue of diminishing fisheries-related employment opportunities during the first months of the pandemic. Importantly, only eight respondents, or under one-half of one percent of 1,812 participants responding to this question, reported any increase in the number of crew or other employees since the pandemic started. Most business owners and operators reported no change in number of employees. In other words, hiring was essentially frozen during the first months of the event, with roughly one-quarter of businesses reporting a decline in the number of workers who could be kept on the payroll. As seen in Table 2.12, an average of 1.75 employees per respondent lost their jobs, at least temporarily, during the first six months of the pandemic.

Table 2.11 Employment patterns during the first six months of the pandemic*†

| Region | Commercial Harvesters | | For-Hire Operators | | Respondents Active in both Sectors | |
|----------------|-----------------------|----------------------|-----------------------|----------------------|------------------------------------|----------------------|
| | % Reporting No Change | % Reporting Decrease | % Reporting No Change | % Reporting Decrease | % Reporting No Change | % Reporting Decrease |
| Caribbean | 72.9 | 25.7 | 52.2 | 47.8 | 71.4 | 28.6 |
| | (n=358) | | (n=23) | | (n=7) | |
| Gulf of Mexico | 65.2 | 28.4 | 82.6 | 13.5 | 70.3 | 29.7 |
| | (n=191) | | (n=299) | | (n=64) | |
| Mid-Atlantic | 71.9 | 24.2 | 75.0 | 21.6 | 70.9 | 24.1 |
| | (n=147) | | (n=198) | | (n=76) | |
| New England | 77.2 | 22.8 | 68.6 | 29.4 | 70.6 | 29.4 |
| | (n=57) | | (n=51) | | (n=34) | |
| South Atlantic | 70.0 | 27.3 | 89.3 | 10.1 | 76.7 | 23.3 |
| | (n=109) | | (n=159) | | (n=43) | |
| Across Regions | 70.9 | 26.1 | 80.1 | 17.1 | 71.8 | 26.4 |
| | (n=859) | | (n=729) | | (n=224) | |

*Based on the question: “Has the number of crew/employees changed because of the COVID 19 pandemic?”

†Valid *n* overall=1,812. Note: Only eight (.4%) of an overall sample of 1,812 respondents reported any increase in employment during the period of interest; as such, a distribution of increase is not reported here.

Table 2.12 Crew members/employees released during the initial months of the pandemic*†

| Region | Mean Reduction in Number of Crew or other Employees | | | |
|----------------|---|--------------------|------------------------------------|------------------------------|
| | Commercial Harvesters | For-Hire Operators | Respondents Active in Both Sectors | Avg. overall/ valid <i>n</i> |
| Caribbean | 1.01 (n=91) | 1.11 (n=9) | 1.00 (n=2) | 1.04 (n=102) |
| Gulf of Mexico | 2.13 (n=48) | 2.26 (n=38) | 1.56 (n=18) | 1.98 (n=104) |
| Mid-Atlantic | 2.26 (n=32) | 1.44 (n=41) | 1.67 (n=15) | 1.79 (n=88) |
| New England | 1.54 (n=13) | 2.47 (n=15) | 2.00 (n=8) | 2.00 (n=36) |
| South Atlantic | 1.77 (n=26) | 2.31 (n=16) | 1.78 (n=9) | 1.95 (n=51) |
| Across Regions | 1.74 (n=210) | 1.91 (n=119) | 1.60 (n=52) | 1.75 (n=381) |

*Based on the question “How many fewer people have you employed compared to the first two quarters of 2019?”

†Among those captains or owners reporting changes in employee status; counts of responding harvesters are provided in parentheses (valid *n* overall=425).

As noted previously, existing patterns of social and economic interaction within and between commercial fishing and seafood processing and distribution sectors were seriously disrupted during the first six months of the pandemic. This, in turn, relates to linkages between fishery sectors and the larger economy and society, obviously also compromised in various ways. Far fewer citizens were eating at restaurants or traveling during this time frame. This was detrimental both for eating establishments and the seafood businesses that normally provide the products. While it might be anticipated that retail seafood operations would begin to see an increase in business activity as more people ate at home during the first months of the pandemic, this did not clearly offset revenue losses observed during the period.

As can be seen in Tables 2.13 through 2.15 below, less than one-half of one percent of survey participants reported any gain in fishing revenue above that accrued during the same (non-pandemic) time period in 2019. Indeed, almost the entire sample of persons involved in commercial or charter fishing across the study region reported a loss of revenue during the initial months of the pandemic. Notably, the average percentage loss of revenue exceeded 60 percent for the overall sample when compared to the same time period in 2019. Average dollar losses per respondent were also extensive among all groups in all regions. The relatively smaller dollar loss among the Caribbean sectors is reflective of: (a) the artisanal nature of many fishing operations in the U.S. Caribbean, and (b) differences between community economies in the Caribbean region and coastal economies in the continental U.S.

Table 2.13 Changes in commercial fishing revenue six months into the pandemic*

| Region | % of Sample Reporting Lost Revenue | Average % Decrease in Revenue | Average Dollar Loss per Harvester† |
|---------------------------------|------------------------------------|-------------------------------|------------------------------------|
| Caribbean (<i>n</i> =295) | 99.7 | 63.1 | \$6,940 (<i>n</i> =245) |
| Gulf of Mexico (<i>n</i> =170) | 99.4 | 56.7 | \$65,796 (<i>n</i> =103) |
| Mid-Atlantic (<i>n</i> =133) | 99.8 | 57.0 | \$54,806 (<i>n</i> =82) |
| New England (<i>n</i> =49) | 100.00 | 52.1 | \$87,597 (<i>n</i> =33) |
| South Atlantic (<i>n</i> =93) | 99.9 | 53.4 | \$30,685 (<i>n</i> =62) |
| Across Regions (<i>n</i> =740) | 99.7 | 56.4 | \$49,164 (<i>n</i> =525) |

*Based on the questions: (a) “By what percent would you say your revenues have decreased compared to the same time period last year (January – June 2019)?” and (b) “Can you estimate your decrease in revenue for the same period?”

†For average dollar loss, *n* is the number of respondents who could and did estimate lost fishing revenue.

Table 2.14 Changes in for-hire fishing revenue six months into the pandemic*†

| Region | % of Sample Reporting Lost Revenue | Average % Decrease in Revenue | Average Dollar Loss per Harvester† |
|---------------------------------|------------------------------------|-------------------------------|------------------------------------|
| Caribbean (<i>n</i> =23) | 100.0 | 81.6 | \$36,000 (<i>n</i> =18) |
| Gulf of Mexico (<i>n</i> =290) | 99.9 | 59.2 | \$48,997 (<i>n</i> =215) |
| Mid-Atlantic (<i>n</i> =168) | 99.9 | 61.9 | \$22,939 (<i>n</i> =108) |
| New England (<i>n</i> =78) | 100.0 | 61.3 | \$23,865 (<i>n</i> =32) |
| South Atlantic (<i>n</i> =141) | 99.9 | 56.1 | \$26,604 (<i>n</i> =97) |
| Across Regions (<i>n</i> =700) | 99.9 | 61.6 | \$31,681 (<i>n</i> =470) |

*Based on the questions: (a) “By what percent would you say your revenues have decreased compared to the same time period last year (January - June 2019)?” and (b) “Can you estimate your decrease in revenue for the same period?”

†For average dollar loss, *n* is the number of respondents who could and did estimate lost fishing revenue.

Table 2.15 Revenue change among respondents active in both sectors*

| Region | % of Sample Reporting Lost Revenue | Average % Decrease in Revenue | Average Dollar Loss per Harvester† |
|---------------------------------|------------------------------------|-------------------------------|------------------------------------|
| Caribbean (<i>n</i> =9) | 100.0 | 81.4 | \$60,000 (<i>n</i> =2) |
| Gulf of Mexico (<i>n</i> =60) | 100.0 | 59.1 | \$43,070 (<i>n</i> =30) |
| Mid-Atlantic (<i>n</i> =69) | 99.9 | 60.7 | \$37,190 (<i>n</i> =42) |
| New England (<i>n</i> =30) | 100.0 | 65.4 | \$9,488 (<i>n</i> =16) |
| South Atlantic (<i>n</i> =37) | 100.0 | 59.6 | \$38,370 (<i>n</i> =27) |
| Across Regions (<i>n</i> =205) | 100.0 | 65.2 | \$37,623 (<i>n</i> =117) |

*Based on the questions: (a) “By what percent would you say your revenues have decreased compared to the same time period last year (January - June 2019)?” and (b) “Can you estimate your decrease in revenue for the same period?”

†For average dollar loss, *n* is the number of respondents who could and did estimate lost fishing revenue.

Loss of revenue was almost universal among respondents in the commercial harvest and for-hire sectors both in and across the study regions. Yet, rates of application for and receipt of financial assistance were relatively low during the first six months of the pandemic. With the exception of respondents in the Caribbean and Gulf of Mexico portions of the overall sample, more than half of respondents had not requested assistance during this period. The most commonly requested form of assistance was noted among Caribbean-based respondents, nearly 37 percent of whom reported having requested unemployment benefits early in the event.

Table 2.16 Receipt of financial assistance during the first six months of the pandemic*

| Type of Assistance | % of Respondents Receiving Assistance | | | | | |
|---------------------------|---------------------------------------|---------------------------------|-------------------------------|------------------------------|---------------------------------|----------------------------|
| | Caribbean Region <i>n</i> =418 | Gulf of Mexico <i>n</i> =575 | Mid-Atlantic <i>n</i> =435 | New England <i>n</i> =138 | South Atlantic <i>n</i> =311 | Overall <i>n</i> =1,877 |
| Private Bank Loans/Credit | 1.2 | 2.6 | 3.4 | 5.8 | 3.9 | 2.7 |
| SBA Loans | .7 | 21.7 | 10.6 | 18.8 | 15.1 | 12.7 |
| Paycheck Protection | 2.2 | 17.2 | 7.8 | 17.4 | 7.7 | 10.1 |
| Unemployment Benefits | 39.2 | 12.5 | 14.5 | 14.2 | 10.9 | 18.9 |
| Other Forms of Assistance | 21.8 | 11.5 | 9.7 | 5.1 | 7.7 | 12.3 |
| No Assistance Requested | 28.2 | 50.6 | 68.3 | 55.1 | 66.9 | 52.7 |

*Based on the request “Please indicate if this business has received loans/financial assistance from any of the following since January 2020 (check all that apply).”

Disaster situations are known to generate profound social and psychological impacts among persons who are dependent on the harvest of natural resources (cf. Béné et al., 2015). Various mechanisms can be used to help people cope with such major life disruptions in fishing-oriented communities. These include important mediating social connections, such as family, friends, church, and community (Clay et al., 2016). The pandemic may be seen as a type of disaster that

disrupts normal ways of life and commerce on a protracted basis, with the potential for a variety of lingering problems.

Table 2.17 below depicts some of the important social and economic means survey respondents initially used to cope with the pandemic and associated challenges. Notably, a majority of respondents reported that personal savings were used to address emerging problems and challenges. The value of coping through interaction with family and friends is also made clear in the table, as it is in Table 2.18. Here, the data reveal that personal savings, family and friends, and government assistance were almost universally chosen, in that order, as most helpful for addressing pandemic-related problems during the first months of its appearance in the study regions.

Table 2.17 Coping mechanisms used by commercial and for-hire respondents*

| Type of Coping Mechanism | % of Respondents Utilizing Select Coping Mechanisms | | | | | |
|------------------------------------|---|---------------------------------|-------------------------------|------------------------------|---------------------------------|----------------------------|
| | Caribbean Region <i>n</i> =418 | Gulf of Mexico <i>n</i> =575 | Mid-Atlantic <i>n</i> =434 | New England <i>n</i> =138 | South Atlantic <i>n</i> =311 | Overall <i>n</i> =1,876 |
| Personal Savings | 52.2 | 69.0 | 53.7 | 60.1 | 59.2 | 59.4 |
| Family & Friends | 54.1 | 55.0 | 45.9 | 47.1 | 55.3 | 52.1 |
| Government Assistance | 36.6 | 22.3 | 12.0 | 12.3 | 14.1 | 21.0 |
| Other Mechanisms | 14.4 | 9.7 | 17.7 | 14.5 | 16.7 | 14.1 |
| Church and Community Groups | 11.2 | 15.3 | 8.8 | 8.7 | 16.7 | 12.6 |
| Employees or Crew Members | 1.9 | 8.7 | 11.1 | 5.8 | 7.4 | 7.3 |
| Fishing Associations, Cooperatives | 3.1 | 7.3 | 7.6 | 10.9 | 7.1 | 6.7 |

*Based on the question “What has helped you cope with the effects of the COVID 19 pandemic? (Check all that apply).”

Table 2.18 Coping mechanisms most helpful to commercial and for-hire respondents*

| Region | % Distribution of Top 3 Coping Mechanisms | | |
|-----------------------------------|---|-------------------|--------------------------|
| | 1. Personal Savings | 2. Family/Friends | 3. Government Assistance |
| Caribbean (<i>n</i> =412) | 52.4 | 54.3 | 36.8 |
| Gulf of Mexico (<i>n</i> =574) | 69.0 | 55.0 | 22.3 |
| Mid-Atlantic (<i>n</i> =430) | 53.7 | 45.9 | 12.0 |
| New England (<i>n</i> =136) | 60.1 | 47.1 | 12.3 |
| South Atlantic (<i>n</i> =309) | 59.2 | 55.3 | 14.1 |
| Across Regions (<i>n</i> =1,861) | 58.8 | 51.6 | 19.5 |

*Based on the question “Which has been the most helpful in coping with the effects of the COVID-19 pandemic?”

2.2 Seafood Processing and Distribution Sectors

Persons involved in the commercial harvest sector are, in business terms, often highly reliant on various seafood businesses. These include processing firms, wholesale and retail markets and marketing businesses, and firms that specialize in the distribution of seafood products. This section of the report describes the results of survey work with samples of persons involved in this dimension of the industry in each study region.

2.2.1 Characteristics of the Sample

As indicated in Table 2.19, the overall sample is fairly evenly distributed between seafood dealers, first receivers, and wholesalers; and persons who undertake these tasks in conjunction with seafood processing. Given that owners and operators in the overall seafood business sector characteristically provide multiple services, relatively few survey respondents reported involvement in processing only. Most respondents in the overall sector report extensive business experience (Table 2.20). Average years of experience range from nearly 17 years in the Caribbean to nearly 32 years in the Gulf of Mexico. Certain firms in each region have been operating for many years beyond the average, while a few have only recently been established. Total years of operation range from 1 to 88 years across the overall sample. Percentages in the tables are followed by valid sample sizes for each region and overall.

Table 2.19 Type of seafood business in which the respondent is presently engaged*†

| Region | Type of Business in the Processing and Distribution Sector | | | valid <i>n</i> |
|----------------|--|-------------------|-------------------------------|----------------|
| | % Dealers/First Receivers/Wholesalers | % Processors Only | % Both Dealers and Processors | |
| Caribbean | 51.1 | 2.1 | 46.8 | 47 |
| Gulf of Mexico | 60.8 | 1.5 | 35.7 | 199 |
| Mid-Atlantic | 46.9 | 9.4 | 34.4 | 32 |
| New England | 70.1 | 3.0 | 26.9 | 67 |
| South Atlantic | 56.6 | 2.6 | 36.8 | 76 |
| Across Regions | 59.4 | 2.6 | 35.6 | 421 |

*Based on the question “What kind of business do you engage in?”

†Percentages relate to regional and overall totals—not including respondents who preferred not to answer.

Table 2.20 Respondent’s average years of experience with seafood business*

| Region | Average Years of Experience with Business | valid <i>n</i> |
|----------------|---|----------------|
| Caribbean | 16.5 | 46 |
| Gulf of Mexico | 26.2 | 197 |
| Mid-Atlantic | 31.9 | 36 |
| New England | 28.4 | 66 |
| South Atlantic | 26.4 | 77 |
| Across Regions | 26.0 | 422 |

*Based on the question “How many years of experience do you have with this business?”

Table 2.21 below depicts the broad regions in which owners and/or operators of the sampled businesses market and distribute their seafood products. The survey reveals that the majority of such persons market within their home state or territory. This includes the Caribbean region, where all respondents reported localized marketing and distribution only. A fairly consistent percentage of respondents in other regions also distribute to national markets. With the exception of respondents in the New England region, 23% of whom distribute to international markets, relatively few business owners or operators transact outside the U.S.

Table 2.21 Areas where respondents market seafood products*

| Region | Area(s) Where Seafood is Marketed* | | | valid <i>n</i> |
|----------------|------------------------------------|--------------|-------------------|----------------|
| | % One State/Territory | % Nationally | % Internationally | |
| Caribbean | 100 | 0.0 | 0.0 | 47 |
| Gulf of Mexico | 68.0 | 32.5 | 7.4 | 203 |
| Mid-Atlantic | 61.1 | 38.9 | 8.3 | 36 |
| New England | 50.7 | 42.0 | 23.2 | 69 |
| South Atlantic | 68.4 | 34.2 | 5.3 | 76 |
| Across Regions | 68.2 | 31.3 | 8.8 | 431 |

*Based on the question “Where do you market your product? – (Check all that apply)”

Table 2.22 below reports on current employments trends within and across the samples. As can be noted here, firms in the Caribbean and South Atlantic are, on average, relatively small, while Gulf-, Mid-Atlantic-, and New England-based processors and distributors are larger by comparison. This is especially true for the New England sample, for which the average base of employees is nearly 17 persons.

Table 2.22 Number employees by processor and distributors early in the pandemic*

| Region | Average Number of Employees (as of late-summer 2020) | valid <i>n</i> |
|----------------|---|----------------|
| Caribbean | 3.3 | 46 |
| Gulf of Mexico | 8.5 | 170 |
| Mid-Atlantic | 9.5 | 32 |
| New England | 16.8 | 60 |
| South Atlantic | 3.8 | 53 |
| Across Regions | 8.6 | 361 |

*Based on the question “How many full-time/part-time people do you currently employ on-site (not including yourself)?”

2.2.2 Initial Pandemic Impacts in the Seafood Processing and Distribution Sectors

Various broadly implemented strategies intended to diminish transmission of the virus during the early months of the pandemic unavoidably generated major impacts to fishing fleets across the regions of interest. This naturally translated to a range of effects among firms in the seafood processing and distribution sectors.

Given limited alternative marketing options and major impacts to the tourism industry in the U.S. Virgin Islands and Puerto Rico, a particularly large percentage of respondents reported having ceased operations at least once due to the pandemic in the Caribbean fishery management region

(Table 2.23). A much smaller percentage of business owners and/or operators stopped working in the Mid-Atlantic region, suggesting a greater number of marketing options and ongoing demand for products in that region. Such variability notwithstanding, nearly half of all respondents reported ceasing operations at least once during the first six months of the pandemic.

Table 2.23 Processing and distribution firms ceasing operations due to the pandemic*

| Region | % of Business Owners Stopping Operations Due to the Pandemic | valid <i>n</i> |
|----------------|--|----------------|
| Caribbean | 87.0 | 46 |
| Gulf of Mexico | 48.1 | 187 |
| Mid-Atlantic | 25.0 | 32 |
| New England | 41.3 | 63 |
| South Atlantic | 49.1 | 57 |
| Across Regions | 49.9 | 385 |

*Based on the question “Did you have to close your business operations at all due to the COVID-19 pandemic?”

Such problems are also well-reflected in Table 2.24 below. Here readers may note major reductions of overall business activity in all study regions as a result of the pandemic. Average reductions in business range from 67% in the Caribbean to 39% in the Mid-Atlantic. Reductions in processing- and distribution-specific business activity exceed 50% when considered in relation to the overall sample.

Table 2.24 Average reduction in seafood business activity six months into the pandemic*

| Region | Average Reduction in Business Activity | valid <i>n</i> |
|----------------|--|----------------|
| Caribbean | -67.1% | 45 |
| Gulf of Mexico | -51.8% | 176 |
| Mid-Atlantic | -39.4% | 32 |
| New England | -45.0% | 58 |
| South Atlantic | -52.4% | 54 |
| Across Regions | -51.6% | 365 |

*Based on the question “On a scale of 0% to 100%, at what level of business activity are you operating now in comparison to June/July of last year (2019)?”

A variety of factors appear to underlie reported changes in business activity during the initial months of the pandemic. Respondent perspectives on this issue are presented in Table 2.25 below. As can be seen in the table, surveyed business owners or operators consistently reported that marketing and sales problems were highly impactful to the firm in question. While government restrictions stemming from the pandemic may be seen as more of a causal force than an impact per se, nearly 58% of all respondents reported this as one of the three most significant factors affecting their businesses. Implementation of health and safety measures and seafood pricing problems were also commonly reported as having exerted a major impact on seafood business activity across the study regions.

Table 2.25 Principal factors affecting seafood businesses early in the pandemic*

| Factors Impacting Operations | % of Respondents Reporting Factor as Most Impactful | | | | | |
|-------------------------------------|---|---------------------------------|------------------------------|-----------------------------|--------------------------------|--------------------------|
| | Caribbean Region <i>n</i> =47 | Gulf of Mexico <i>n</i> =188 | Mid-Atlantic <i>n</i> =31 | New England <i>n</i> =61 | South Atlantic <i>n</i> =56 | Overall <i>n</i> =383 |
| Government Restrictions | 87.2 | 60.1 | 41.9 | 44.3 | 48.2 | 57.7 |
| No Markets or Buyers | 78.7 | 83.0 | 77.4 | 80.3 | 75.0 | 80.4 |
| Implementing Health/Safety Measures | 68.1 | 35.1 | 22.6 | 23.0 | 25.0 | 34.7 |
| Low Prices for Seafood | 12.8 | 43.6 | 25.8 | 49.2 | 42.9 | 39.2 |
| Loss of Employees | 21.3 | 24.5 | 16.9 | 14.8 | 10.7 | 19.8 |
| Other Factors | 12.8 | 18.1 | 19.4 | 21.3 | 17.9 | 18.0 |

*Based on the request “Please choose the top three COVID-19 pandemic factors that have had the largest impact on your business.”

As indicated in Table 2.26 below, a pressing issue for respondents is one that indicates the importance of strong supply chain linkages between commercial harvesters, seafood processors and distributors, and seafood buyers. Without well-functioning restaurants and retail businesses, processor-distributors and harvesters are stymied. When formerly well-established and prospective new buyers are diminished by an event like the pandemic, the overall industry suffers in economic terms. As noted earlier, home consumption of seafood does not appear to have compensated for business lost through sales to restaurants during the initial months of the pandemic.

Part of the problem, at least in certain parts of the study regions during the early days of the event, may relate to a lack of local seafood products available for sale. This, in turn, may be seen as an effect of the rudimentary constraints caused by pandemic disease. These include rules and guidelines for limiting spread of the virus, and the reluctance of fishermen to risk interaction with crew, processors, buyers, marketers, and others in this linked system. A reasonable hypothesis here is that such reluctance would eventually diminish if and as masking and physical distancing are recognized as effective response strategies, and as the need for income exceeds any persisting risk involved. Subsequent research into harvesters’ responses to the situation later in the pandemic may or may not bear out this assertion in reality.

Table 2.26 Impacts to seafood business operations resulting from the pandemic*

| Type of Impact | % of Respondents Reporting Change in Operation (valid <i>n</i> =390) | | | | | |
|--------------------------------------|--|----------------|--------------|-------------|----------------|---------|
| | Caribbean Region | Gulf of Mexico | Mid-Atlantic | New England | South Atlantic | Total % |
| Reduced Sales to Restaurants, Retail | 95.7 | 73.4 | 87.9 | 79.4 | 78.0 | 78.9 |
| Reduced Operations/Hours | 59.6 | 57.4 | 33.3 | 54.0 | 40.7 | 52.6 |
| Lack of Local Product to Sell | 80.9 | 37.8 | 9.1 | 28.6 | 20.3 | 36.4 |
| Reduced Export Opportunities | 4.3 | 13.3 | 9.1 | 33.3 | 11.9 | 14.9 |
| Reduced Importation | 10.6 | 8.0 | 9.1 | 14.3 | 3.4 | 8.7 |
| Other Impacts | 8.5 | 24.5 | 21.2 | 28.6 | 18.6 | 22.1 |

*Based on the question “How were your normal business operations affected by the COVID 19 pandemic compared to the same time period last year (January-June 2019), even if only temporarily (check all that apply)?”

As can be seen in Table 2.27 below, at the six-month mark of the pandemic, almost 44% of respondents in the seafood processing and distribution sectors were reporting that they had to lay off at least some of their employees in order to keep their businesses viable. There is little notable variation in the situation across the overall sample. Respondents based in the Gulf of Mexico reported losing the greatest number of employees compared to the period in 2019, with some ten persons losing their job on average (valid *n*=82; Table 2.28 below). Nearly seven persons lost their jobs on average across the full sample. Very few respondents reported hiring additional employees, though a small number of firms in the New England and Mid-Atlantic regions reported adding eleven and six workers on average, respectively. Ostensibly, such persons were hired to meet shifting demand for specific seafood products (possibly scallops) in the regional or other marketplace.

Table 2.27 Status of employment six months into the pandemic*

| Region | % Reporting No Change in Number of Employees | % Reporting Increased Number of Employees | % Reporting Decreased Number of Employees | valid <i>n</i> |
|----------------|--|---|---|----------------|
| Caribbean | 56.5 | 0 | 43.5 | 46 |
| Gulf | 47.9 | 2.1 | 45.7 | 188 |
| Mid-Atlantic | 57.6 | 9.1 | 33.3 | 33 |
| New England | 43.5 | 11.3 | 40.3 | 62 |
| South Atlantic | 44.8 | 3.4 | 48.3 | 58 |
| Across Regions | 48.6 | 4.1 | 43.9 | 387 |

*Based on the question “Has the number of full-time/part-time on-site employees changed because of the COVID-19 pandemic?”

Table 2.28 Change in employees on payroll six months into the pandemic*†

| Region | Average Number of Workers Added | Average Number of Workers Lost | valid <i>n</i> |
|----------------|---------------------------------|--------------------------------|----------------|
| Caribbean | 0.0 | 1.75 | 20 |
| Gulf | 3.5 | 10.14 | 82 |
| Mid-Atlantic | 6.33 | 3.50 | 13 |
| New England | 11.29 | 3.83 | 30 |
| South Atlantic | 5.0 | 2.73 | 28 |
| Across Regions | 7.63 | 6.50 | 173 |

*Based on the questions “How many more people have you employed (compared to the first two quarters of 2019)?” and “How many fewer people have you employed (compared to the first two quarters of 2019)?”

†Among those business owners or operators reporting changes in employee status.

Table 2.29 below elucidates the intense economic dampening effect of the pandemic on seafood processing and distribution firms across the study regions. Very few respondents reported any gain in revenue during the first six months of the event, and the vast majority reported revenue losses. The reported percentage decreases in revenue are consistent and extensive, ranging from a 43% loss on average in the mid-Atlantic region to a nearly 59% loss on average in the South Atlantic. These figures translate to considerable loss in dollars within and across the regions, with a \$581,410 loss reported on average. Relatively low values reported by Caribbean-based respondents are in large part indicative of the relative value of the dollar in this distinct island region and economy.

Table 2.29 Changes in business revenue during the first six months of the pandemic*†

| Region | % Reporting Revenue Gains | % Reporting Revenue Losses | Average % Decrease in Revenue | Average Dollar Loss per Business |
|----------------|---------------------------|----------------------------|-------------------------------|----------------------------------|
| Caribbean | 2.2 | 93.5 | 56.3 | \$28,517 (<i>n</i> =39) |
| Gulf of Mexico | 6.4 | 88.2 | 54.3 | \$911,735 (<i>n</i> =101) |
| Mid-Atlantic | 12.5 | 84.4 | 43.4 | \$626,684 (<i>n</i> =18) |
| New England | 8.1 | 85.2 | 51.6 | \$525,689 (<i>n</i> =31) |
| South Atlantic | 3.4 | 93.1 | 58.5 | \$162,654 (<i>n</i> =26) |
| Across Regions | 6.2 | 88.8 | 54.0 | \$581,410 (<i>n</i> =215) |

*Based on the questions “By what percent would you say your revenues have increased compared to the same time period last year (January - June 2019)?” and “By what percent would you say your revenues have decreased compared to the same time period last year (January - June 2019)?” and “Can you estimate your decrease in revenue for the same period?”

†Valid *n* here represents the number of respondents providing information regarding revenue changes, including estimated loss of revenue in dollars.

An important consideration in systematic response to disaster by participants in the nation’s marine fisheries is the degree to which seafood businesses are financially prepared for disruptions in the business cycle. Notable in Table 2.30 below is the extent to which business owners and/or operators were prepared to continue operating during the pandemic by tapping into savings, or by acquiring loans or other forms of financial assistance. Although a varying percentage of respondents in this sector reported an entire lack of buffering, most indicate needing upwards of one month of fiscal resources to deal with the situation. This is indicative of

some level of resilience during the initial months of the event. On the other hand, it suggests major problems ahead for businesses whose owners are not financially well-equipped to deal with pandemic problems in the long-term—particularly since the event continued to worsen after the six-month mark.

Table 2.30 Cash-on-hand as a buffer against pandemic impacts*

| Time Period Covered | % of Respondents Reporting Cash-on-Hand Coverage | | | | | |
|---------------------|--|---------------------------------|------------------------------|-----------------------------|--------------------------------|--------------------------|
| | Caribbean Region <i>n</i> =39 | Gulf of Mexico <i>n</i> =101 | Mid-Atlantic <i>n</i> =18 | New England <i>n</i> =31 | South Atlantic <i>n</i> =26 | Overall <i>n</i> =215 |
| 1-7 Days | 6.5 | 7.0 | 3.4 | 5.0 | 11.1 | 6.9 |
| 1-2 Weeks | 6.5 | 13.9 | 10.3 | 10.0 | 14.8 | 12.2 |
| 3-4 Weeks | 6.5 | 15.0 | 20.7 | 18.3 | 9.3 | 14.1 |
| 1-2 months | 28.3 | 12.3 | 20.7 | 25.0 | 18.5 | 17.8 |
| 3 + Months | 39.1 | 15.5 | 24.1 | 25.0 | 14.8 | 20.5 |
| No Buffer | 4.3 | 12.8 | 10.3 | 8.3 | 20.4 | 12.0 |

*Based on the question “How would you describe the current availability of cash-on-hand for this business, including any financial assistance or loans? Currently, cash on hand will cover: (select only one).”

Problems are further indicated in Table 2.31 below, which reveals that 20% of respondents missed a scheduled payment following arrival of the virus in the U.S. during January 2020.

Table 2.31 Percent of processor and distribution firms missing payments *†

| Region | % of Respondents Reporting Payment Status† | | |
|----------------|--|--------------------------------|----------------|
| | <i>Have Missed Payment</i> | <i>Have Not Missed Payment</i> | valid <i>n</i> |
| Caribbean | 32.6 | 67.4 | 46 |
| Gulf | 19.1 | 73.4 | 188 |
| Mid-Atlantic | 20.0 | 80.0 | 30 |
| New England | 16.4 | 73.8 | 61 |
| South Atlantic | 17.9 | 80.4 | 56 |
| Across Regions | 20.2 | 74.3 | 381 |

*Based on the question “Since January 2020, has this business missed any scheduled payments due to the COVID-19 pandemic?”

†Figures do not include those respondents who preferred not to answer.

As of pandemic month-six, relatively few seafood business owners reported having received forms of financial assistance that could improve their response to the event (Table 2.32 below). Some regional variation can be noted, however, especially as regards application to the Paycheck Protection Program. As part of the Coronavirus Aid, Relief, and Economic Security Act (the CARES Act of 2020), the program offers direct incentives for small businesses to keep workers on payroll. The program is administered by the Small Business Administration.¹⁰ Of note, while relatively few seafood business owners or operators in the Caribbean and South Atlantic regions reported using this form of assistance, it was being used more widely in other regions at the time the survey.

¹⁰ SBA will forgive the loans if all employee retention criteria are met, and if the funds are used for eligible expenses. The loans are administered with an interest rate of one percent.

Table 2.32 Financial assistance sought by seafood processing and distribution firms*

| Type of Assistance | % of Harvester-Respondents Receiving Assistance by Type | | | | | |
|---------------------------|---|---------------------------------|------------------------------|-----------------------------|--------------------------------|--------------------------|
| | Caribbean Region <i>n</i> =47 | Gulf of Mexico <i>n</i> =188 | Mid-Atlantic <i>n</i> =31 | New England <i>n</i> =61 | South Atlantic <i>n</i> =56 | Overall <i>n</i> =383 |
| Paycheck Protection | 12.8 | 36.7 | 38.7 | 60.7 | 19.6 | 35.2 |
| No Assistance Requested | 42.6 | 35.1 | 32.3 | 18.0 | 50.0 | 35.2 |
| SBA Loans | 4.3 | 26.6 | 25.8 | 23.0 | 19.6 | 22.2 |
| Unspecified Assistance | 21.3 | 7.4 | 3.2 | 11.5 | 14.3 | 10.4 |
| Private Bank Loans/Credit | 2.1 | 4.3 | 6.5 | 21.3 | 12.5 | 8.1 |

*Based on the request “Please indicate if this business has received loans or other financial assistance from any of the following since January 2020 (check all that apply).”

As discussed in the previous section of this memorandum, various social and economic mechanisms are available to assist persons affected by the pandemic and other disaster situations. Table 2.33 below depicts reported use of such mechanisms among those active in the seafood processing and distribution sectors around the study regions. Once again, family and friends, personal savings, and government assistance are deemed by participants to be particularly important means for addressing pandemic-induced problems.

Table 2.33 Coping mechanisms in the seafood processing and distribution sector*

| Type of Coping Mechanism | % of Respondents Utilizing Various Coping Mechanisms | | | | | |
|--------------------------|--|---------------------------------|------------------------------|-----------------------------|--------------------------------|--------------------------|
| | Caribbean Region <i>n</i> =47 | Gulf of Mexico <i>n</i> =188 | Mid-Atlantic <i>n</i> =31 | New England <i>n</i> =61 | South Atlantic <i>n</i> =56 | Overall <i>n</i> =383 |
| Family & Friends | 40.4 | 58.5 | 54.8 | 55.7 | 50.0 | 54.3 |
| Personal Savings | 14.7 | 56.9 | 29.0 | 50.8 | 62.5 | 49.3 |
| Government Assistance | 23.4 | 25.0 | 22.6 | 34.4 | 16.1 | 24.8 |
| Employees at the Firm | 6.4 | 28.2 | 9.7 | 29.5 | 10.7 | 21.7 |
| Church, Community | 21.3 | 17.0 | 9.7 | 11.5 | 14.3 | 15.7 |
| Industry Associations | 19.1 | 9.0 | 6.5 | 19.7 | 17.9 | 13.6 |
| Other Mechanisms | 6.3 | 8.0 | 12.9 | 9.8 | 8.9 | 8.6 |

*Based on the question “What has helped you cope with the effects of the COVID-19 pandemic? (Check all that apply).”

The results of the survey rating exercise depicted in Table 2.34 below produced the same basic results as above. That is, family and friends were most commonly reported as the principal coping mechanism being used by seafood processors, dealers, and distributors during the initial months of the pandemic. This was followed by personal savings and government assistance. These results differ from the results of survey work with commercial and for-hire participants who generally indicated that personal savings, rather than family and friends, was most helpful in coping with the pandemic. This difference is not readily explained, based on available survey data.

Table 2.34 Coping mechanisms most helpful to seafood processors and distributors*

| Region | % Distribution of Top 3 Coping Mechanisms | | |
|---------------------------------|---|----------------------------|---------------------------------|
| | <i>1. Family/Friends</i> | <i>2. Personal Savings</i> | <i>3. Government Assistance</i> |
| Caribbean (<i>n</i> =47) | 40.4 | 14.9 | 23.4 |
| Gulf of Mexico (<i>n</i> =181) | 59.0 | 58.5 | 25.7 |
| Mid-Atlantic (<i>n</i> =24) | 55.6 | 33.3 | 22.2 |
| New England (<i>n</i> =59) | 55.9 | 52.5 | 35.6 |
| South Atlantic (<i>n</i> =53) | 50.9 | 61.8 | 16.4 |
| Across Regions (<i>n</i> =364) | 52.2 | 44.2 | 24.7 |

*Based on the question “Which has been the most helpful in coping with the effects of the COVID-19 pandemic?”

3. Interim Conclusions

Based on results emerging from NOAA Fisheries' initial round of survey work, designed to assess operational impacts resulting from the COVID-19 pandemic, the early months of the event clearly were challenging for commercial harvesters, for-hire operators, and seafood business owners across the study regions. The survey indicates that initial pandemic impacts were many and extensive, both within and across study sectors and regions. By eliciting and describing initial effects across numerous fishery management regions, the work also begins to clarify the process and implications of rapid macro-economic change for domestic fisheries as a whole.

3.1 The Ongoing Nature of the Pandemic Response and Shifting Effects on Fisheries

Pandemic disease, stay-at-home orders, and business closures had profound economic implications for participants in the nation's marine fisheries early in the pandemic. Given widespread initial uncertainty about the virus, emergency response measures, such as shut-down orders, were logical and undoubtedly saved lives. Yet it should also be noted that science-based literature underscores the utility of well-planned holistic response to respiratory disease pandemics (see Homeland Security Council, 2005; Centers for Disease Control and Prevention, 2014; Sim et al., 2014). Importantly, such response strategies include universal masking and physical distancing at the level of the community.

But challenges related to physical distancing and the wearing of masks, or the failure to employ these measures, continued to impact many industries around the nation during the first months of the pandemic. Marine fishery sectors were no exception, since virtually all dimensions of commercial and for-hire fishing, and the operation of seafood processing and distribution firms, normally involve close-proximity interactions between participants and/or between participants and their customers. Examples include: (a) numerous harvesters working on small commercial fishing vessels; (b) line workers interacting in seafood processing plants; (c) workers preparing and selling seafood in retail markets; and (d) captains, mates, and patrons fishing from small charter vessels or large head boats. Each of these situations involving close-proximity interactions are at once normal and, in the absence of sufficient mitigation strategies during the pandemic, potentially dangerous to those involved. Although fishery participants have the options of distancing and masking, observation in coastal communities around the U.S. during the first months of the pandemic made clear that such steps were not universally undertaken. This situation changed somewhat as public health messages became increasingly consistent across the states during the summer months of 2020. However, based on observation of fisheries in coastal communities along the East and Gulf coasts, adherence to preventive measures onboard continued to be sporadic into the autumn and early winter months of 2020.

As indicated by the survey described here, a miniscule number of respondents were able to maintain the previous year's degree of earned revenue. Early periods of economic shock dramatically reduced income across the regions. It may be noted, however, that a few harvesters interviewed during the survey did report that they had adapted successfully to diminishing restaurant sales during the spring and summer months of 2020. Such persons state that they took

advantage of shifting opportunities in the retail sales sector, as Americans increasingly ate at home during early periods of lockdown and uncertainty. Similarly, a very small number of seafood wholesalers and dealers reported having found themselves well-positioned to respond to heightened demand for seafood in the nation's retail and wholesale markets. Whether such exceptional situations were sustained as the pandemic worsened dramatically in October 2020 and beyond remains to be seen. The survey-based work of Smith et al. (2020) suggests that commercial harvesters in the Northeast U.S. adapted during the initial months of the pandemic by: (a) identifying new markets; (b) shifting attention to different species; (c) supplementing income with other work and with government relief monies; and even (d) ceasing fishing and related investment until conditions improved.

Challenges abound across the commercial and for-hire fishing and seafood industries in the U.S. Direct impacts of the pandemic notwithstanding, it is important to recognize that business operations associated with marine fisheries are conducted in challenging biophysical and socioeconomic contexts that are continually in flux. In the case of commercial fisheries: the act, effort, and cost of fishing; processing and distribution arrangements; and the status of support sector supply chains, are but a few of the factors business owners and operators must consider and address even in the best of times. For-hire fishing is similarly challenging, with ongoing needs for effective marketing and the clear desirability of providing patrons with an enjoyable fishing trip even in the absence of a good catch, which itself is unpredictable.

Indeed, the ability of commercial harvesters and for-hire operators to succeed over time is never assured. This relates to the changing nature of harvestable marine resource populations and the need for fishery participants to effectively respond to changes at the level of the ecosystem—defined here to include not only the changing ocean environment, but also the human histories, competitive pressures, and policies and economies that are integral parts and drivers of such systems. Introduction of new micro- and macro-level challenges, such as the need for commercial harvesters, charter operators, visiting anglers, administrators of seafood businesses, line workers, and other participants to wear masks and maintain appropriate distance in any given fishery, and the massive societal and economic impacts of a highly transmissible disease and efforts to contain it, undoubtedly have profound implications for such systems-in-motion.

3.2 Analytical Considerations

The work described in this report should be seen as science-in-progress. From a methodological perspective, and with regard to project findings to date, it is worth noting that this phase of work does not examine interaction between pandemic impacts and other sources of change to domestic marine fisheries. Nor does it fully examine regional variabilities. It is enough at this juncture to begin to document and examine pandemic impacts with a broad brush. Yet, such interactions and variabilities are important to clearly understand. For instance, numerous commercial and for-hire participants in Puerto Rico and the U.S. Virgin Islands lost their vessels during the 2017 hurricane season and no longer fish for a living. Others continue fishing on boats owned by fellow harvesters in extended family and community settings. The hurricanes radically altered the social and economic configuration of fishing as it was undertaken in 2017, and the new configuration is now being altered by the pandemic. At the same time, many local fishermen frequently complain that pelagic fish stocks are not as abundant near the islands as in years past, and that their businesses were suffering prior to both the hurricanes and the pandemic.

While this is seen by many fishery participants as a distinct natural resource problem, it is now linked in cumulative fashion to problems stemming from the 2017 storms, and now the pandemic. Future analysis may seek to unravel some of this complexity in this and other regions.

3.2.1 Linkages and Implications for Fisheries

It is a profound, if obvious, fact that trends in marine fisheries and seafood transactions are closely linked to national economic trends and to the behaviors of the population at-large. The early months of the current pandemic in the U.S. were characterized by much uncertainty about the nature of the virus, including its degree of transmissibility, prospective means for diminishing its spread, and its actual potential for causing morbidity and mortality in and across the nation's urban and rural populations. When proven public health measures such as quarantining, distancing, and shut-downs were established and implemented in this national context of uncertainty, normal patterns of social and economic activity, including those associated with fishing and the seafood industry, began to be disrupted. Given that rules and guidelines were developed and implemented by each state, such disruption occurred unevenly across states and specific localities within the states and territories. This study makes clear both the profound nature of pandemic impacts on marine fisheries in the U.S., and some of the regional variability in the manifestation of such effects during the initial six months of the event in the U.S.

3.2.2 The Future

Rates of morbidity and mortality resulting from the COVID-19 pandemic rose sharply in the U.S. during the months following implementation of the survey described in this report. Escalation of this root problem can be seen clearly in the Centers for Disease Control graphic below. Based on the fishery-specific initial effects of the pandemic and the intricate manner in which fisheries are linked to national and regional economies, problems and challenges for participants in the commercial harvest, for-hire, and seafood processing and distribution sectors of the industry can be expected to expand and multiply. The full nature of such linkages, epidemiological and behavioral factors associated with infection or avoidance thereof, and the implications of changing rates of infection and mitigation measures for those who produce seafood are not yet clearly known. But these and other factors clearly present important areas for scientific inquiry. How industry participants react to so many challenges, and whether they can adapt productively in an overall setting in which rates of viral infection initially far surpassed those of other nations, remain uncertainties best examined through further research and ongoing monitoring of the sectors and regions of interest.

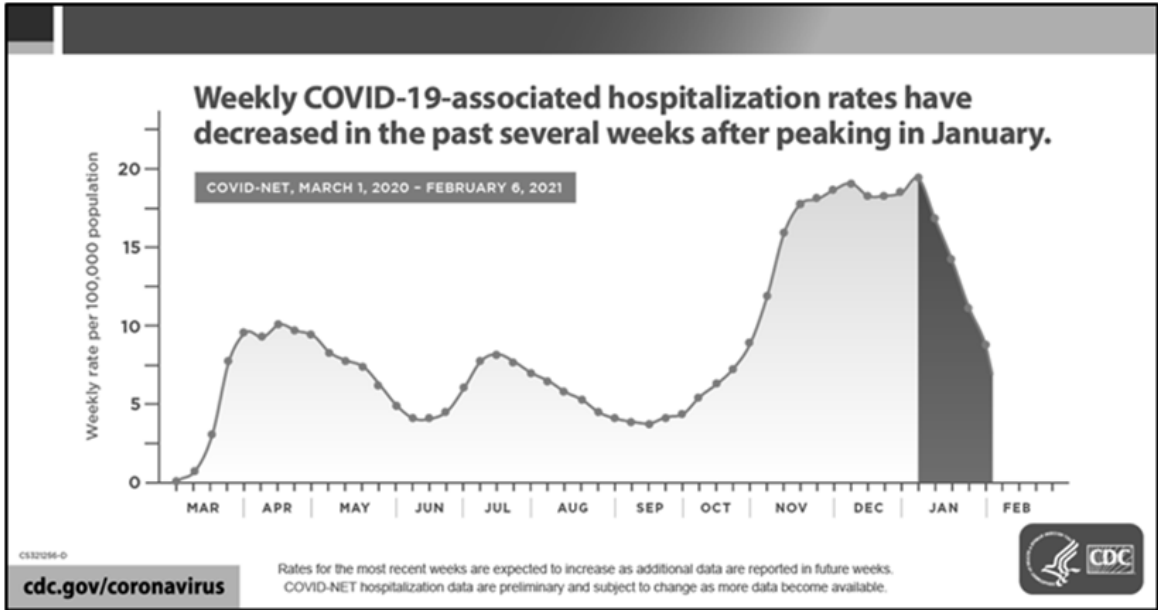


Figure 2. Rates of hospitalization due to COVID-19 as of early February, 2021.

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