Northeast U.S. Season Preview 2019
THE TIME TO START FISHING IS NOW WITH GOOD PRODUCTIVE WATERS NEAR MANY CANYON AREAS

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ROFFS™ concludes its 2019 spring preview series by providing an overall update of the oceanographic conditions from mid-May offshore of the northeastern United States focusing in 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 article 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 area.

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, downscaled 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 2019 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 2019

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 early to mid-May we found that the SST of the core of the Gulf Stream off of Cape Hatteras, NC for 2018 was approximately 78.5°F to 79.3°F and for this year it is 1.0-1.5°F warmer (79.5°F – 80.5°F). The SST of the coastal water off of New Jersey, Delaware and Maryland is approximately 3.0°F to 4.0°F warmer this year than during the same time period in 2018. Furthermore, the SST offshore of Long Island is about 5.0°F to 6.0°F warmer than this time last year. These and other indicators that will be described below suggest (and we already have proof) an earlier arrival of the main migration and population of tuna, wahoo, dolphin and billfish into the northeast canyon region this year compared to last year. Part of this is contributed to the fact that the SST images we are comparing are about two weeks later this year compared to last year and with the recent warmer weather in the northeast U.S., the waters (especially inshore) are starting to warm at an average rate of 0.5°F to 1.0°F per day. Also please consider that last year was a cooler than normal weather pattern for the spring season in the Northeastern U.S.

One of the main drivers for trends and weather and for the mild to slightly above average spring SST's in the Northeast U.S. region can be attributed to the North Atlantic Oscillation (NAO) and its consistent positive phase during the first four months of the year. 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/).

Another possible factor to consider is the El Niño phase in the Pacific Ocean. Currently we are in a mild El Niño year and it is forecasted by NOAA to remain a mild El Niño year through the summer, which usually means warmer than 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.

Atmospheric temperatures along with SST are starting to increase at a more rapid pace as Memorial Day approaches. 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 an abundance of mahi, yellowfin tuna and marlin along with other highly migratory species. Reports from end of March and April have already shown wahoo, dolphin and tuna caught off of Cape Hatteras to Cape Lookout area where you find the Gulf Stream filaments and Gulf Stream edges. Based on historical observations we anticipate that these fish along with other tuna, dolphin, wahoo and then billfish will continue and already have moved to the northeast U.S. region from the Gulf Stream and into the relatively large eddy features that move over the canyon areas. Additional good news is that wahoo, dolphin, tuna, marlin and sailfish have already been caught off of South Carolina and North Carolina suggesting these species are already within the Gulf Stream and warmer waters in the Northeast U.S. when the habitat is favorable.

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 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 blue water and the mixing boundaries of the eddy features provide valuable habitat for the highly migratory large pelagic fish that enter this region in the spring and early summer seasons. Although, last year was better than 2017 as far as good eddy features and options for fishing, there are already signs that this year could be just as good if not better than last year as we will discuss in 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 May16-18, 2019 period. Figure 2 was derived from the NASA MODIS ocean color satellites (Aqua and Terra) showing the ocean color/chlorophyll image data during this same period May 15-18, 2019.

We used a combination of imagery over a few days with the time-tested ROFFS™ cloud reduction algorithm to produce these relatively cloud-free images over this large area. The time of the satellite passes and the amount of data taken from each image is not the same for the SST and ocean color images. Thus, there are some subtle differences in locations of where the water mass boundaries derived from the SST and ocean color occur. Again, a noted mismatch is seen in the area east of Cape Hatteras to east of Oregon Inlet, NC where in the SST (Fig. 1), the Gulf Stream and eddy locations are slightly different than in the corresponding Ocean Color image (Fig. 2). In spite of these and some other issues this image pair is considered more than adequate for the purposes of our seasonal discussion.

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=O5BHIWud4RA). 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.

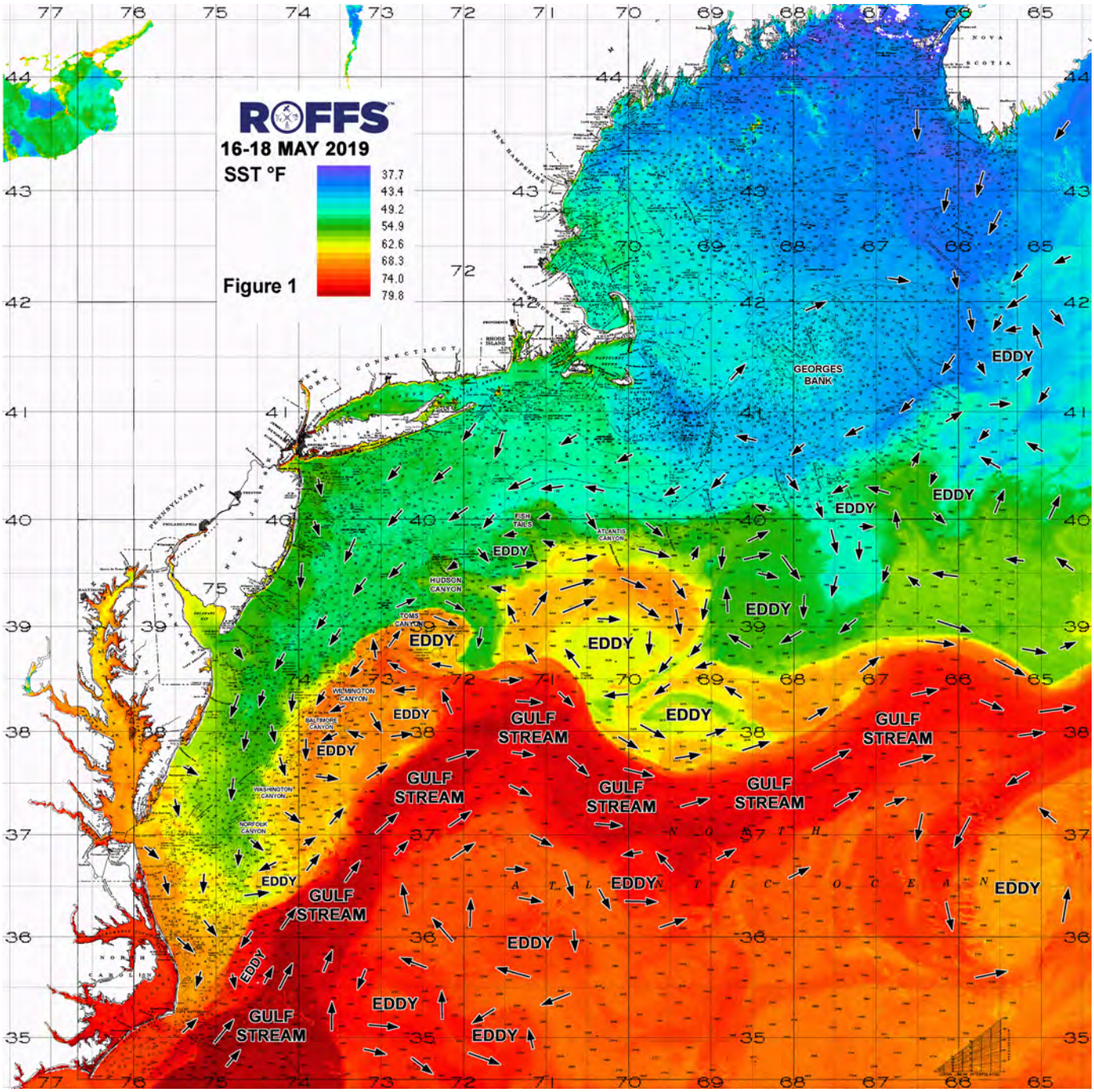

Figure 1: *This year's Northeast U.S. conditions were derived from a variety of infrared sensors to get SST from NASA, NOAA and ESA satellites during May 16-18, 2019. Main eddy features, canyons and surface currents are labeled.*

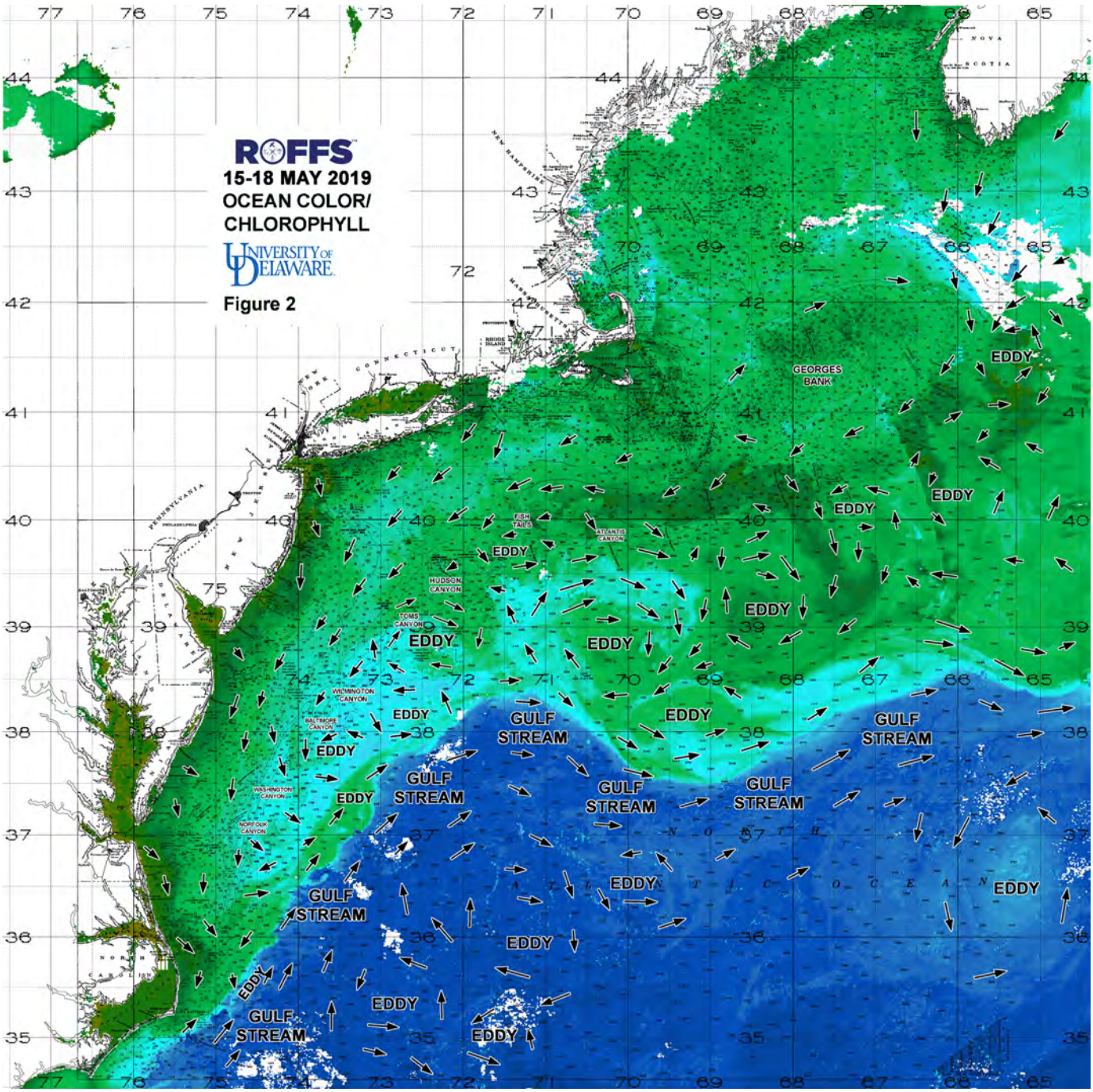

Figure 2*: This year's Northeast U.S. conditions derived from the ocean color/chlorophyll imagery during May 15-18, 2019 from the Aqua and Terra sensors on the MODIS satellite provided by the University of Delaware. We consider this an image pair with the above SST Figure 1 image. Same main eddy features and surface currents labeled, white indicates clouds.*

Looking at Figure 1, the most important features to highlight are the three main warm core clockwise rotating eddies that should continue to provide favorable conditions for good spring and early summer fishing conditions from south of Massachusetts to south of New York and in the canyon regions off of New Jersey to Delaware and Maryland to Virginia. There is an eddy centered, as of last week, offshore between Toms and Carteret Canyon (near 72°20'W & 38°50'N), another centered south of Atlantis Canyon (near 70°15'W & 38°50'N) and another to the east centered south between Hydrographer and Oceanographer Canyon (near 68°20'W & 39°15'N).

These western two eddies have already been interacting with the Gulf Stream and will continue pulling new warmer Gulf Stream water toward the canyon areas and providing the pathway for the tuna and other migratory fish to enter the canyon areas.

In fact, looking closer, there is a trio of eddies offshore between Toms Canyon and Poor Mans Canyon (the aforementioned clockwise rotating warm core ring eddy and two counter clockwise rotating eddies) that are combining to pull in mixed Gulf Stream water directly into Carteret, Lindenkohl and Spencer Canyons and now southwest into Wilmington and Baltimore Canyon and soon to be Poor Mans to Washington Canyon. These mid-spring conditions are leading to a good early season fishing season especially for tuna. In fact this main clockwise rotating eddy that is now offshore of Toms canyon was producing bluefin tuna a month ago in the Block and Hudson Canyon regions.

Additionally, looking farther eastward, the next important feature to keep an eye on is the warm core Gulf Stream eddy south of Atlantis Canyon. It is now interacting directly with the Gulf Stream and pulling up warmer 68°F to 69°F to 70°F water towards the offshore Fish Tails to Atlantis Canyon's areas with 62°F to 64°F water over the 500-1000 fathom contours. This eddy if it remains relevant, will continue to move west then southwest producing good fishing conditions for the Fish Tails, Dip then Hudson Canyon in the next few weeks into mid-June.

It is also important to look further east to the eddies and conditions forming east of the Atlantis Canyons to Oceanographer Canyons and southeast Georges Bank. As these will likely be the features that contribute and progress west then southwest and what anglers will be targeting during the mid-to-late summer season from the Gulf of Maine to the canyons south of New York to the canyons offshore of New Jersey, Delaware, Maryland and Virginia. It appears that if the eddy we see now south between Hydrographer and Oceanographer Canyon remains intact and drifts in the traditional westward direction, it has the potential to be a good, if not excellent fishing season offshore of the Northeastern U.S. throughout the summer. Looking south of Georges Bank there does not appear to be any larger warm core eddies to track at this time, only a few smaller counter-clockwise rotating eddies. However, it only takes a few days to a week for the Gulf Stream to meander, shift and push farther north and form more warm-core eddies to further improve the fishing conditions so please stay in contact with ROFFS™ for your analysis and updates. Furthermore, in the next few weeks to month, the SST will continue to warm closer the bank providing opportunities for tuna, wahoo, dolphin and marlin to migrate farther north into the canyon areas and inshore for easier targets.

Looking at Figure 2, we are not concerned about the lack of bluer water over this region at this time because we at the later stages of the peak season of the spring algae bloom (as evident in the large abundance of greener water). This is an annual event that provides the food for many of the baitfish species for the next month or two. Already we can see a larger abundance of blue-green to blended blue water near or offshore of some of the canyons, especially between New Jersey and Maryland, which we did not see at this time last year.

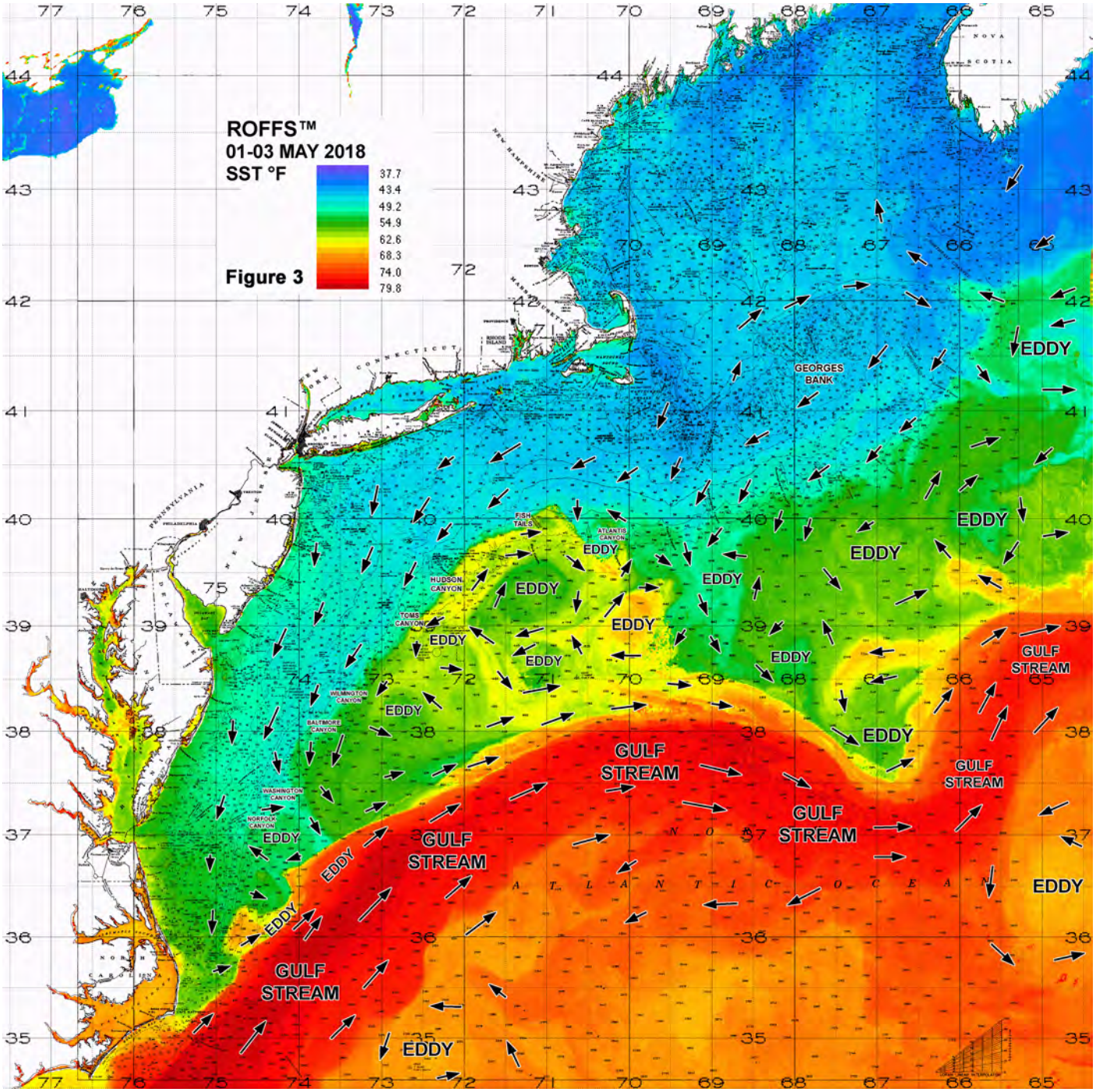

Figure 3. *Last year's Northeast U.S. conditions were derived from a variety of infrared sensors to get SST from NASA, NOAA and ESA satellites during May 01-03, 2018. Main eddy features, canyons and surface currents are labeled.*

Another promising sign that this year's spring to early summer season will be a more productive fishing than last year is the orientation of the Gulf Stream. If you look at the direct comparison of last year's SST conditions (Figure 3) and compare it to this year's conditions (Figure 1), you can see the Gulf Stream was more stable and farther south last year. This year the Gulf Stream has an increased amount of larger meanders in it and has pushed much farther north (especially west of 70°00'W) than last year. This equates to the warmer pelagic fish pathway being closer to the

canyon areas, hence closer to the coast in many regions providing more opportunities for fish to be closer to target fish zones earlier in the year.

Another effective indicator for forecasting a good 2019 season is the recent fishing reports. We had reports of wahoo, dolphin and tuna action offshore of North Carolina within the Gulf Stream edges as far back as late March to early April, so we know there is already a population of fish farther to the north and east. Furthermore, we have had reports of bluefin tuna sightings offshore of Long Island a few weeks ago. But the most encouraging conditions and reports are of plenty of bluefin tuna and even a few yellowfin tuna in the warmer 65°F to 70°F-72°F water that is already east of Toms Canyon and in the Carteret, Lindenkohl, Wilmington and Baltimore Canyon areas with some of the warmer water inshore of these canyons. There have also been reports of larger mako sharks and a few dolphin fish caught in and around these canyons. There is no doubt that these fish are also within the warmer eddy filament water that is on the northern edges of the eddy that is offshore of Atlantis Canyon too. Hence, the target species, especially tuna, have already arrived in many locations and it is time to get offshore.

Conclusion

Based on what we have been observing over the last several weeks with the number of Gulf Stream warm-core eddy features in the Northeast U.S. and the location of the Gulf Stream, it appears that the first round of tuna population (especially the bluefin) have already arrived and have been offshore and within some of the canyon regions for a few weeks now. There is already some evidence of mahi, yellowfin tuna and mako sharks within striking distance off of New Jersey, Delaware and Maryland and even to the south of New York, Rhode Island and Massachusetts if weather permits. It appears compared to last year, the SST overall is warmer which tells us it is going to be an earlier arrival of most pelagic target species compared to last year as we are already seeing, including marlin perhaps a few weeks sooner than normal. It remains to be seen how many bigeye tuna and albacore tuna will arrive this year, as this is still a mystery over the last few years. Three years ago bigeye tuna were caught at higher rates, while in 2017 was relatively slow and 2018 was a bit better in some locations at certain times of year. We still have so much to learn about the distribution and migrations of these and other fish and their association with different oceanographic conditions. Bigeye tuna tend to stay deeper in water column 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. This is one trend we continue to monitor. Yellowfin tuna is another mystery most years, as usually the best yellowfin action is during May and June then becomes better again in mid-to-late September and early October before it gets cool.

We encourage you to take a look at these early season conditions and if you have not already get your boat ready and get offshore when the weather permits. **The bottom line is**, the existing oceanographic conditions and fishing reports suggest, especially for the New Jersey to North Carolina crowd, that you should already have boats in the water and fishing. For the New York to Massachusetts crowd, you should be in final preparations to get offshore when the weather permits as the water is going to warm inshore and offshore and conditions will continue to improve rapidly especially for swordfish, sharks and tuna and soon to be mahi then wahoo and billfish.

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, 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 (1-5 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.

Please contact ROFFS™ (1-321-723-5759 / fish7@roffs.com / www.roffs.com) for the up-to-date detailed fishing conditions and get the inside track to where the better fishing locations will be tomorrow. The time has already arrived to fish offshore so do not miss the early good tuna action. Our experienced satellite and fishery oceanographers will continue to monitor the northeast U.S. oceanographic conditions closely as the shark and tuna season quickly improves and the active summer fun fishing and tournament season rapidly approaches. Also, please investigate and download the mazu SportFishing app from the Mac App Store for your iPad. We have partnered with mazu where you can open our analysis on their app and our hot spot locations can now be overlaid and georeferenced on real time offshore satellite data (https://www.mazu-marine.com/sportfishing/) for increased accuracy and accessibility.

Safe and Successful Fishing,

Team ROFFS™