



## **NERRS Collaborative Shrimper Interview Summary**

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Between February and May 2023 Georgia and South Carolina Sea Grant staff conducted semi-structured interviews with 12 commercial shrimpers based in Georgia and South Carolina. The interviews aimed to gather input on their observations and perceptions of shrimp harvest and effort trends within the context of changing environmental conditions in the South Atlantic region. Interview participants were selected based on their geographic location and shrimping experience, previous engagement with Sea Grant staff, or by being recommended by others in the industry. Participation was voluntary, and interviewees were offered a \$100 stipend for taking the time to conduct the interviews. All interviews were conducted in person and recorded using portable recorders. Interview conversations were transcribed using Otter.ai software. Below is a summary of input received by the shrimpers.

Home ports of the interviewed shrimpers ranged from St. Marys, Georgia to McClellanville, South Carolina. Other home ports included Brunswick, Darien, Townsend, Valona and Savannah Georgia and St. Helena, South Carolina. All interviewed participants were white males. Participant's experience working in the shrimp industry ranged from 10 years to over 50 years with a cumulative time of over 370 years. Eight of the 12 interviewed shrimpers were currently captains or co-captains and owners of a shrimp vessel (2 of these individuals also owned or co-owned docks or processing and retail facilities). The remaining four participants were currently captains of shrimp vessels.

Six participants indicated they primarily shrimp within the state and/or federal waters of their home port state, while the other six indicated they will travel to other states depending on the time of year. Shrimping locations extended from the Outer Banks, North Carolina to Cape Canaveral, Florida. Shrimping activities in North Carolina typically take place in mid to late summer for brown shrimp and/or fall for white shrimp. Shrimping activities in Florida typically occur in late fall through early spring for white shrimp. For those that stay within their home state and/or federal waters in South Carolina and Georgia, the typical seasons are spring roe shrimp, summer brown shrimp and fall white shrimp.

Interview participants provided a number of reasons for why they shrimp the locations they do; Those who primarily shrimp in the state/federal waters of their home state indicated they like being “closer to home” due to family, their age, or age of their vessel, fuel costs, consumers demand, or convenience and personal preferences. Respondents willing to travel beyond their home port states indicated a desire to catch the biggest and most shrimp per market demands. Being more strategic in choosing where to go or not to go was a common sentiment shared by many of the participants from both states.

### **Environmental Changes**

A number of observed environmental changes were referenced by the shrimpers in both states. Warmer, milder winters were the most prevalent change mentioned, although not unanimous, and observations of this change spanned from the late 1990’s to ‘the past few years’. Some participants commented that this phenomenon was a discernable trend, while others referenced it as just being cyclical. One shrimper from South Carolina indicated they remember Thanksgiving traditionally being colder in the past. A shrimper in Georgia remembered ice being fairly common on boat decks (and his beard) in winter months during the 1970s. Several shrimpers from both states also commented that the waters where they shrimp are getting warmer in general and summer temperatures also seem to be hotter than in past years.

*“It seems like that melt your face off days or more often,”-Georgia shrimper*

Knowledge of commercial quantities of shrimp in the Virginia and Chesapeake Bay region and increased shark interactions were also mentioned by more than half of the interviewees. Many of the participants’ observations regarding changes in habitat tended to be fairly localized. For example, observations of ‘shifting bottoms’ were mentioned in both states, but pertained to specific locations (ex: Tybee, Jekyll and Saint Simons Islands and Sandy Point). One South Carolina shrimper discussed changes in water flow and diverting fresh water up in the Santee River basin, as well as how dredging affects flow and saltwater intrusion further upstream. Similar comments were made by a Georgia shrimper in reference to Bird Island being built in Saint Simons Sound in the early 2000s and affecting water flow where he shrimps. He further commented on seeing a decline of conch in the area since this time.

*“Seems like things have changed for shrimp migration. Up North, a lot of shrimp come down now, in the Chesapeake and all that, I can’t remember that before...maybe they’ve been there the whole time but now with the warmer waters they’re coming out where we can catch them.”*  
– South Carolina shrimper

A few interviewees from each state have observed more extreme events in recent years such as rainfall, tides, storms and fronts. In particular, a shrimper who fishes around the Georgia/South Carolina line referenced August and September being when he observed these conditions the most often. However, other shrimpers said they have not observed much change in rainfall or tides; in fact, one individual commented that there has been a lack of rain where he shrimps and another commented that the tide comes to the same spot as it always has. Another conflicting observation was presence of fog. One shrimper in Georgia referenced observing less fog than in the past, while another commented on fog showing up earlier and staying longer than he remembers in the past.

Observations in bycatch changes also varied. Some participants referenced catching fewer whiting and blue crab in Georgia than they remember historically (one referenced this probably being the result of TEDs and BRDs) while another said he caught more crabs in the past few years than he ever has seen before. A South Carolina shrimper mentioned an increase in bycatch of spot and croaker where he fishes, while another commented that he hasn't observed much change in bycatch, but that at certain times of the year, it can get worse than at other times. Finally, one shrimper referenced observing declines in salt marsh vegetation, but commented this was more in north Florida than in Georgia and South Carolina. A South Carolina shrimper also referenced a general decline in natural resources (i.e. shrimp, crabs, fish, etc.) where he has fished over the past several decades.



### **Changes in Shrimp**

As with general environmental conditions, shrimpers from both states referenced various observations relating to changes in shrimp abundance, size, and/or timing of arrival.

All 12 shrimpers interviewed indicated that the brown shrimp they catch appears to be smaller and don't grow as much as they remember in previous years. Most, but not all the interviewees also agreed they see fewer brown shrimp than in the past too. While the arrival of brown shrimp seemed to be on par with historical observations (end of May through July), shrimpers in both states, particularly in South Carolina referenced a shorter presence of brown shrimp. A Georgia shrimper also mentioned that switching out to flat nets to catch brown shrimp in the summer was

once common for many shrimpers, but he personally had not done this since 2012 because of how few brown shrimp that he sees in the summer.

*“Our brown shrimp used to be pretty much a staple in the summertime; now they show up very small and are only around for two or three weeks and they never grow; It used to be up into August catching brown shrimp but for the last 3-4 years August you pretty much stay tied up because no shrimp and plenty of sharks” -South Carolina shrimper*

When the shrimpers started observing the changes in brown shrimp varied. Observations from Georgia participants ranged from the early 1990s (specifically after sounds were closed) until the ‘last three to four years’; similarly, the timeline from the South Carolina shrimpers ranged from the late 1990s until the ‘last three to four years.’ Not all participants gave specific sizes, but several shrimpers in both states referenced 31-35 to 26-30 count shrimp as the largest size of brown shrimp they have observed anymore. Some commented not seeing any brown shrimp bigger than 40/50 count size. In comparison, a Georgia shrimper commented he used to catch 21-25 count headed brown shrimp in the 1970s and 1980s.

*“...we used to catch brown shrimp in the summer but we don’t catch any no more...and the size, we used to catch big brown shrimp but now they’re so small...” –South Carolina Shrimper*

In terms of roe white shrimp, April was often mentioned as the ‘normal’ time when Georgia shrimpers start targeting them, particularly in Georgia and northeast Florida. This is the case for South Carolina shrimpers as well who note that the most productive time of year for roe season April-June. Several participants, though, mentioned that with recent warmer, milder winters, they are seeing roe shrimp show up earlier (March was referenced by several interviewees) and stay longer. One shrimper commented that the past few years of abundance of white shrimp at the end of the previous fall seasons combined with warmer winters have resulted in a good roe shrimp season for his crews. Other shrimpers made comments that besides roe shrimp showing up earlier, they seem to be present more throughout the year. A few Georgia shrimpers referenced catching more roe shrimp into the fall than they remember in the past. This observation also aligns with statements made by other Georgia shrimpers that they no longer have ‘distinct seasons’ (i.e., spring roe shrimp, summer brown shrimp, and fall white shrimp) like they remember historically. Several participants referenced the seasons being more ‘mixed up’ particularly between roe shrimp and brown shrimp although this was not an observation shared by everyone interviewed.

Several Georgia interviewees also mentioned that in the past few years their fall white shrimp seemed to be more mixed in size than in the past. They said traditionally they’d catch more uniform sized white shrimp as the fall progressed, but noticed they are having to separate out various sizes even later into the year. Others also mentioned that the fall white shrimp have not grown as much as they remember in recent years; one shrimper said they seem to be ‘one count size off’. Similarly, a South Carolina interviewee said their fall white shrimp seem to be staying a similar size composition too, rather than growing larger.

The most common fall white shrimp observation referenced by the South Carolina shrimpers was a shift in timing of their arrival. While one shrimper acknowledged ‘year is different’ he and

others commented they don't start catching white shrimp until October and November. Many said that September used to be one of their best months in term of abundance but now 'quite often September is a sorry month.'

While a few interviewees said they are catching more shrimp now than in the past or that shrimp populations (at least in Georgia, South Carolina and Florida as compared to North Carolina) seem to be 'doing well', a majority of interviewees from both states mentioned they feel shrimp populations have declined overall where they shrimp and/or that they are catching less shrimp than they remember historically especially when there were more people working in the industry.

*"When I first started shrimping there was a bunch of boats here in Beaufort County and even when there were a lot of boats everybody was catching shrimp...so you would think that now that boats are gone there would be a lot more shrimp to catch and yet that's not the way it is...there's less shrimp around now than there was back then when there was a fleet of boats here 20-25 years ago."* -South Carolina shrimper

Finally, while they didn't mention shrimp populations as a whole, several interviewees, particularly from Georgia referenced local sites (ex: a specific channel or shoal) that historically were productive shrimping locations, but in the past several years now hold little to no shrimp.



## Observations of Black Gill Disease

Most of the interviewed shrimpers' observations about shrimp black gill (BG) disease align fairly well with what is known in the scientific community; that it tends to be more visibly observable during warmer periods (June through August) and begins to subside as temperatures begin to cool down in the fall. Some Georgia shrimpers commented on seeing visible black gill as early as May in recent years, which has also been observed by UGA researchers and both Georgia and South Carolina DNR.

*"Look warmer weather. Yeah, well, we've have milder winters. So the warmer weather comes around sooner. The black gill shows up sooner with warmer weather."* -Georgia shrimper

First remembrance of seeing BG ranged from the early to mid-1990s (one specifically said soon after the sounds were closed in Georgia) through the early 2000s. Some interviewees have observed visible BG in roe white shrimp, but generally in very low quantities. In addition, several, but not all interviewees report seeing BG in the brown shrimp they catch ranging from low to moderate amounts. One South Carolina shrimper mentioned he doesn't remember seeing BG in brown shrimp when he first started observing the condition, but now sees it in both white and brown shrimp. One Georgia shrimper mentioned seeing it in the tiger shrimp he has caught too.

Interviewees from both states referenced seeing more progressive BG in smaller white shrimp ('pinky size') in the August and September time period as they begin to make their way out of the sounds. However, observations differed as to the intensity of BG observed at any one time. Some interviewees have seen BG in over 90% of their catch at a time in some years, while in other years, only approximately 40% of their catch appeared to have visible BG. Several Georgia interviewees commented that they didn't think BG has been as bad in the past two years compared to previous years. Two of the South Carolina shrimpers made similar comments, while others mentioned its intensity being worse where they shrimp. However, it was acknowledged that in some years 'entire crops' can be wiped out during this period. In fact, several of the South Carolina shrimpers referenced BG as a major reason why they are not seeing as many shrimp in September as in the past. As with the Georgia shrimpers, several South Carolina interviewees who primarily fish in state waters in late summer and early fall also mentioned the relationship between high densities of small white shrimp coming out of creeks and sounds during this time period with higher observations of BG. Furthermore a South Carolina participant commented that if BG is going to kill off the shrimp anyway, managers should consider allowing some kind of limited harvest in the sounds before this happens as a way to better support those still working in the industry.

*"I think it's because there are so many shrimp in the sounds, in the rivers and stuff, it's chalk block full and they ain't got nowhere to feed off of."* -Georgia shrimper

*"September used to be the best month, but in the last decade or so with black gill disease, the first crop of September is almost non-existent; it isn't until October-January now when they get a good spring spawned crop."* -South Carolina shrimper

Shrimpers from both states reported seeing less BG the further they move away from the shore. There was a sentiment that the shrimp that make it out into the ocean are able to rid themselves of BG, or 'get clean'; the survivors are the ones that make up the fall white shrimp crop. Interestingly, some interviewees also said intensity of BG seems to be worse during times when there is more rainfall, while others referenced it being worse when there are drier conditions. Finally, when mentioning the increased observance of roe white shrimp throughout the shrimp season, one shrimper theorized that they are 'stretching out their lifecycle' to counteract the impacts of BG.

### **Changes in Shrimping Operations**

Several common themes arose from interviewees in both states when asked how, if at all, they have had to change their operation in recent years. Interviewees generally agreed that local markets are increasingly favoring larger shrimp than in the past. Several commented that they used to not have any problem selling smaller brown or white shrimp, but that it has become a significant challenge getting suitable prices for them anymore, especially in the past four to five years.

*"Right now the way it's getting in this industry, if you don't have a shrimp that, with the head off, a 31-35 or better, it's kind of not even worth messing with."* -Georgia shrimper

*"It's more of a peddler's market, more of direct sales, so I always steer towards catching bigger shrimp because that's what my customers want."* -Georgia shrimper

In fact, many interviewees commented they have 'given up on brownies' based on the smaller sizes and lower quantities they encounter, and the prices they typically get for them. One shrimper in Georgia mentioned they used to send their small brown (and white) shrimp to Louisiana to be processed, but this largely stopped after Hurricane Katrina destroyed several processing facilities there. He and others referenced there not being adequate peel and devein operations locally that could help alleviate some of the cost burdens for the smaller shrimp being caught. It should be noted though that the shrimpers who do direct sales commented that they are still able to sell the brown shrimp they catch in many cases and have some customers that actually prefer these smaller shrimp.

Interviewees from both states referenced the growing economic importance of the spring roe shrimp season to their operation. Where once the fall white shrimp season was a primary source of income (and brown shrimp were considered a summertime staple) for many shrimpers, several interviewees mentioned that now the spring roe season holds the most economic importance to them given they can get more money for these larger shrimp.

*"[I] can remember back when a young man, roe shrimp in the spring, if you caught any at all, it was a bonus, you didn't count on them at all; Now, people rely on maybe 40% of their income from roe shrimp."* -South Carolina Shrimper

*"[I] could have kept fishing past Feb, but at dock for maintenance reasons; had to make time to stop; didn't want risk missing roe season this year; that's the money maker."* -Georgia Shrimper

Georgia interviewees mentioned the issue of smaller brown shrimp being pushed overboard when mixed in with catches of larger roe shrimp (often late May and June). Some interviewees commented they will have crews pick them up if they can get money for them, but their focus is on the more valuable roe shrimp. One shrimper said he's seen crews end up pushing 'several baskets worth' over at a time, but this was to ensure they maintained the quality of the more valuable roe shrimp. Another captain commented, "A man can only do so much" referencing trying get the roe shrimp out of the mix with brownies in past few years. Working in hotter summer temperatures was also mentioned as a compounding factor in this decision. One participant mentioned he has had such good roe shrimp catches recently, he cut his own pay to bring another crew member on board to help deal with the volume of roe shrimp so they would not lesson their quality from prolonged exposure on the deck. Another interviewee mentioned they will often pick up and move to another location if they begin encountering larger quantities of brown shrimp, but it's not always possible.

Despite the increased importance of the spring roe shrimp season, it should be noted that the fall white shrimp is still important to shrimpers' operations. One Georgia shrimper mentioned, 'white shrimp is a blessing.' Many commented though that their most productive times tend to be later into the fall or even in early winter now when they are able to catch larger white shrimp. Shrimpers in both states referenced longer fishing seasons with the recent shifts to warmer and shorter winter periods. Shrimpers in each state mentioned catching marketable shrimp well into January the past few years, and some even referenced they already are or plan to start fishing through the entire winter instead of taking breaks as they historically did.

These changes lead to another common theme that emerged from the interviews; adaptability. Interviewees referenced the necessity of having to modify the way they fish to remain in the industry. Examples varied such as deciding to fish through the whole year with only short breaks, being willing to travel out of state to where the larger shrimp are or switching to direct marketing. Others commented they have had to change how they pay their crews (off the top rather than getting a percentage) in order to keep qualified help.

*"If you are going to be a successful fisherman you have to adapt just like anything else, just try to find a way to deal with it" -Georgia shrimper*

As with adaptability, several, but not all shrimpers from each state also discussed being more strategic in where and when they decide to shrimp these days compared to the past. This was particularly true in reference to rising fuel costs and market prices for the shrimp they catch. The concept of weighing risks and benefits in their decision-making process was often addressed. For example, one shrimper in Georgia said his fuel consumption is now higher due to the upgrades he made to his engine, but his productivity has also increased. A South Carolina interviewee said he and his crew will not go shrimping unless they know marketable shrimp are present; otherwise, they can't justify burning the fuel and not making a profit.

*"You have to risk it for the biscuit. It's fishing! A lot of reward to risk ratio... need to still remain financially ahead." -Georgia shrimper*

Finally, as previously mentioned, increased shark depredation was a common topic mentioned by many of the shrimpers throughout the interview process. A few interviewees referenced the increased financial burden of sewing damaged nets more often and the lost productivity from these interactions. One shrimper commented that he knows of shrimpers who have gotten away from using more common and expensive Spectra or Dyneema nets for traditional nylon webbing because of sharks. Because sharks are damaging even these more durable nets, shrimpers are deciding its not worth the investment and going with less expensive nets.



### **Decisions to Shrimp Based on Weather and Environmental Conditions**

Consistent with the theme of being more strategic when deciding to shrimp, all but two interviewees said they consider certain weather and/or environmental conditions when making these decisions. One of these two commented, “I don’t look for none of that. I go every day if I catch something. If I do, I still go the next day.” On the other hand, another shrimper said that 80% of his shrimping is based on weather conditions (part of this decision was based on safety reasons due to the age and size of his vessel).

Wind direction and speed, tidal stage and moon phase, water temperature, rain events, and clarity of water were factors mentioned by interviewees. It varied among interviewees regarding which factor, or combination thereof, results in the best shrimping conditions since it’s all based on personal experience and location. Nevertheless, there were some general observations shared by many of the participants in both states.

- Nor’easters tend to pull shrimp ‘off the beach ‘while western winds will pull shrimp closer to shore.
- Muddier waters tend to result in better shrimping than clearer waters.

- Bigger tides tend to result in better shrimping than smaller tides.
- Quick shifts in weather conditions such as temperature, winds, or rainfall can result in abrupt changes in catch levels.

Regardless of what condition(s) an interviewee preferred or didn't prefer, the importance of studying trends was often inferred. However, more than one seasoned shrimper mentioned that sometimes they will catch good shrimp in conditions when they wouldn't expect to and at other times, not catch much shrimp in conditions that typically result in larger amounts. Finally, when asked whether interviewees ever link winter weather conditions to how productive the upcoming season will be, there was broad consensus that a severe freeze or prolonged colder than normal temperatures will negatively impact the productivity of the upcoming roe shrimp season. However, no respondents made any connections between colder winter conditions and the productivity of the fall white shrimp season.

*“When you start to learn trends, and what's happening, when you had a good day, and you start noticing, and it takes years and years and years to do that. And a lot of people never figure it out, I've discovered.” -Georgia shrimper*

### **Resources to Help Inform Shrimpers about Weather and Environmental Conditions**

The majority of shrimpers interviewed rely on at least one electronic-based resource to help inform them about environmental conditions such as wind direction and speed, tides/moon phase or water temperatures where they shrimp. Mobile Apps, (ex: [FishWeather](#) , [Windy](#), [Wind Alert](#) , and [SailFlow](#)) websites (ex: [NOAA' National Weather Service Marine Forecast](#), [Grays Reef Buoy Data](#)) and/or computer programs were commonly referenced. Some also mentioned relying on TV, VHF, radar and/or their vessel's transducer to inform them about conditions. One shrimper commented that he simply “sticks his head out the window” to inform him about weather conditions.

### **Top Concerns as Shrimpers**

Shrimper responses from both states regarding their top three concerns today compared to 10 years ago were primarily related to socio-economic factors as opposed to strictly environmental ones. Many of these factors referenced are interrelated, have been ongoing, and often place additional stressors on the industry as a whole. For example, eight of the 12 respondents cited rising operating costs, specifically fuel prices as a major concern. Competition with imported shrimp was referenced by half of the respondents. Additional top concerns were stagnant prices for domestic shrimp, lack of available crew, and loss of critical infrastructure. Impacts from shark interactions, specifically damaged nets and lost productivity (lost product and time spent sewing) were also mentioned. A few shrimpers addressed general concerns about the industry not remaining viable in the future and increased difficulty of working in the industry (particularly trying to run a vessel and a dock). Only one shrimper referenced fewer available shrimp being one of his top concerns. This observation was also linked to shifting bottom habitats where he shrimped. Finally, another participant mentioned concerns regarding competing use of fishing grounds by offshore wind operations potentially coming to Georgia and northeast Florida.

*“It's just – expenses are so high, and you gotta get something for what you're selling but you just can't compete against real high fuel [costs] and not getting any [money] for your catch”  
– South Carolina Shrimper*

*“My biggest headache is crew because it takes a different type of person to want to anchor out 3-4 nights and so finding a crew to go along with the program is not always easy.”*

– South Carolina Shrimper

*“Seems to be taking turn for the worse with industry. Always saw boats in all main locations past 8 years, not a boat in sight. Can't even get a half of anyone on the radio.”*

-Georgia Shrimper

*“Never seen it where in Jan/Feb where you had big shrimp you couldn't get rid of it overnight. Everyone's got their freezers full”*

-Georgia shrimper (referencing impact of imported shrimp)

### **Concerns about Climate Change/ Changing Environmental Conditions**

Interviewed shrimpers' perspectives about climate change ranged from not believing it at all, acknowledging that changes are happening, but not being sure if it's caused by humans to fully accepting it as a human-influenced phenomenon. However, even among those who acknowledged changes were occurring, there was a general consensus that these changes were not major concerns to them. Some referenced climate change being 'outside their control' or something else they will adapt to, while others referenced more immediate concerns (i.e., fuel costs). One South Carolina shrimper indicated he was “more concerned with the amount of development of the estuaries and population growth than weather or climate change,” but acknowledged that there may be connections between the two factors.

*“I can't worry about something I can't control other than with my stewardship”*

-Georgia shrimper

*“Think it's something you gotta watch but you just have to learn to adapt to it”*

-South Carolina shrimper

### **How Researchers Can Provide More Useful Weather and Environmental Information**

Several shrimpers from both states commented they weren't sure if researchers could provide them with any new information regarding changing weather or environmental conditions. However, one Georgia shrimper mentioned that it would be beneficial to combine shrimp landings and environmental trends. *“Well, you know, if, if all that data is compiled, you know, water temperature and trends and stuff put down, it'd sure be nice to look at. I'd say like from the North Carolina, South Carolina, down to Florida. That would be, I mean, you know, to see what, it would be interesting to see how many pounds we caught that year and what happened that year.”*

Respondents from both states also mentioned that more research on BG, particularly, where it comes from, and the geographic movement of shrimp infected with BG should be conducted. One South Carolina shrimper further suggested the need for more sampling of 'estuary mud' for the presence of BG. Another added he'd like to know where the information goes and how it's used for the shrimp observer program. Several Georgia shrimpers asked for more information

about why brown shrimp don't seem to be growing as much as in the past as well as the geographic location of roe brown shrimp. One shrimper questioned the validity of Georgia DNR's Ecological Monitoring Survey Data. He asked how their sampling at set stations can provide accurate estimations when shrimp move so much according to environmental conditions, particularly wind direction. The same shrimper mentioned researchers should find more ways to help the local industry compete with foreign shrimp. One South Carolina shrimper commented about the relationship between increased ocean acidity and plankton production (in particular, jellyfish), and whether this could negatively impact shrimp production. More research on ways to mitigate shark damage was also suggested by several participants.

### **Best Ways for Researchers to Communicate with the Shrimp Industry**

Georgia participants commented that direct in-person communication, when possible, would be effective, particularly for older fishermen who either don't have email or don't check it. Conducting 'Dock talks' were one example given; Another suggested posting information in the offices of fish houses where many shrimpers pass. One shrimper encouraged active engagement of younger shrimper to help keep them engaged in these ongoing issues. Use of social media and UGA Marine Extension and Georgia Sea Grant shrimper listservs were mentioned as communication outlets. One shrimper indicated a lot more communication needs to happen. He also commented there is a high level of skepticism among many in the industry and that *"80% of shrimpers seem to think information like this project are being used against them."* Furthermore, he commented that many feel that their input 'fall on deaf ears' and that 'its like talking to nothing.'

South Carolina participants indicated that face to face interactions, email blasts, newsletters and Facebook would be the best ways for researchers to communicate this information to the shrimp industry. One participant also commented using National Fishermen as an outlet to share this information.

**Shrimper Semi-Structured Survey Questions**

<b>Topic Area/Guiding Questions</b>
<p><b><u>Introductions/Shrimping Experience</u></b></p> <p><i>After asking participant to introduce themselves (name and where they are from)</i></p> <ul style="list-style-type: none"> <li>• Tell me about your involvement with commercial shrimping in (GA/SC)               <ul style="list-style-type: none"> <li><u>Potential Prompts</u></li> <li>○ What is your favorite thing about shrimping?</li> <li>○ Where is your home port?</li> <li>○ How did you get into shrimping?</li> <li>○ What boat(s) do you work on/own/run?</li> <li>○ What role(s) have you had in the fishery (captain? striker? Boat owner?)</li> <li>○ What area(s) do you normally shrimp? Why do you fish these particular areas?</li> </ul> </li> </ul>
<p><b><u>Observed Changes in the Environment/Weather Conditions</u></b></p> <ul style="list-style-type: none"> <li>• What noticeable changes have you observed, if any, in the environmental conditions* and/or weather events where you shrimp?           <p><i>*Potential environmental conditions could include, but not be limited to: water temp, air temperatures, habitat shifts, salinity, winds, storms, seasonality, shark presence, changes in bycatch, habitat loss</i></p> <ul style="list-style-type: none"> <li><u>Potential Prompts</u></li> <li>○ What makes these changes different from what you have observed in the past?</li> <li>○ When did you start noticing these changes?</li> <li>○ Where have you seen these changes occurring? (<i>Rivers, sounds, nearshore/offshore, entire coast?</i>)</li> <li>○ Are these changes occurring year-round or just seasonally? If seasonally, when?</li> <li>○ What changes, if any, have you observed during the winter months?</li> <li>○ What have you heard from other shrimpers, if anything, about changing environmental/weather conditions?</li> </ul> </li> <li>• What do you think is contributing to these changes, and why?           <ul style="list-style-type: none"> <li><u>Potential Prompts</u></li> <li>○ Tell me your thoughts about a changing climate being a contributor to the environmental conditions you are observing</li> <li>○ What other factor(s) have you heard from shrimpers that you know, if any, about what may be responsible for these observed changes?</li> </ul> </li> </ul>
<p><b><u>Observed Changes in Shrimp Distribution, Abundance, Size and Conditions</u></b></p> <ul style="list-style-type: none"> <li>• Tell me what noticeable changes you have observed, if any, with the arrival, distribution and/or abundance of juvenile and adult shrimp you've encountered when shrimping           <ul style="list-style-type: none"> <li><u>Potential Prompts</u></li> <li>○ Have you noticed any differences in the white and/or brown shrimp populations where you shrimp? If yes, what specifically?</li> <li>○ How do these observations differ from what you've witnessed in the past?</li> <li>○ When do you first remember noticing these changes (year)?</li> </ul> </li> </ul>

- Since then, have these changes occurred consistently? Sporadically? Seasonally? Please explain.
  - Where have you noticed these changes occurring? (*Geographic scale: Rivers? Sounds? Near/offshore? Whole coast?*)
  - What, if any changes have you noticed about the size of shrimp you're catching throughout the year?
  - To your knowledge how are your observations similar or different from what you know other shrimpers have observed?
- Tell me what you are seeing in regard to Black Gill in the shrimp you catch?
    - Potential Prompts
    - How, are these observations similar/different from past years? Please explain.
    - Any changes in seasonal occurrences?
    - Frequency/intensity of visible black gill you're seeing?
    - Geographic locations?
    - How, if at all, does this compare to what you've seen in the past? More? Less? Same?
    - When did you first remember observing these changes?
  - What do you think are the reason(s) for the changes in Black Gill disease you have observed?
    - Potential Prompts
    - What have you noticed about the environmental and/or weather conditions when you notice black gill is present? Is this any different than what you have noticed in the past? If so, how?
    - What have you heard from other shrimpers, if anything, about these changes and contributing factors?

**Response to/Impacts of Observed Changes**

- How, if at all, have you had to change the way you shrimp in light of the change(s) you have observed?
  - Potential Prompts
  - What types of seasonal changes have you had to make, if any, currently compared to the past?
  - How has your fishing range changed? (ex: where you go, your depth, or for how long)
- How have these changes, impacted your operations, if at all?
  - Potential Prompts
  - +/- Profit margins?
  - +/- Operational costs (*ex: fuel, ice, repairs, maintenance, gear etc.*)
  - +/- Time spent fishing?
  - Changes in supply chains, markets ?
  - Availability and use of infrastructure (ex: docks, railways etc.)
  - Physical/mental wellbeing?
  - What other types of impacts have you heard, if any, from other shrimpers about how these changes have affected their businesses?

**Decision Making and Potential Concerns**

- How do you decide whether to go shrimping or not in terms of environmental and weather conditions?

Potential Prompts

- What types of weather and/or environmental conditions help you indicate what will be a good or bad day? What about the season?
  - Do you ever link winter conditions to how productive or not the upcoming season will be? If so ,how? What types of factors do you consider, and how specifically might they affect shrimp and/or shrimping conditions?
  - What kind of resources or tools do you use to inform you about weather conditions or other environmental factors?
- What do you consider to be your top 3 concerns as a shrimper today compared to 10 years ago? Explain your answer.
  - How concerned are you about the impacts from changing climate and environmental conditions on your operation? Explain your answer.

Potential Prompts

- Do you see any potential opportunities changing climate and environmental conditions on your operation If so, please explain.

**Assistance to Shrimpers**

- In what way(s) can researchers provide more useful information about environmental/weather conditions to shrimpers?

Potential Prompts

- What is the best way for researchers to communicate this information to the shrimp industry?
- What other type(s) of data are missing that would be useful to shrimpers?
- Is there a certain spatial scale that would be most helpful to shrimpers for receiving information on environmental conditions? Please explain.

**Conclusion**

- What else would you like to tell me about the issues we've talked about today?