Northeast U.S. Season Preview 2022
SLOW AND COOL START THIS YEAR BUT CONDITIONS ARE GOING TO WARM UP SOON

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ROFFS™ concludes its 2022 spring preview series by providing an overall update of the oceanographic conditions from mid-May offshore of the northeastern United States focusing on the Mid-Atlantic Bight region and its canyons that includes the zone from Cape Hatteras to Georges Bank into the Gulf of Maine. We again utilized a combination of many different data sets mainly satellite derived sea surface temperature (SST) and ocean color/chlorophyll images. In this edition we will discuss the present ocean conditions and what it means for the upcoming late-spring to summer fishing season for the Cape Hatteras, NC to Massachusetts offshore canyon areas.

As a reminder, for forecasting short-term oceanographic conditions related to finding fish, ROFFS™ uses real-time direct observations. We have learned that evaluating the preseason conditions along with regional climate models provides insight into future seasonal trends for fishing. Experience and understanding the ocean – atmospheric dynamics is our guide as we have had moderate success in forecasting seasonal trends of fishing productivity based on the stepwise progression in the location of the fishes' preferred habitat based on temperature and water color. Please reference our 2022 Bahamas forecast for more in-depth discussion on the environmental and climate indicators that goes into our detailed evaluation of the eastern United States fishing forecasting analysis (Click Here).

Background and Some Observations for 2022

It is important to look at the year-to-year trends including the anomalies to gain insight into the location and condition of the fishes' preferred habitat compared with previous years. Comparing similar locations and features to last year during the same general time period in mid-May we found that the SST of the core of the Gulf Stream off of Cape Hatteras, NC for 2021 was approximately 79.5°F to 80.4°F and for this year it is about 1.0°F cooler (78.8°F to 79.4°F) but 2°F cooler than 2020. The SST of the coastal water off of New Jersey, Delaware and Maryland is approximately 3.0°F cooler this year than during the same time period in 2021 closer but a tad warmer than 2020. Similarly, the SST offshore of Long Island to Rhode Island is about 3.0°F cooler than this time last year. Furthermore, the trend continues as the SST in the western Gulf of Maine is also 2-3°F cooler this year than last year. These and other indicators that will be described below suggest a slightly later arrival of the main push of tuna, wahoo, dolphin and billfish into the Gulf Stream section of the northeast U.S. region this year compared to last year, but also a slightly later arrival of the main population of tuna, wahoo, dolphin and billfish to the northern canyon regions. Reports have confirmed that it has been a slower than normal start to the tuna and dolphin season from Cape Hatteras to offshore of Virginia. These cooler than normal SST's and later arrival of the larger amounts of pelagics corresponds with the cooler, wetter and windy spring weather up in the northeast U.S, but it is finally starting to warm up now. With that said, with June approaching and forecasts for warmer temperatures, waters (especially inshore) will be starting to warm at an average rate of 0.5°F to 1.0°F per day triggering tuna, dolphin, wahoo and some billfish to start migrating north closer to the canyons in the upcoming weeks, especially within

the main eddy features that are connected to the Gulf Stream and the slightly northern shift of the Gulf Stream compared to last year, which we will be discussing within this forecast.

One driver for trends and weather and for the spring SST's in the Northeast U.S. region can be attributed to the North Atlantic Oscillation (NAO) and its positive phase during the months of January, February and March but switching to a negative phase in April. NAO index is based on the atmospheric surface sea level pressure difference between the Subtropical (Azores) High and the Subpolar Low within the North Atlantic Ocean (https://www.ncdc.noaa.gov/teleconnections/nao/). Typically, positive NAO phases means higher winds, cooler SST and atmospheric temperatures (like it has been this spring), but currently there was a switch to a negative phase in April which could mean a warming period and less winds in late-May and June which is encouraging for warming the SST and calmer winds that lead to relatively favorable fishing conditions and easier access offshore. Another possible factor to consider is the El Niño phase in the Pacific Ocean. Currently we are still in a La Niña phase and it is forecasted by NOAA to continue to be in a weak La Niña phase through the summer and into Fall, which usually means normal to below normal SST's in the Gulf of Mexico, Caribbean and east to northeast Pacific, but it remains to be seen what that means for waters offshore of the Northeastern U.S.

Also, please see ROFFS™ recent Southeast U.S. Gulf Stream fishing conditions analysis (Click here). These Gulf Stream conditions to the south are usually a good indicator and associated with the main populations of mahi, yellowfin tuna and marlin along with other highly migratory species migrating north during the spring months. Reports from mid-April to mid-May have already indicated good wahoo, dolphin and some tuna action along both sides for the Gulf Stream edges from Florida to North Carolina and they are also already catching blue marlin off of North Carolina to the Cape Hatteras area. Based on historical observations we anticipate that these fish along with other tuna, mahi-mahi, wahoo and then billfish will continue and already have moved to the northeast U.S. regions from the Gulf Stream and then into the spin off warm core large eddy features from the Gulf Stream that move over the canyon areas. Additional good news is that marlin and wahoo have already been caught off of South Carolina and North Carolina along with some yellowfin tuna and dolphin out of Oregon Inlet and Cape Hatteras area to the Point but not yet in large numbers compared to last year at this time.

Nowcast Analysis

One of the most valuable features that we look at when trying to forecast the region in the Northeast U.S. is the number, size and location of clockwise rotating warm core Gulf Stream eddies that are located north of the Gulf Stream region from south of Georges Bank to offshore of New York, New Jersey to Delaware and Maryland areas. These are eddies that have broken off from the Gulf Stream and tend to slowly drift westward toward the Atlantis Canyons to Hudson Canyon and then in a southwestward direction toward the Norfolk Canyon before being pulled back into the Gulf Stream. The environment associated with warmer usually blue water (below the surface) and the strong boundaries of the eddy feature outer edges provide valuable habitat for the highly migratory large pelagic fish that enter this region in the spring and early summer seasons. This year, however, it appears to be less encouraging than last and similar to the 2020 spring season with cooler water and less Gulf Stream warm core eddies that are in good positions. However, we do have some reason for optimism that will be discussed in more detail below.

The recent spring satellite data shown in Figure 1 and 2, and the fishing reports we have already received may provide insight into the upcoming fishing season. Figure 1 was derived from a variety of U.S. (NOAA and NASA) and European (ESA) satellites to show the SST during the May 17-18, 2022 period. Figure 2 was derived from the NASA MODIS ocean color satellites (Aqua and Terra) and ESA's Sentinel 3A and 3B satellites along with SNPP and NOAA 20 VIIRS satellites showing the ocean color/chlorophyll image data during this same period of May 17-18, 2022.

We used a combination of imagery over two days with the time-tested ROFFS™ cloud reduction algorithm to produce these relatively cloud-free images over this entire area. The time of the satellite passes and the amount of data taken from each image is not exactly the same for the SST and ocean color images. Thus, there may be some subtle differences in locations of where the water mass boundaries derived from the SST and chlorophyll/ocean color occurs. In spite of these small discrepancies this image pair is considered more than adequate for the purposes of our seasonal discussion as they were taken from the same two days.

The directional flow of the water was derived from our ROFFS™ sequential image analysis techniques, following the water masses, image to image based on the water mass's distinct, i.e. signature value. An example of this year's SST satellite infrared imagery in a greytone movie can be found on the ROFFS™ YouTube™ site (https://www.youtube.com/watch?v=k-4eMnAai8w). Viewing the movie several times allows one to visualize the flow of the Gulf Stream and other currents, where the darker greytoned water is the warmer water and white areas are clouds. Notice the progression of these larger warm-core Gulf Stream eddies from east to west then southwest between the Gulf Stream and Canyon regions.

Looking at Figure 1 below, the most important features to highlight are the eddy systems in the area between Oceanographer Canyon to Hudson canyon and southwest toward Baltimore Canyon. These will be the features that will need the most attention and that you will be fishing on during Memorial Day weekend and into June before the waters warm due to atmospheric temperature. Unfortunately this year there is an underwhelming amount of larger warm core Gulf Stream eddies near the canyons. We have basically three clockwise rotating warm core Gulf Stream eddies in this region to keep track of. The first one is currently offshore of Poor Mans to Washington Canyon (centered near 73°45'W & 37°45'N) and is already pulling in some mixed Gulf Stream 65°F to 68°F filament water inshore over the Baltimore, Poor Mans to Washington Canyon area. This has produced a few tuna bites. However, this eddy is moving rapidly to the south-southwest and has already started to blend out with the cooler coastal water. BUT, with the Gulf Stream so close to the south, it is possible it interacts with the Gulf Stream water soon and pull back in some warmer water for good fishing action into late-May, early June. The second main warm core eddy is centered offshore of Toms to Lindenkohl Canyon (centered near 72°15'W & 38°45'N). This is the most promising eddy that we have been following all spring, but unfortunately it veered more offshore and south over the past few weeks and is not as close to the canyons as we hoped. It does contain some relatively warmer 62°F to 64°F filament water within its core, good for tuna, sharks and swordfish and it is also close to the warmer mixed Gulf Stream 70°F to 72°F water directly to the south, so it also could interact with this water and pull in some more promising water closer to the canyons. However, right now it is still offshore of 750-1000 fathom depths. The last warm core eddy is centered well south of Veatch Canyon (69°35'W & 39°00'N) and contains the warmest 70°F to 72°F water that is being pushed slightly north and westward for some good tuna, dolphin, wahoo and maybe even early marlin action. The bad news is it is quite far offshore to target right now (approximately 25-30 miles south of the Atlantis Canyons). We are hopeful this eddy keeps moving further northward and westward and if it does will provide some good

conditions later this spring into June and July closer to Hudson Canyon then Toms Canyon and southwestward.

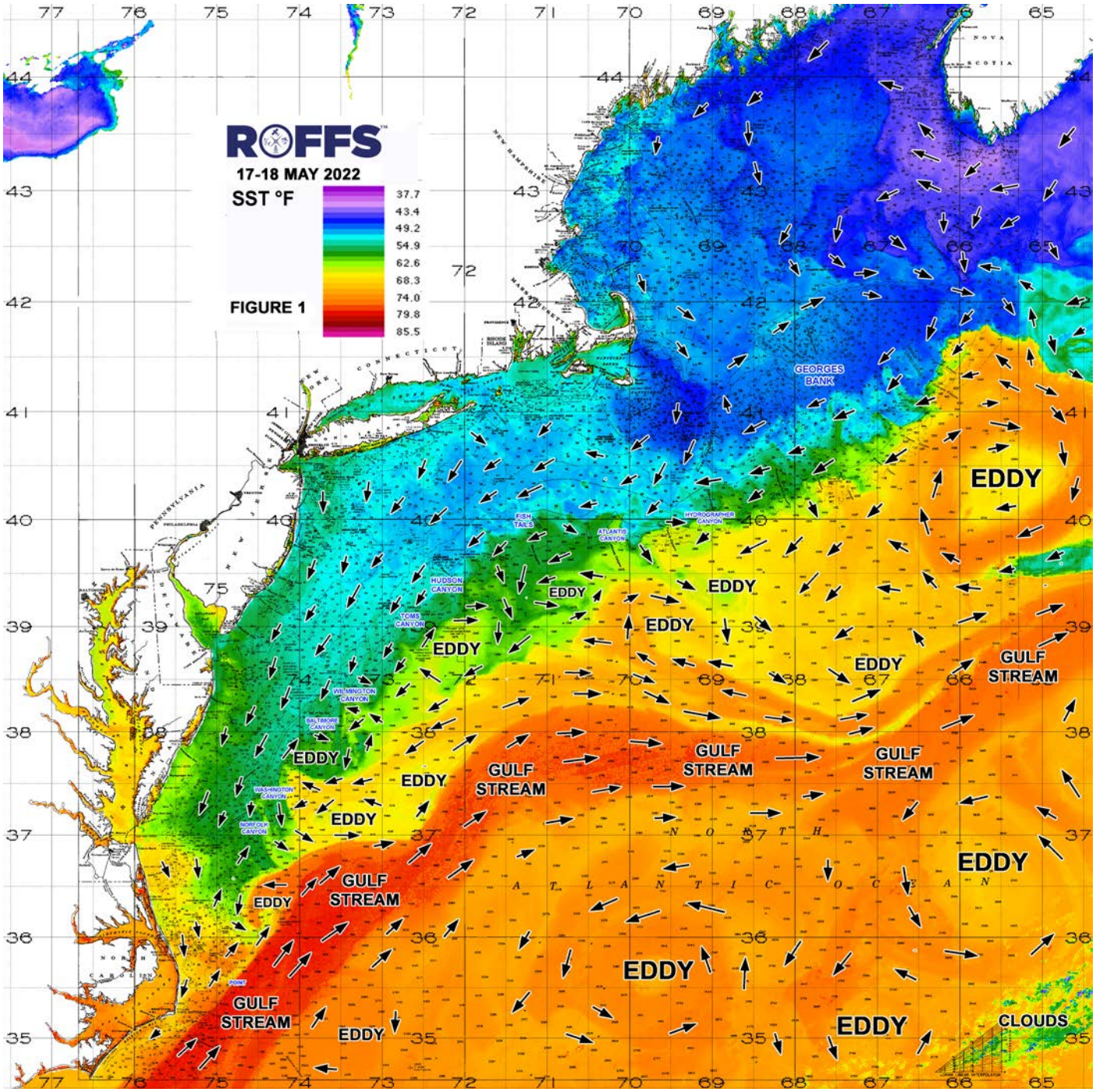

Figure 1: *This year's Northeast U.S. conditions were derived from a variety of infrared sensors to get SST from NASA, NOAA and ESA satellites during May 17-18, 2022. Main eddy features, canyons and surface currents are labeled.*

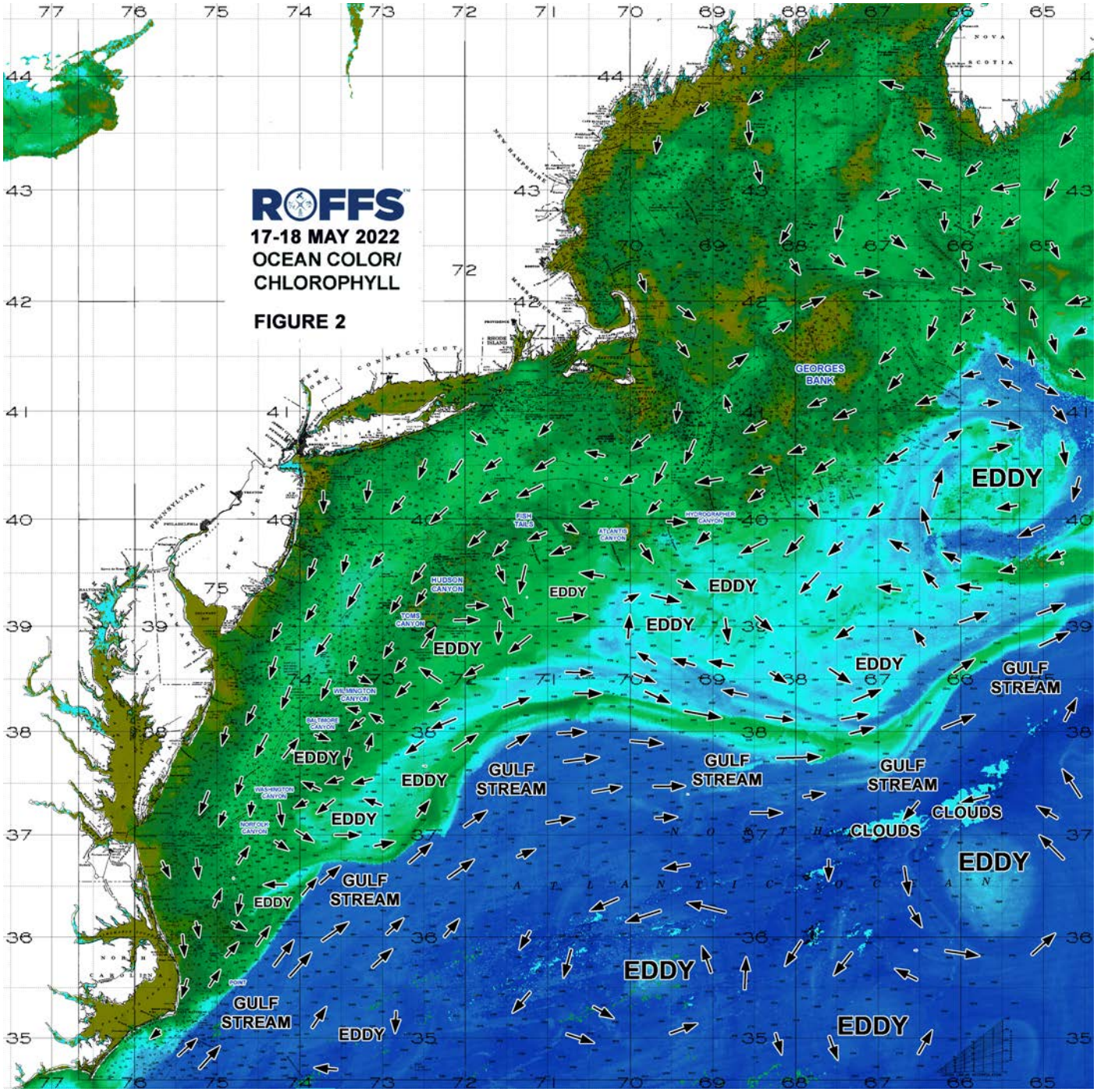

Figure 2*: This year's Northeast U.S. conditions derived from the ocean color/chlorophyll imagery during May 17-18, 2022 from the Aqua and Terra sensors on the MODIS satellite and SNPP and NOAA 20 VIIRS provided by the University of Wisconsin and from Sentinel 3A & 3B ESA satellite data. We consider this an image pair with the above SST Figure 1 image. Same main eddy features and surface currents labeled.*

Looking at these aforementioned eddies, as the SST warms these conditions over the Mid-Atlantic Canyons are expected to improve over the next month drastically as these eddies further interact with the Gulf Stream and pull in more productive waters in the near future. As these eddies progress westward and southwestward they will improve fishing conditions for the canyons south of Massachusetts to south of New York and also the Canyons between Hudson and Norfolk Canyons into June and July, especially where the water is pushing in a favorable inshore direction

over the canyons and ledges. Keep in mind that the Gulf Stream is the driving force to the south of these Canyon regions and it only takes a few days to a week for the Gulf Stream to meander farther north and directly interact with these eddies or shed another warm core eddy to improve the conditions in the Northeast U.S. and we already know there are some tuna, marlin and mahi within the Gulf Stream region outside of North Carolina. Conditions over the past week or two off of Poor Mans and Washington looked promising for a few days as some tuna were caught and further validates that these fish are already within the Gulf Stream waters.

It is also important to look further east for eddies and conditions forming east of Oceanographer Canyon and south to southeast Georges Bank. As these will likely be the features that contribute and progress west then southwest and is what anglers will be targeting during the mid-to-late summer season and bigger tournament season from over the canyons south of New York then to the canyons offshore of New Jersey, Delaware, Maryland and Virginia. At this time it actually looks **very promising** as there is one large Gulf Stream warm core eddy centered southeast of Georges Bank (near 65°35'W & 40°30'N) that will continue to push westward and could create some really good fishing over Powell to Oceanographer then Hydrographer Canyon areas later in June and July. Furthermore, there is another promising trend of 65°F to 68°F to 69°F water (a bit warmer than last year) much closer to the Powell, Lydonia and Oceanographer to Hydrographer Canyon area in 500-1000 fathoms already, good for bigeye, bluefin tuna, swordfish and even early yellowfin tuna.

Looking at Figure 2, we are not concerned about the lack of bluer water over this region at this time because we are at the peak season of the spring algae bloom (as evident in the large abundance of greener water offshore within the eddies). In fact, water overall is greener than last year at this same time further validating the later and cooler start to the fishing season. This is an annual event that provides the food for many of the baitfish species for the next month or two. However, just because the surface water is greener in color within these offshore eddies, a few feet below the surface the water is likely clearer and bluer. It is neat to see how the offshore warmer water is green, but some of the cooler inshore water over the bank and between 30-100 fathoms is bluer-green to clean green. The ocean color/chlorophyll signature becomes much more important later in the summer to distinguish the main water mass boundaries when the SST is so warm and uniform.

Another indicator of this year's spring to early summer fishing season is the orientation of the Gulf Stream. If you look at the location of the Gulf Stream in comparison to last year's SST conditions (Figure 3) and compare it to this year's conditions (Figure 1), you can see the Gulf Stream this year appears to be farther north when you get west of 70°00'W than last year, indicating a closer source of fish closer to the western canyons this year than last year. Also, overall the water between 1000 fathoms and the Gulf Stream are warmer than last year, which is also encouraging. This means it is only a matter of time (a few weeks) when the atmospheric temperature warms the water rapidly and provides that bridge for the fish from offshore to the canyon regions.

Another effective indicator for forecasting a good 2022 season is the recent fishing reports. We have not had many, but some have already caught mahi and yellowfin tuna off of North Carolina to the Point and out of Virginia area (but not as many as last year at this time). What is more encouraging is that blue marlin have already been caught off of Cape Hatteras the past week or two. This indicates that the first wave of target species have already arrived and are within the Gulf Stream and it only takes a push north and a pathway farther inshore within these eddy features and as the SST warms. There should be at least tuna in many of the canyon regions by

June, especially off of Virginia and farther east from Veatch Canyon and east. In fact, we have also heard of a few bluefin tuna caught and sighted between Hudson Canyon and Chicken Canyon area.

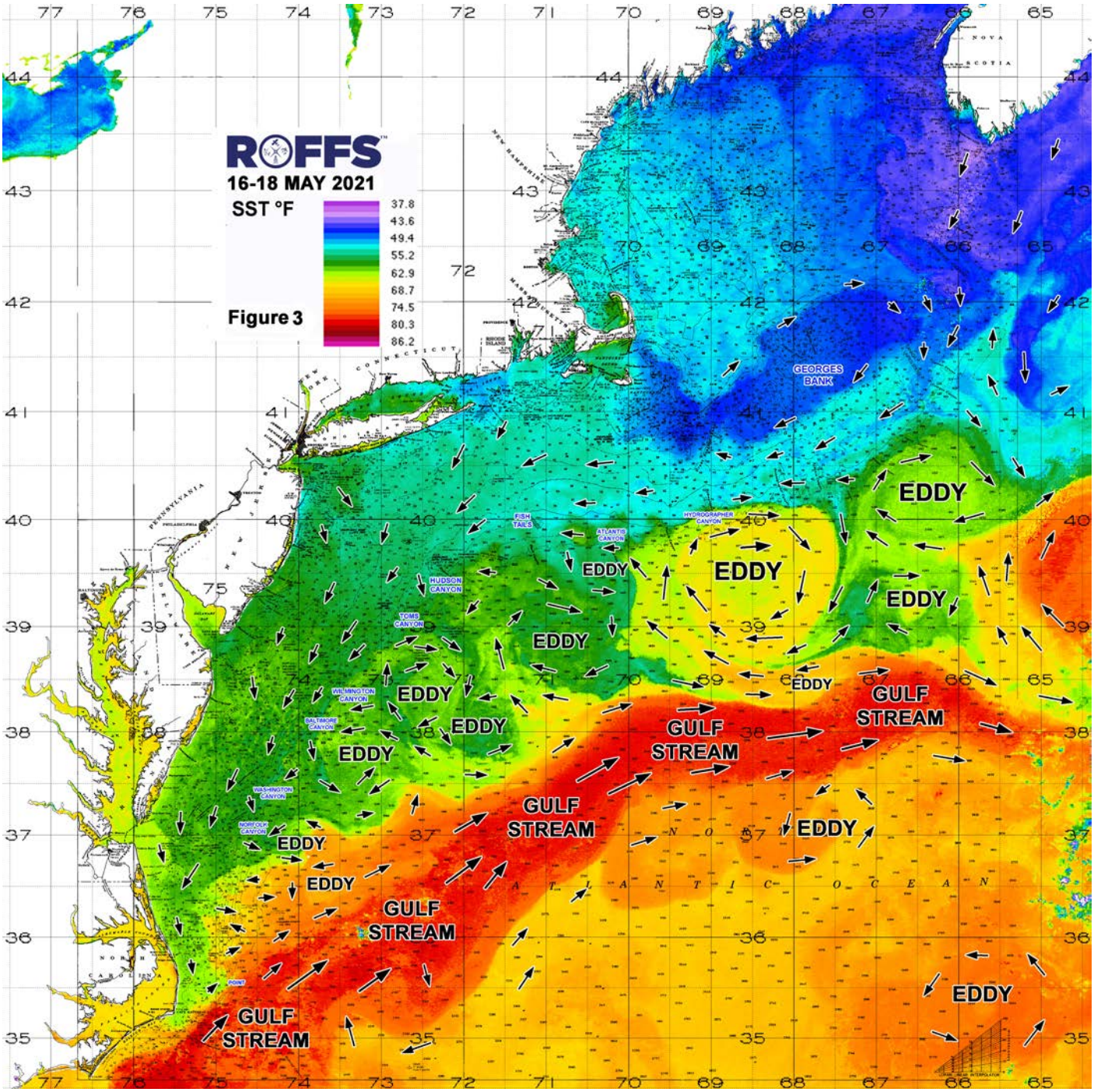

Figure 3. *Last year's Northeast U.S. conditions were derived from a variety of infrared sensors to get SST from NASA, NOAA and ESA satellites during May 16-18, 2021. Main eddy features, canyons and surface currents are labeled.*

Conclusion

Based on what we have been observing over the last few weeks, it appears that the arrival of the larger populations of tuna, wahoo, mahi-mahi, and billfish may arrive at a slightly later time this year than last year as the SST is overall cooler in many regions and there is a lack of warm-core Gulf Stream eddies in this region that are close to the canyons in the areas west of Oceanographer Canyon. Compared to last year, the SST (including the Gulf Stream) is cooler which tells us it is going to be a normal to later arrival of most pelagic target species compared to last year including the main migration of tuna and marlin a few weeks later than last year, and similar to 2020. Again, it remains to be seen how many bigeye will arrive this year, as this is still a mystery over the last few years. Bigeye tuna tend to stay deeper in water column and prefer slightly cooler water than yellowfin and are many times associated with pilot wales and come into the canyon areas early in the morning or early evening to feed then go back offshore. Yellowfin tuna is another mystery most years, as usually the best yellowfin action is during late May and June then becomes scattered and then picks up to be better again in September to early October. The GOOD NEWS is this year the Gulf Stream is slightly farther north, closer to the Canyon regions, and the conditions to the east of Hydrographer Canyon looks very promising and better than last year. However, as of right now the conditions west of Hydrographer Canyon do not look as favorable as last year quite yet, but conditions and heating will change rapidly.

We encourage you to take a look at these early season conditions and if you have not done so already, get your boat ready and get prepared to get offshore when the weather permits and the water will warm in the next few weeks as we know there are at least bluefin tuna in some inshore and canyon areas already and tuna, dolphin and marlin offshore of Cape Hatteras to southern Virginia. The bottom line is conditions do not look as promising as last year and there is a lack of strong eddy features (except off of Georges Bank) but the existing oceanographic conditions and fishing reports suggest, especially for the North Carolina and Virginia crowd, that you should already have boats in the water and fishing if you are able to do so. For the New York to New Jersey, Delaware, and Maryland crowd, you should be in final preparations to try to get offshore when the weather permits and as the water is going to warm inshore and offshore and conditions will continue to improve rapidly especially for swordfish, sharks and tuna now and then mahi, wahoo and billfish into mid-to-late June. Connecticut, Massachusetts to Rhode Island crowd fishing the canyon regions to the south, should also have your boats ready for early tuna season offshore for bigeye, bluefin and even yellowfin tuna as it already looks favorable in Veatch Canyon and east in areas.

It is important to remember that good fishing action on a daily basis is strongly linked to local, short-term (days) current conditions that concentrate the fish once the preferred habitats of the fish are in a particular region. When the water mass boundaries associated with these currents are geographically stable and favorable, i.e., persistently pushing over “good” bottom topography and/or in a favorable inshore direction creating upwelling, then they concentrate the baitfish and larger fish can be found foraging. This indicates that the fishing action on any given day is controlled by relatively short-term (hourly to daily) and relatively small-scale (5-10 mile) movements of the currents and their water mass boundaries. Our experience indicates that to reliably forecast specific concentrations of fish on a daily basis one must evaluate the ocean conditions on these scales. Relatively small subtle changes in the currents and their associated water mass boundary zones often have dramatic effects on the distribution and concentration of fish.

Contact ROFFS™ (1-321-723-5759 / fishing@roffs.com / www.roffs.com, @roffsfishing on Facebook and Instagram) for the up-to-date detailed fishing conditions and get the inside track to where the better fishing locations will be tomorrow. Our experienced satellite and fishery oceanographers will continue to monitor the northeast U.S. oceanographic conditions closely as the tuna season quickly improves and the active summer fun fishing and tournament season rapidly approaches. Get your boat ready now, as tuna conditions are improving especially in the eastern canyons and from Cape Hatteras to Virginia. Thank you for your support.

Safe, Successful and Healthy Fishing in 2022,
ROFFS™ Team