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# The Moon, Mystery Fish, and More

## *The Latest Science for Anglers*

BY SCOTT BAKER AND SARA MIRABILIO

### DOES THE MOON AFFECT OFFSHORE TOURNAMENT CATCH RATES?

***Yes — and moon phase influences some gamefish more than others.***

A few weeks ago, I captured this image of the moon during mid-afternoon. It reminded me that the phase of the moon can have an impact on anglers' catch rates.

I dug into the archives to pull out this popular and still often-cited research study from 2007. It may be a little dated by fisheries science standards, but readers take heart: Many of the gamefish examined occur throughout the world, and scientists can predict the movements of the moon and earth for at least another 50 million years!

- *Research Need*

Competitive anglers will use any tool or information available to catch more fish — or, in the case of offshore fishing tournaments, to catch more fish than the next boat catches.

Environmental signals can and do alter the behavior of wildlife, including fish. Perhaps the most consistent environmental signal is the lunar calendar (new moon to new moon, 29.5 days). But, most fisheries work has revealed that catch rates and lunar phase are often species-specific.

Furthermore, most of the research has focused on commercial fisheries. Compared to marine recreational fisheries, large quantities of high-quality landings records offer scientists easy access to data on a much larger scale.

But, fear not, recreational anglers. There is another venue where high-quality angler catch records exists — as part of almost every highly regulated (and often financially incentivized) offshore sportfish tournament.

- *What did they study?*

Scientists collected anglers' "catch-per-unit-effort records" from 145 offshore fishing tournaments in New South Wales, Australia, during a 9-year consecutive period. They separated their analyses by different types of tournaments (e.g., shark or marlin), given the differences in fishing practices, and cross-checked them with the moon phase.

The research focused on eight popular

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gamefish: black marlin, blue marlin, striped marlin, blue shark, shortfin mako shark, tiger shark, yellowfin tuna, and dolphin fish. Incidentally, the black and striped marlin are the only two of these species not found in the Atlantic Ocean off North Carolina.

### • What did they find?

Scientists found a relationship between catch rates and lunar phase for 5 of the 8 species as shown here. Note that researchers determined no significant trends for blue marlin, striped marlin, and tiger shark.

| *Species* | *Moon Phase with Highest Catch Rates* |
|---|---|
| *Black marlin* | *between full moon and last quarter* |
| *Blue marlin* | *(no relationship)* |
| *Striped marlin* | *(no relationship)* |
| *Blue shark* | *new moon* |
| *Shortfin mako shark* | *first quarter* |
| *Tiger shark* | *(no relationship)* |
| *Yellowfin tuna* | *first quarter* |
| *Dolphin fish* | *first quarter* |

This was a large dataset, representing 145 tournaments, 381 fishing days, and 14,319 total fish. The majority of these fish were marlins (43%), yellowfin tuna (27%), and dolphin fish (17%).

### • What should anglers know?

The scientists speculated that the species' prey (baitfish) also moved in association with lunar cycles, although they did not test for this in the study.

In addition, the differences in observed catch rates by species could be due to biology. For example, some species may be able to pursue and capture prey during more segments of the lunar cycle than others.

*— Summary compiled by Scott Baker*

*Florida Fish and Wildlife/CC BY-ND 2.0*

*Some sportfish fare well in both natural and restored habitats.*

## DOES THE TYPE OF HABITAT AFFECT JUVENILE FISH?

***Research shows sportfish generally have higher populations in natural and restored habitats.***

• *Research Need*

The loss of estuarine habitats is impacting wildlife in ways that scientists don't yet fully understand. Restoration efforts are helping to address the effects of these losses. But what happens when different species require different coastal habitats? A one-size-fits-all habitat restoration approach may benefit some species over others.

Quantifying the number and condition of juvenile fish by species across habitats can help us to determine whether habitat restoration efforts are benefiting species we want to protect.

• *What did they study?*

Researchers in Florida studied how juvenile sportfish fare in different kinds of habitats: natural, restored, and "impacted" — ecosystems that urbanization has affected.

The scientists used historical images to initially determine how to classify estuary habitats. Researchers then looked at population density (the number of fish within a defined area), fish growth, habitat composition, and other factors to determine where juvenile sportfish thrive.

The research team focused much of their efforts on common snook, but also looked at over a dozen other species including 4 species popular with anglers: black drum, red drum, sheepshead, and spotted seatrout.

• *What did they find?*

Scientists determined that the population density of juvenile sportfish was generally greatest at natural sites. They also found that restored sites did well, too, sometimes better than natural sites. Both natural and restored sites did better on average than impacted sites.

Snook appeared to be widespread across sites, showed the most growth, and were in the best condition at natural and restored sites as opposed to impacted sites.

Some habitats with specific features were dominated by high numbers of a single species. For example, while researchers found juvenile sheepshead at all sites, high numbers were associated with shoal grass and oysters. Juvenile red drum were high in number at a single site close to the inlet and associated with mud and rock. In contrast, juvenile black drum were found along marsh grass shorelines. Finally, juvenile spotted seatrout were found in the highest numbers in red mangrove and oyster rocks.

• *Anything else?*

Prey fish may be a good indicator of habitat suitability. Sites with a high diversity of prey fish fostered better growth for snook.

The researchers also suggested that water transparency could influence prey-predator interactions for snook, because clear water allows prey to see predators more easily.

• *So what?*

These results indicate that restoring habitats is worthwhile when trying to protect sportfish and that considering multiple kinds of habitat and species requirements is important when we design restoration efforts.

Researchers suggest that "targeted" habitats — restored habitats that account for the requirements of specific fishes — offer the best solution.

Assessing past efforts will help to increase understanding of the best practices for coastal estuarine habitat restoration.

*— Summary compiled by Allison Fisk and Scott Baker*

## HOW WILL CLIMATE CHANGE AFFECT SPAWNING AMERICAN SHAD?

***By the 2090s, the spawning season for American shad could begin 12 days earlier.***

American shad are on the move right now. These fish migrate down rivers to the ocean and south during the fall and winter.

Historically, American shad have supported important sport and commercial fisheries along the Atlantic coast. However, overfishing and the construction of dams, which block spawning migrations, have depleted many shad populations. Federal and state resource agencies are working to restore American shad to many North Carolina rivers throughout the state.

Recreational and commercial fishing, pollution, habitat loss, and industrial water sewage also impact "anadromous" species of fish, which spend most of their life cycle in saltwater but move upriver from the sea to lay their eggs.

But what role is climate change having on the life cycles of some of our anadromous species?

Warmer water plays a significant role in the life cycles of aquatic fishes, as water temperature can serve as one environmental cue for spawning to begin. Will warmer temperatures lead to earlier-than-normal spawning in shad?

• *Research Need*

The American shad, an anadromous fish whose populations in the Hudson River Estuary in New York have dramatically decreased, are very important to both commercial and recreational fishing. With stocks in the Hudson River and other locations along much of the U.S. East Coast becoming so low, there is concern that these population numbers will not recover naturally.

Researchers want to know whether warmer temperatures are affecting the reproductive cycle of the American shad. And, if so, how so?

• *What did they study?*

To understand the effects of water temperature on the reproductive cycle of the American shad, researchers collected and analyzed long-term temperature data from Poughkeepsie Water Treatment Facilities, daily air temperature data from the North American Land Data Assimilation System, and fish egg count data from the Hudson River Monitoring Program.

Their results made it possible to develop models to project future temperature changes in the Hudson River estuary to help predict the spawning life cycle of the American shad and other fish species.

• *What did they find?*

Ovary development increased in the American shad as water temperatures

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*Will warmer temperatures lead to earlier-than-normal spawning in American shad?*

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increased. The onset of spawning seasons appears closely linked to mean and peak June water temperatures in the study area. With warming waters, the spawning season for American shad is predicted to begin 12 days earlier by 2090 and be 3 days shorter overall.

- *Anything else?*

The Hudson River Fisheries Unit has developed an American shad recovery plan. With new practices, the closure of the Hudson River American Shad fishery, and habitat restoration, Hudson River Fisheries Unit predicts that American shad numbers will be in a steady state of recovery over the next several decades.

- *So what?*

Because these results indicate that the rate at which ovaries mature in American shad increases as water temperatures rise, American shad will lay their eggs earlier in the year as waters continue to warm.

Researchers predict that water temperatures in the Hudson River will continue to increase over the next century and acknowledge that factors not examined here — like changes in availability of zooplankton (prey for American shad), or the introduction of new invasive species — may also alter these model results.

Projection models from this study will help in predicting effects on reproduction and spawning cycles of American shad. Furthermore, these modeling systems will be essential for understanding the current and future effects of climate change on other marine fishes.

*— Summary compiled by Lauren D. Pharr*

## WHAT'S IN YOUR PLATTER?

***We might have enjoyed pangasius without even knowing it.***

- *Research Need*

Pangasius fish, primarily *Pangasius hypophthalmus* (commonly called "tra" or "swai") and *Pangasius bocourti* ("basa"), belong to the Pangasiidae family of catfish. This imported, farm-raised, low-cost freshwater fish has white flaky flesh, a delicate texture, and a clean taste.

Pangasius is one of the fastest growing fish commodities — if not the fastest growing — on the U.S. market. The fish first appeared on the U.S. market around 2005, entered the National Fisheries Institute's top 10 consumed seafoods in the U.S. around 2009, and has held the No. 6 spot every year since 2011.

For a species to remain in the top 10 consumed seafoods in the United States is a significant achievement. This list alone makes up 86% of all the U.S. seafood consumption, and the U.S. is only behind China and Japan in terms of total seafood consumption.

As of 2002, federal government regulations have allowed only North American catfish to be labeled as "catfish." However, during the early rise of pangasius in the U.S. marketplace, packagers labeled pangasius as "catfish" and competed directly with North American native catfish in the Ictaluridae family.

Yet, if pangasius is popular enough with American consumers to make and move up in the top 10 list, why is it consumers rarely see pangasius (or "tra," "swai," or "basa") on restaurant menus? Americans consume roughly 70% of their seafood in restaurants, but if restaurants are using pangasius, are they labeling the fish as something else or not labeling it at all?

- *What did they study?*

Scientists collected 47 different fish products at 37 restaurants in a single Southeast city. The fish products represented three categories: (1) items labelled as "catfish", (2) expensive items labelled as "grouper" and other species, and (3) items generically labelled as "fish" with no further identification given (e.g., as "Fish of the Day" or in a "Fish Platter"). Restaurants prepared the fish in various ways, offering grilled, deep-fried, pan-fried, blackened, crusted, and raw products.

The research team purchased each product as a take-out meal and immediately transported it to the lab to determine whether the product was a pangasius species or not. Additional analysis identified whether those products testing as pangasius species were tra, swai, or basa.

- *What did they find?*

Fourteen of the 47 fish products sampled (nearly 30%) were pangasius species, all of which were tra or swai. None of the 14 had been labeled on restaurant menus as pangasius (or as tra, swai, or basa).

Nine fish samples in the study were not identified at all on menus, and six of these tested as pangasius. Of 15 fish products labeled as "catfish," researchers confirmed that four were pangasius, not domestic catfish. Finally, of the 18 dishes that menus identified as "grouper," four actually were pangasius.

Analysis of menu pricing revealed that restaurants used pangasius as a stand-in both for high-priced fish dishes and cheaper ones.

- *Anything else?*

Researchers described cooked grouper fillet as generally thicker than that of pangasius, separating in large flakes or chunks with a firmer texture. The team characterized pangasius as a thin fish fillet that often crumbled easily into small pieces.

- *So what?*

Although this research only looked at restaurants in a single city, all that pangasius brought into the U.S. each year has to go somewhere — and it seems probable that other restaurants throughout the U.S. also serve pangasius. Compared to similar but previously conducted studies, pangasius mislabeling or lack of labeling appears to be on the rise.

Seafood mislabeling continues to be a problem in the U.S. and other parts of the world. Always ask about the identity of the fish you purchase. *— Summary by Scott Baker*

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*Pangasius with rice and red pepper.*

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