Focus Group Report

Insights from the Public on Key Elements of Red Tide Messaging and Modes of Communication

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General Public

Executive summary

The goal of this project is to inform best communication practices to enable the use of science-based information in decision-making during Florida red tide events. Collaboration with stakeholders was an integral component of the project, particularly to better understand the human dimensions influencing decision-making. Conversations during the focus groups provided in-depth understanding of the emotions, values, thoughts and opinions driving personal behaviour.

In this report, we summarize in-depth insight about the key elements of red tide messaging and modes of communication provided by the public during four focus groups. We also identify the red tide-related communication challenges and recommendations identified by participants.

The instructive content provided by the focus group participants will help shape the Red Tide Communications Plan for Florida, which aims to align practitioner (i.e., agency) needs with end-user (i.e., resident and visitor) wants. The information will not only help determine preferred red tide content, formats and delivery modes but also inform development of innovative educational approaches and messaging aimed at public health and safety.

Findings are described based on focus group scenarios presented and questions asked. Recommendations are compiled in the final section of this report.

Methods

We conducted four focus groups, two during daytime hours and two in the evening to accommodate most schedules. This study evaluated current red tide communication products and messages using thought provoking scenarios. Scenario development was guided by findings from earlier stages of our project including from focus groups with natural resources and public health professionals; focus groups with members of the tourism, hospitality and small business industries, public information officers and the media; surveys with the public evaluating the usability of current communication products; a public survey evaluating current communication delivery modes; and a literature review of previous red tide communication research.

Recruitment

Initial recruitment came from our statewide survey of communication delivery modes where participants were asked if they would be interested in participating in a focus group. In order to ensure a diverse audience, participants were invited based on their responses to demographic questions related to time in Florida, proximity to coast, engagement in water-related activities, and underlying respiratory conditions.

Participants were invited via email and/or telephone and enticed with $50 Amazon gift cards. Due to COVID-19 social distancing guidelines, a virtual format was used for the focus groups. Each invited participant was initially able to select from one of three focus group date/time options. However, Hurricane Elsa necessitated a last-minute cancellation of one of the focus groups. In order to ensure that the target number of participants was reached, two alternate date/time options were offered. The team also did additional recruiting via Florida Sea Grant and Gulf of Mexico Coastal Ocean Observing System (GCOOS) social media pages.

Focus Group Implementation

Focus groups were conducted in accordance with the University of Florida IRB to protect participant privacy and ensure they were aware of their rights as research participants. Because of the low risk to participants, the focus groups were designated as a study exempt (IRB-20202724) from full review. Nevertheless, it was important for participants to be aware that 1) their participation was voluntary; 2) they could choose to answer questions or not; and 3) they could terminate their participation at any time. We also informed them that we would be recording the focus group discussion for follow-up analysis but that steps would be taken to separate responses from identifiers such as full first and last names.

Each of the four focus groups was facilitated by a moderator who asked the questions, probed with follow up questions, and ensured everyone had a chance to speak. A second moderator ensured all components of the questions were addressed by participants before moving to the next question. We began with a brief overview of the project and project team. Participants were asked to keep their videos and microphones on to encourage discussion. Participants then introduced themselves (first name) and answered an ice breaker question. After everyone had a turn, we began with the focus group questions. Participants were free to speak without raising their hand and asked to keep the conversation verbal rather than writing in chat. In addition to recording the focus groups, project team members listened in the background and took notes to help with transcription.

Data Management and Analysis

At the conclusion of each focus group, the recorded transcriptions, both text and video, were saved. The moderators also debriefed with the full project team to discuss session content, what was learned, what was surprising, and emotions evoked.

To begin analysis, text transcriptions were compared to what was said on the video and text transcription errors were corrected. Additionally, all participant identifiers, including names, were removed from the transcripts to protect participant identities.

Data coding was accomplished in two stages based on methods described by Charmaz (2006), Krueger (2000), and Ritchie & Spencer (1994). Initial coding, in Microsoft Word® and MaxQDA®, involved the generation of numerous category codes without

limiting the number of codes. At this stage, we listed emerging ideas and identified keywords frequently used by respondents as indicators of important themes. The second stage focused coding by eliminating, combining, or subdividing the coding categories identified in the first step. Attention was given to recurring ideas and wider themes connecting the codes.

Sessions and participants

Four focus groups with 26 participants total were held (Table 1). Two focus groups occurred on July 7, one on July 13, and one on July 14, 2021.

Table 1: Focus group participants by region

Southwest FL	Central West FL	FL Nature Coast	FL Panhandle	Central FL	East Coast FL	Out of State
7	13	1	1	1	2	1

Focus Group Questions

Below is the bank of questions used during the focus groups (Probes indicated as bullets). Questions were presented with graphics below via PowerPoint.

Icebreaker - *Please tell us your name, where you live and one experience you've had with red tide that you can share. If you don't have a personal experience, what is something you've heard about red tide?*

Scenario 1: Part 1 (Individual Signs)

We'd like to determine how people make decisions under different scenarios. We're going to provide a few situations and ask you to walk us through the process of how you make your decisions based on the information provided.

For the first example, think for a minute about your favorite beach. Picture a time when you were at that beach, maybe who you were with and the experience you had.

Now picture that experience again, only this time you see these signs when you arrive at the beach. Here is the first sign.

** Order of signs displayed in this scenario were changed in subsequent focus groups so that each sign was introduced first and last at least once to eliminate this aspect of survey bias.

Scenario 1: Sign 1 of 3

1. **What is your initial reaction to the sign?**
   - [After everyone responds, go back to selected response & ask]: What makes you say that?
   - Does anyone else have a different reason for how they feel?
2. **As you look at the sign, how are you going to decide what to do?**
   - What do you think will happen if you do that?
   - What would make you take a different option?
3. **What kinds of feelings are caused by the sign?**
   - What is it about the language that is helpful?
   - What things on the sign are not helpful?
   - What would you change on the sign?

Scenario 1: Sign 2 of 3

Let's take a look at another sign.

4. **What is your initial reaction to this sign?**
   - Will you do anything differently when you see this sign?
   - What makes you say that?
5. **What kinds of feelings are caused by the sign?**
   - What is it about the language that is helpful?
   - What things on the sign are not helpful?
   - What does it mean to you that red tide may not be present at all county beaches?
6. **What would you change on the sign?**

Scenario 1: Sign 3 of 3

Finally, we have one last sign to show you.

7. **What is your initial reaction to this sign?**
   - Will you do anything differently when you see this sign?
   - What makes you say that?
8. **What kinds of feelings are caused by the sign?**
   - What is it about the language that is helpful?
   - What things on the sign are not helpful?
   - What would you change on the sign?

[We will look at the individual icons on this sign in more detail following the next set of questions]

Scenario 1: Part 2 (Combined signs)

Now we are going to show the signs together.

9. **Is there a particular sign you'd be more likely to rely on to make a decision about whether or not to stay at the beach?**
   - What is it about the sign that makes it more trustworthy to you than the others?
   - How likely would you be to follow up with "more information" options on the signs?
   - Would you search for additional information elsewhere? If so, where?
10. **Have you ever searched for red tide conditions before heading to the beach or enjoying other coastal activities? If so, what was that like?**
    - What were your plans and where/how did you search for information?
    - Was it easy or difficult to find the information you wanted?
11. **Have you ever arrived at the beach to find signs warning about an ongoing red tide? If so, what did you do when you saw the sign?**

12. **Is there any information you'd want to see on a red tide sign that was not on any of those you viewed?**

Scenario 1: Part 3 (Icons)

** For this exercise, the first two focus groups evaluated icons currently displayed on the Florida Department of Health Red Tide Alert signs. The remaining two focus groups evaluated icons created by the project team based on feedback from the first two focus groups.

We're now going to ask you to share your thoughts on a series of icons currently used in red tide communication. We are interested in knowing what you think the icons mean, without the benefit of text to explain their intended message.

Scenario 2

You have plans to attend a wedding at the beach this weekend. Recreational activities on the water are planned for Saturday and a beach ceremony on Sunday. We know many of you get your information from broadcast media and there has been coverage about Florida Red Tide in the area where the event is to take place. You might see shocking images like the one here.

In deciding whether or not to attend the weekend festivities, you also checkout two different red tide tools. One is the Florida Fish and Wildlife Conservation Commission's Red Tide Map shown here on the left, and the other is the HABscope Respiratory Forecast, shown here on the right.

ADD LINKS FOR THESE IN CHAT BOX

FWC's Red Tide Status map shows cell counts of the organisms responsible for FL red tide. Dots represent the concentration of red tide cells over the past 8 days of sampling.

The HABscope map is produced by NOAA and the Gulf of Mexico Coastal Ocean Observing System. It is a tool that is produced by combining wind forecasts from the National Weather Service with cell counts made by volunteers using an instrument called HABscope. The map shows potential risk of respiratory impacts to beachgoers. The forecasts are updated every 3 hours.

We'd like you to walk us through the process of how you decide whether or not to keep your existing plans.

1. **How would you determine if it is safe or not for you to join in the wedding activities based on this information?**
2. **Do you have confidence in these sources?**
   - What is it about the content that scares or reassures you?
3. **What other information will you rely on to inform your decision about whether or not to participate in the activities?**
4. **Do you have recommendations about how to make red tide forecasts more useful to meet your needs?**
5. **How will you feel about attending the wedding events after seeing this information?**
   - Do you feel your health would be jeopardized?
   - Would you be able to have a good time?
6. **How far in advance do you need information to make your decision?**

7. **Revisiting the media image we saw earlier, how do you feel about attending the wedding festivities now after considering other sources of information?**

Scenario 3

Recently, there has been a lot of coverage about red tide in your local news. We'd like to know if/how this affects your decision about whether or not to eat seafood.

1. **What concerns do you have about eating seafood?**
2. **What questions would you want answered before deciding if you would eat seafood?**
3. **What information would you rely on to decide if it is safe to eat seafood?**
   - Would you rely on restaurant staff or others?
4. **Would you be more likely to eat a particular type of seafood over another because of red tide?**
   - Probe: For example, would your decision be different for clams and mussels vs crabs and lobster vs fish?
5. **How does the source of the seafood affect your confidence?**
   - Probe: Would it make a difference if you caught the food yourself or ate it at a restaurant?

Wrap-up Questions

1. **What do you think you can do to minimize the impacts of red tide to your community?**
2. **Is there anything we haven't discussed that you'd like to add?**

Participant Responses

In answering the focus group questions, participants provided a wealth of information. This section condenses the overall responses from the four focus groups by question/scenario.

Key Findings for Major Research Questions

1. Icebreaker

The icebreaker question was designed to get participants thinking, initiate a dialogue, and gauge the varying levels of experience with Florida red tide. Participants were asked to describe one experience they had with red tide, or if they did not have any red tide experience, to share something they had heard about red tide. Of the twenty-six participants, seventeen (65%) had direct experience with red tide. These participants described many human health symptoms and ecosystem effects associated with red tide including the smell, dead fish, not being able to breathe, coughing, having a runny nose, itchy eyes and burning throat. Some participants made note that red tide was currently present in the Tampa Bay region. One participant described diving in anoxic waters after the 2018 red tide and having

her lips turn blue and losing feeling in her mouth. And a charter captain discussed how red tide can be very irritating to his clients. Several participants reminisced childhood experiences such as one gentleman who stepped on a dead pufferfish and got hurt. Another recalled a friend finding a dead dolphin that stranded on the beach. Of the nine participants without first-hand experience, all were aware that red tide was in the news a lot, that it kills fish and wildlife, and that it's toxic. One participant (erroneously) recalled from college that *Karenia brevis* is a rhodophyte. Another told us that he has emphysema and his doctor advised him to stay away from red tide. Several participants with no red tide experience expressed a desire to learn as the primary reason for their participation in the focus group.

2. Scenario 1

Scenario 1 contained three parts. Parts 1 and 2 assessed three signs that are used to alert the public to red tide conditions at beaches. Signs are second only to public media news in terms of how the public receives information about red tide (Krimsky and Montes, 2021). As such, it is important to ensure that the signs used resonate with the public and lead to an intended response. We asked participants to close their eyes and think about their favorite beach, then imagine arriving and seeing a sign alerting them to red tide. Participants were asked to describe their initial response to each sign displayed and then walk us through their decision-making process upon encountering each sign. We also asked how each sign could be improved. Finally, we asked which of the three signs they preferred and why. Initial reactions across the three signs and four focus groups spanned feeling sad to alarmed to hopeless to disenfranchised.

> *"It would make me second guess going to the beach or entering the water, going to – anywhere near the water actually. It's kind of alarming."*
>
> *"… I would be like, oh I can't go, but it kind of makes me feel a little bit hopeless that I can't do anything about it – and just drive off."*
>
> *"I don't know, we've - what we've experienced, especially in like 2017, 2018, and seasons after that, we weren't able to take those fish home. So really it just brings up feelings of disappointment and failed leadership."*

Some noted the effectiveness of the information provided and how they addressed health and the basic information needs of visitors:

> *"Yeah, this one's (Red) pretty brief and right to the point, especially about the respiratory irritation. Basically, go away, is what it's saying, if you have problems. Yeah, it doesn't have a lot of the other stuff on it, but this is at least something. And the respiratory irritation seems to affect pretty much everybody, so I think that it's a – it's a good sign."*

> *"I think it's probably not a terrible surprise because usually, when you open your door in the parking lot, you start coughing so you kind of like know it's there. But it's definitely good for like tourists and stuff who aren't familiar to the area to let them really know like why there's dead fish all over the beach or why they're coughing to death, so I think for the tourists it's really good."*

One participant noted that the first sign (red sign that says "…if affected ..., ") offered visitors the choice to make their own decisions based on their own physical response while another was not so sure, pointing out the difficulties for red tide communicators:

> *"That one doesn't give me a whole lot of information. I kind of feel like it, I can't say it gives me more of a choice because any sign gives me a choice, but kind of makes me want to stay more than the others in a way, unless I really experienced tough problems from it."*

> *"I just don't think you should leave it up to people to decide if, like if there is an area that's very affected like – I don't necessarily know if you should just like, leave a sign up like that, because even if folks are brand new to red tide exposure, what if they have like a horrible breathing problem or health problem that's going to exacerbate it, so you're going to just…leave it up to the decision of that person, when they're not truly even aware of red tide in the first place, like the extent of how it can affect them."*

When asked which sign participants preferred, most selected the FDOH sign though consensus was not 100% (see table 2). In general, participants liked that the FDOH sign was clear and concise, informative and action oriented. There were elements of the other two signs that participants also thought were helpful. For example, the flip sign QR code, weblink, and telephone number that provided options for more information about area beaches, and the red sign's bold red and white contrast were identified as positive features. Participants also liked that the FDOH sign provided information about fishing during a red tide and suggested signs should be placed at boat ramps and fishing piers. There was confusion by several participants as to what constitutes a "healthy fish". One participant questioned why removing and throwing away gills isn't included in the bullet about fish guts, especially considering that many smaller fish are typically eaten whole.

Some general observations include the following. The information provided on the signs, even if it was recognized as important and useful, prompted feelings of negativity and disappointment. Participants said the information would immediately turn off visitors and be bad for local businesses. This highlights the contradiction of providing essential public health information while at the same time creating some negative feelings. A related issue is that the signs can not specify if the effects of red tide are present on a particular beach at any particular time. While providing general information was seen as important, one participant suggested using electronic signs

that could be updated in real time to inform visitors about the conditions at specific beaches.

Table 2. Public focus group assessment of existing red tide signs

	Red Sign 	**Flip Sign** 	**DOH Sign** 
Positive Sign Features	Color draws attention, eye catching	Red print--top draws attention	Health Alert - catches attention
		QR and website link enable search of conditions at nearby beaches	Clear messages help assess personal risk
	Brief and to point	Informative	Informative
	Human focused	Looks official	Action oriented
		Logos lend credibility	Communicates options
Negative Sign Features	Poor grammar with run on sentence	Doesn't empower - causes feeling of hopelessness	Confused by "throw guts away" and "healthy fish"
	Interpreted as red tide is no big deal	Too wordy	Language is too "legalese" and all negative
		Gray background is distracting	Restaurant owners probably don't like
	Not as informative (as other signs)--information is too vague	Logos are too big - take up too much space	Lacks Dept. of Health logo for credibility; only has State of FL logo
	Not good for local businesses - scares people away	Un-bolded text is difficult to read	
	Looks generic - like it's always there	Sign would be easy to ignore - doesn't stand out	
Recommended Changes	Add QR code and/or link to more information	Add "Caution" to catch eye	Reduce red background; more room for messages
	Add a 1-800 number for more information	"Red tide is naturally… " should not be in bold--informative but not actionable	Combine 2nd & 3rd icons (respiratory issues); add symptoms
		Move bottom paragraph (suggested actions) immediately under "Red tide is present" header	Add "and people" to 7th icon ("Keep pets and livestock…")
			Add "rinse pets if get wet"
			Add link to more information
Features to Incorporate into Modified Sign	Eye-catching color	Logos to show trusted sources	Combined icons & words to organize & make easy to read
	Official-looking sign material (metal)	Links to more information	Actionable information to inform what you should & shouldn't do
		Text balance between actions & information	

Throughout scenario one, there was discussion that didn't specifically relate to any particular sign. For instance, seafood safety generated discussion and skepticism that any fish caught during a red tide could be safe to eat. Two participants mentioned that red tide signs are probably not good for area restaurants, particularly since many of the restaurants that serve seafood are located along the beach. This again points out that providing public health information can have unintended consequences. Better messaging about the safety of commercially harvested seafood is needed. Another discussion topic was centered on QR codes, web links and 1-800 numbers. Participants noted that beaches notoriously have poor cellular service. Some felt QR codes and web links would present access challenges for beach users that are not technologically savvy. One popular suggestion was being able to sign up for text alerts that would notify based on location. Another participant suggested the need for messages in braille. Some participants questioned the process for displaying signs, wondering if they were only displayed when beaches were affected or if they were there all the time. Several participants in one focus groups were surprised to learn that beaches stay open during a red tide. This led to considerable discussion regarding whether it was asking too much of the public to have to make their own risk assessment. We noted that participants with prior red tide experience were more likely to say they would stay at the beach and see how it goes, as opposed to those without experience who would likely leave the area. Some participants suggested the need for multiple signs, one providing alerts to red tide risks and another with general information about red tide blooms. Having a digital message board that updates beach conditions was also suggested to provide timely and beach-specific guidance. Participants noted that many visitors would lack basic understanding of red tide and would need that in addition to instructions about safety. Finally, a few participants wanted more information that empowered them with actions they could take to enhance resiliency. These participants mentioned feeling helpless upon seeing the signs and beach conditions because they didn't know what they could do personally to improve the situation.

Scenario 1 part 3 assessed icons currently used on the FDOH sign. For this exercise, we showed participants each icon without the associated text to see if they could determine the meaning. The exercise was enlightening as participants were unable to correctly determine any of the intended messages conveyed by the icons. We assessed FDOH icons during the first two focus groups held on 7 July 2021. Based on participant feedback, Florida Sea Grant (FSG) created new icons and we conducted the same exercise using these new icons during the last two focus groups held 13 and 14 July 2021.

FDOH - Do not swim near dead fish at this location. Participants generally agreed this icon meant “no swimming” or “don’t go in the water”. However, they did not feel that the icon conveyed anything about dead fish and recommended adding a fish with “X’s” for eyes.

FSG - Do not swim near dead fish at this location. More participants were able to correctly determine the icon meaning but some were confused by the use of the color brown for the water. One participant thought the swimmer was a dolphin but most were able to interpret correctly. Participants recommended changing the water color.

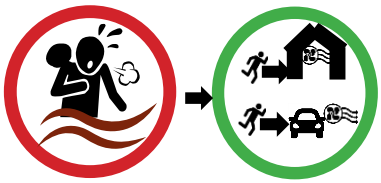
FDOH - Keep pets and livestock away from water, sea foam and dead sea life. Participants thought the icon meant “no dogs” or “keep pets out” but did not see a connection to water, sea foam or dead sea life or red tide in general. One participant noted that most beaches in Florida do not allow dogs. A suggestion was to have a dog and a horse, or a dog with the waterline.

FSG - Keep pets and livestock away from water, sea foam and dead sea life. Most participants were able to correctly determine the meaning of this icon. However, like the previous FSG icon, they were confused by the brown water. Some participants thought the icon meant “no pets around brown water” or “don’t let pets poop in the water because it will kill fish.” The suggestion was to change the water color to blue. One participant also noted a need to add “wash your pets off with fresh water before you leave”.

FDOH - If you have chronic respiratory problems, stay away from this location—red tide can affect your breathing. Participant responses to this icon included “warning for a lung condition”, “don’t breathe here”, “get a chest x-ray”, “something about lungs” and “respiratory problems”. Suggestions for improving this icon included using images that hospitals use for breathing-related messages, adding some kind of gas tank with fumes, and adding a skull and cross bones. One participant suggested removing “chronic respiratory problems” because red tide can affect anyone.

FDOH - If you are having respiratory problems, leave this location-go into an air-conditioned space for relief. This icon provided the greatest challenge for participants. Participants suggested the icon could mean “it might snow today”, “temperature

can affect red tide", "maybe it's molecules instead of a snowflake", "snow is coming" and several more snow related guesses. A suggestion for a better graphic was to show an air conditioner blowing or an air vent. One participant asked if a person gets relief from the cooler temperature or because they left the area.



FSG - If you are having respiratory problems, leave this location-go into an air-conditioned space for relief. Participants generally were able to interpret this icon. Some thought the person in the water could be choking on the water instead of having respiratory problems. Comments included "someone could be physically exhausted from swimming", and "something is wrong with his face (needs eyes)". Suggestions for improvement included adding dead fish and finding a way to make the person look more in respiratory distress with fumes coming off the water or adding dead fish. For this icon only, following the July 13th focus group, we changed the water's color from brown to blue. This resonated better with participants in the July 14th focus group.

The next two **FDOH** icons were displayed together **- Do not harvest or eat distressed or dead fish from this location** and **Rinse fillets from healthy fish with tap or bottled water. Throw out guts.** Participants were able to decipher a portion of the icon's meaning with suggested captions as "no dead fish", "dead fish bad, live fish good", "don't eat dead fish", "eat live fish", and "stay away from dead fish". But they did not make the connection between the healthy fish and proper handling during red tide. When the icon meanings were displayed, several participants questioned how one would determine if a fish were healthy.

FSG - Rinse fillets from healthy fish with tap or bottled water. Throw out guts. This icon produced the most directly translatable results with participants generally saying it was ok to harvest fish but make sure to wash before eating. Questions about how to determine a "healthy" fish again were asked, and one participant wanted to know if rinsing would truly make the fish OK. Another participant suggested a sign with this icon would be appropriate at boat ramps.

FDOH - Do not harvest or eat molluscan shellfish from this location. Participants struggled to recognize the graphic was of clams and no one made the connection to harvesting. We heard "no bread" and several "no moon pies". Suggestions for improvement included using oysters, a clam, or an oyster and a scallop; putting clams in a pile; and adding a lobster.

FSG - Do not harvest or eat molluscan shellfish or dead or distressed fish from this location. We attempted to combine the shellfish icon with the dead or distressed fish icon and completely confused participants. Although some participants were able to figure out "don't eat fish from red tide", we received a wide range of suggested icon meanings like "don't eat fish you catch", "no snorkeling", "don't eat", and "don't leave plastic forks on the beach". General comments from participants were that the icon was asking too much, the snorkel was confusing, and "makes me want to stay away from everything". Suggestions for improvement were to use an open clamshell and a fishing pole or net. One participant asked if it was OK to eat at a restaurant.

In general, participants agreed that icons were an important communication tool to reach non-English speaking audiences but the current icons being used are not conveying their intended messages. Based on this assessment, we suggest new icons be developed and field tested with the general public.

3. Scenario 2

Scenario 2 sought to understand how participants would make decisions during a red tide when provided with currently available decision-making tools. We provided participants with a scenario about attending a beach wedding on a Sunday and an on-water activity (fishing, kayaking, swimming, etc. – we did not specify) the day before the wedding. Recognizing that the public generally gets their information from the media (Krimsky and Montes, 2021), at least initially, we showed them a screen shot from a typical news story about red tide which showed dead fish in the water. We then presented them with two tools to help them decide whether to attend the planned events. These tools were the FWC red tide daily map and the GCOOS/NOAA HABscope respiratory forecast.

About half of the participants were familiar with the FWC red tide daily map but only one had previously seen the HABscope respiratory forecast. Many participants indicated, given these two tools, they would start with the FWC resource and then use the HABscope forecast closer to the events. Some participants, particularly

those who had ruled out the on-water activity, would go straight to the HABscope forecast because they were solely interested in respiratory irritation at the beach wedding, highlighting again the importance of one's personal physical reaction to red tide. Participants who were interested in the on-water activity, found the FWC site most helpful because of the robust sampling that extends out into the water.

> *"I like the NOAA map because it is more current. It shows you every three hours, is that not what you said? It has to do with my breathing versus how many organisms are in the water over eight days. You know the beach conditions can change so fast. I like the more current version."*

When asked about credibility, participants generally felt there was credibility with both sources. FWC was frequently identified as the more credible source. One participant did not trust the GCOOS/NOAA respiratory forecast because wind fields used in the forecast are from the National Weather Service—a source considered untrustworthy by this individual.

When asked what aspects of these red tide resources gave participants confidence in decision-making, the amount of FWC sample sites was often mentioned. One participant also noted FWC has many staff working on red tide issues. Participants liked that the HABscope forecast was real-time and updated every three hours.

> *"I believe Fish and Wildlife is better in the sense of – how do you say this – a more robust system. It partakes on most of Florida, including the Panhandle, while the HABscope is quite specific to the Southwest region of Florida."*

> *"The Fish and Wildlife one helps me as a fisherman determine what waters I want to stay away from but for all the other beach businesses, restaurants, and hotels, and resorts, and everything else, I think that HABscope is – is definitely the way to go."*

> *"I like the HABscope because it kind of combines like local knowledge of, you know, if the wind is blowing it's going to be a lot worse."*

Some participants did not like that the FWC site contained samples over eight-days. "…in eight days, red tide may be here, gone, and back again, or whatever, you know, depending on wind conditions and everything."

Some participants also thought the background cell count dots were distracting and wanted to know if those could be turned off. Comments from participants who already use the FWC cell count map added that the webpage was hard to find, and that it doesn't display well on a mobile phone. On the HABscope respiratory forecast, participants noted that the legend only has options from "very low" to "high" risk of respiratory irritation and that there is no icon for no respiratory irritation, and that the forecast did not cover their geographic area of interest. These comments

reinforce the need to provide information about how the forecast is made—that HABscope sampling is only activated in a particular area once a bloom is underway. There was also considerable discussion about whether people would know about these resources, particularly if they were traveling from other areas of the country, and why these tools are only accessible from separate websites.

> *"Someone from out of state may not even know to check on any of that…They may not even know it exists."*

We asked participants to suggest recommendations for improving the tools we shared or for needs for new tools. On the map tools, participants wanted to be able to enter a zip-code to zoom into an area of interest. Others wanted more predicted trends out into the future. Several participants suggested the need to be more integrated in packaging red tide tools. Other suggestions included an app where one could receive audio information and an option for text alerts based on location.

> *"First, I would ask why Fish and Wildlife doesn't - why they don't link together because that would seem like a very good idea to me. When you go to the Fish and Wildlife site, the HABscope site should be a link to it on there so you could go back and forth."*

> *"I think it would be best to have an integrated solution, right? You mentioned a smart phone app which I think is a great idea but if there was one source where I could check the weather for that day, the surf conditions, temperature, wind, whatever and oh, by the way, it shows me red tide! That is going to be the winner in my book, right? I will go to that every time rather than have to check multiple websites."*

We asked how many days in advance participants would need information to plan and generally heard one to two days for an on-water activity but as much as four to six weeks for a wedding, particularly if one is traveling from out of state. One person suggested that being able to sign up for notifications for a period of time (for travelers) would be useful.

Next, participants were asked what precautions they would take if they attended the wedding and/or on-water activity.

> *"I would make an appearance, but I would wear like a 95 mask and glasses to protect myself and I would not stay there too long, but I would still go."*

> *"I'd be more aware of like how I was responding to air [quality] or how I was responding to the environment to know, do I need to go sit in the car for a little bit and come back."*

Finally, we asked for additional resources participants currently use or might use for red tide decision-making. Among the answers were local news broadcasts and their

associated websites and Facebook pages, Google, local governments, environmental NGOs and citizen science, Twitter, Mote Marine Laboratory, weather apps, friends, and common sense and experience.

> *"I usually cheat and call somebody. …I have a network of fishing guides I work with and I just call them, say "Hey, have you had any problems in this area, have you had any trouble losing your bait fish in your bait well or anything? You see any dead fish?" But I know not everybody has that available."*

> *"When I'm planning on going fishing or boating or going to the beach, the first two things I check primarily is the weather forecast and the tides for that day or what's happening on the weekend. If the tides are low out, that might affect when and where I go fishing. If the wind is onshore [or] offshore, [it] will affect what will be happening with the elements on the water. If I know there's red tide in the area and the wind is blowing in my face, the red tide is going to come to where you are. So, I think checking all three things, the presence of red tide, what's the weather doing, what the tides are doing, should all be combined."*

> *"…I am a Google girl. Google is your friend."*

> *"…I would probably still be getting initially that there was a red tide issue from the news. But in terms of making plans or knowing which beaches to go to …to that level…they kind of even now just frame as Pinellas County has red tide, but doesn't tell you like, how it differs in various areas of Pinellas. So, you know things like this are definitely useful…"*

4. Scenario 3

Scenario 3 explored concerns and decision-making processes related to consuming seafood as part of the previous wedding scenario. We found seafood safety to be of great concern and in many cases, fear and distrust overpower any best available science. About half of our focus group participants would not eat any fish or seafood during a red tide; not from a restaurant, seafood dealer or grocery store. When we explored reasons, we received insightful answers.

> *"…even if I asked if the seafood was local or not, I would not necessarily trust the response I got."*

> *"The people supplying the food, whether we are eating at a restaurant or if it is catered, whoever, I have a decent level of mistrust on that, either because they honestly do not know or, again, there may be some folks who do not want to see their sales decline, so they may provide incorrect information."*

> *"I would abstain. I am not playing Russian roulette with food."*

"I certainly would not trust myself and I know the restaurants, a lot of the seafood comes in, it is tagged, it has a source when it was caught, where it was caught. But that is not good enough for me. I mean I just would not take that chance."

"I do not think I trust myself to make that decision, if the fish was good or not…"

Some participants offered suggestions on what would give them confidence that a fish or seafood was safe to consume.

"…if the caterer was well known, and it was catered in from like, let us just say you know was imported from another state, then I would trust it."

"… I guess I would go with that route and be an educated consumer in that sense, and just ask the server or somebody where the shellfish is from during a red tide event…"

"…I will ask actually the kitchen, not even the manager at the front end of the restaurant, but the – the kitchen chef…"

"I really do not have any concerns. As long as it is commercially sourced like from a restaurant or something. If it is a guy selling fish out of a cooler, or shellfish out of a cooler on the side of the road, that is probably what will get you in trouble."

Some participants referred to safety protocols already in place for seafood suppliers and restaurants.

"I believe it has to go through quality control to make sure that they are not failing health standards. So, maybe I would be a little more trusting of that. But you could also, maybe on your own time, do your own research; see if it is as bad in the area in case it is locally caught. You could probably even use those maps around the previous slide to figure out if the red tide's really affecting around you, in case it is locally sourced. But I do not know; I feel like maybe I would trust it a little bit because I know it has to be up to health standards if you own a restaurant."

"Any fish that's handled commercially at a restaurant or at a fish house or anything has been through safety precautions and you don't have to worry about that being a dead red tide fish."

"The person at the restaurant that is procuring the supplies has to be more careful if they're going to stay in business because the liability would wreck them if they were serving something that was unsafe… and a reputable restaurant can't afford the risk. They've got too much invested to do stupid shortcuts."

Some participants were confident in consuming recreationally caught fish during red tides.

> *"…And I'd be comfortable eating what I got myself. But I'd have to be very – I'd be reluctant to eat anything that – somebody who had a bunch of, was giving away ..."*
>
> *"I would feel a little more comfortable kind of being able to determine myself if it looked healthy or if it was distressed and also knowing you know, potentially, how it was prepared."*
>
> *"For the most part, I know my husband wouldn't fish anywhere where he thought that it might be dangerous."*
>
> *"Personally, I won't be eating the oysters or the shellfish. I won't hesitate to eat the red snapper or the stone crabs. Or the blue crabs or the shrimp, I've never had a problem and never heard of any problems with eating them but definitely, I would not touch any shellfish. I wouldn't eat any fish that was (harvested when already) dead."*

Other participants were surprised that any fish could be safe during a red tide and as in the earlier scenario with the signs, questioned what constituted a "healthy" fish. Other participants were concerned about long-term effects from eating fish that may have been exposed to red tide. One participant noted research she had read about BMAA. [Note: BMAA is [β-Methylamino-l-alanine], a neurotoxin produced by cyanobacteria].

Lastly, we sought to determine if participants had uniform concerns with fish, shellfish and crustaceans. For this question, participants were shown three prepared seafood plates (a fish, a plate of stone crab legs, and a plate of clams) and asked if they would be more or less likely to eat any of the three. Because this was the final scenario, some participants deduced responses based on what they read from the signs in the first scenario. A few knew that shellfish accumulated toxins. Others indicated they would use Google, and a couple based their decision on dead fish images, assuming because they were most vulnerable to red tide, they would also be the riskiest to consume.

5. Wrap-up Questions

The wrap-up sought to determine if participants felt they were empowered to minimize red tide impacts to their community. Most comments centred on reducing fertilizer use and selecting plants that were native to Florida. Other comments included educating others. Several participants indicated they learned a lot by participating in the focus group and that they were eager to share that information with family and friends. A few discussed advocating for better elected officials. A retired teacher indicated red tide should be taught in K-12 schools. Another participant mentioned he was hopeful centralized sewers would come to his area soon, but in the interim, he maintained his septic system more frequently than

recommended. Several participants struggled with the question, either saying they didn't know what they could individually do or pointed to larger issues they were aware of such as Piney Point, phosphate mining and agricultural practices.

In closing comments, participants were given the opportunity to discuss relevant topics of interest that were not previously addressed. Below is a sample of those comments.

> *"We also have a connection with, that we sometimes get the red tide with the [blue-green] algae blooms together, which is even worse…than just red tide alone."*
>
> *"… reason is probably global warming and the increasing water temperature. Charlotte Harbor these days, the water temperature is so much higher than it used to be 20 years ago, and I think that's having an overall negative impact on it. And with the seagrass surveys that we're doing, because the seagrass has gone, the manatees are dying. We have to come up with something significant to solve all these issues."*
>
> *"I just think there's a lot of misinformation out there on red tide. I think there's, you know, a lot of fingers being pointed at big sugar as being solely responsible for red tide. And if you go to Mote's site, I mean they got information there that documents red tide back in the 17 and 1800s in Florida and fish kills."*

Discussion

During red tide events, the public needs and wants to feel empowered to protect their health and quality of life. This requires clear, concise, readily available, and easy- to-interpret messaging and tools to enable assessment of personal risk and inform decisions. We learned that when information is not actionable, it can lead to feelings of hopelessness. Thus, acknowledging the human dimensions that underpin decision-making is vital to effective communication. In turn, effective red tide risk communication that reduces human health impacts can also minimize adverse economic impacts, further emphasizing the importance of actionable information. Following are recommendations for effective red tide risk communication based on nearly eight hours of conversations with participants from the four focus groups convened.

1) Signage
    a. Although the FDOH Red Tide Alert sign is generally preferred, there are numerous opportunities to improve it.
        - Add a web link, QR code and 1-800 number to enable access to information about other local beaches.
        - Add the FL DOH logo to provide credibility.
        - Improve icons to make intended meaning clearer, especially for non-English speakers, and field test with the public.

- Add signs at boat ramps and fishing piers.
- Consider adding text about rinsing pets with fresh water if exposed to red tide or changing text to include no pets in water during red tide.
- Make it clear to beachgoers that signs are only displayed during active red tides.

b. Other considerations

- Metal signs look official but may also be perceived as permanently displayed.
- Red and white provide the best contrast and the combination is eye-catching.
- Messages should be short and concise.
- Messages should be action oriented, not just information.
- Consider electronic signs capable of displaying timely messages.
- Consider a two-sign approach—one with actionable messages related to health risks and a secondary sign with general information about the red tide organism
- Because the physical effects of red tide on those who experienced it left lasting impressions (e.g., coughing, itchy eyes and throats, and respiratory irritation, these physical reactions should be an important part of messaging, especially for those not familiar with red tide.

2) Decision-Making Tools

a. FWC red tide cell count map

- Make it more mobile phone friendly.
- Allow background cell counts to be turned on and off.
- Fade or allow older counts to be turned off.

b. HABscope respiratory forecast

- Add a banner to map explaining what the viewer is looking at (respiratory forecast).
- Make it clear that map segments are only activated when red tide is present.
- Make it clear why there is no pin for respiratory irritation “none”.

c. Tools in general

- Make it easier for the public to find tools by linking across websites.
- Consider new technologies such as text alerts based on location and audio-based apps.
- Find a way to integrate information, such as weather, tides, cell counts and respiratory conditions.

3) Fish and Seafood Consumption
    a. Focus group discussions revealed that, regardless of the source, some individuals are never going to be convinced that consuming any type of seafood during a red tide is safe. However, recognizing the importance of seafood to community health and nutrition, we provide a few opportunities for improved messaging.
        - Work with FDOH, in partnership with the Florida Department of Agriculture and Consumer Services (FDACS), to develop public-facing messaging that highlights seafood safety protocols for commercially harvested products sold at restaurants and seafood markets.
        - Develop communication tools to help restaurants and seafood markets display source tracking of their product during red tide events.
        - Develop messaging that describes the term “healthy” fish.

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