Teacher Reading

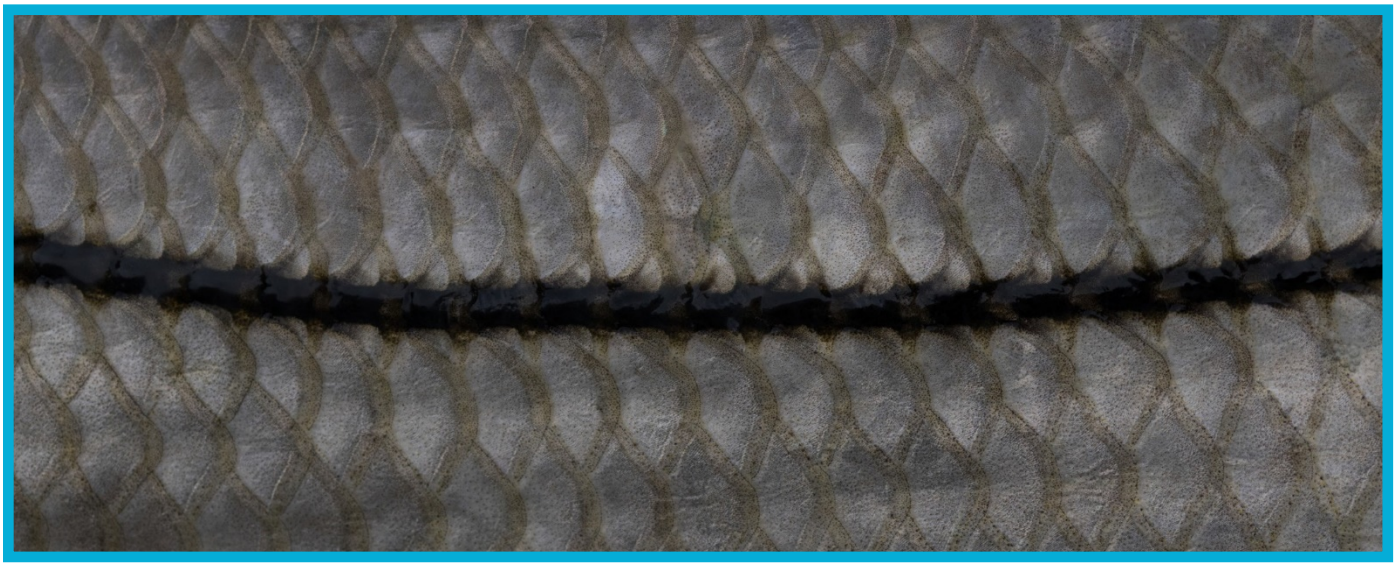
Snook

Snook feed on a wide variety of forage fish. In order to achieve relative safety in numbers, forage fish "school up" in large groups that may include several species that look like each other. Here, a school of forage fish pass over prowling snook.

Globally, fishermen target 12 species of snook, (*Centropomidae spp.*). These species primarily live in the warmer waters of the western Atlantic, including Florida's Atlantic Coast; the southern latitudes of the Gulf of Mexico; Cuba; the western Caribbean; and in the eastern Pacific. In the United States, several of these tropical and sub-tropical species occur only in Florida and Texas, where they are managed as recreational fisheries, with limits concerning which fish an angler can keep, and when. Elsewhere, combinations of tourists and other recreational anglers, subsistence fishermen, and commercial fishermen compete for the species, which provide great sport and boast firm and flaky white filets. The roe of females is also a fried delicacy.

Snook are targeted almost exclusively in shallow coastal waters: in fresh, brackish, and saltwater. Natural habitats include: fresh- , salt- and brackish creeks and rivers; beaches; mangrove shorelines; seagrass meadows; oyster reefs; nearshore hardbottom; sandy surf zones; coral reefs; and rocky "live bottom." Snook also take advantage of manmade structures including: docks, bridges, piers, jetties, seawalls, and artificial reefs. Recreational anglers target snook with fly rods and light tackle – generally by wading, fishing from a canoe or kayak, or fishing from an outboard-powered shallow-draft vessel. In countries where commercial fishing is allowed, commercial and subsistence fishers may use gillnets, seines, and handlines. Sadly, dynamite is still used to harvest snook and other species in developing nations. Dynamite fishing kills indiscriminately and does significant harm to habitats.

The passion for snook fishing with fly rods and other light tackle supports a major global travel, boat-building, and tackle industries which generate well-paying jobs and vital local and regional tourism revenues. Iconic destinations include southern Florida; Cuba; both coasts of Costa Rica; both coasts of Panama; Nicaragua's Caribbean Coast; Belize; and Venezuela.



Snook possess a vivid, black "lateral line." Most fish species have this sensory organ, which allows the fish to feel vibrations in the water from potential predators and prey. The lateral line assists the other senses in efforts to feed and escape larger predators that may eat them.

There are strong economic and ecological incentives to keep snook populations healthy. However, snook have a very complex life history and diverse habitat needs, and people fish for snook for a wide variety of different – even conflicting –reasons. This makes managing those species quite challenging. But such challenges are part of what makes this species so fascinating and important.

Etymology

All described fish species have a scientific name—usually Latin or Greek—and a common name or names used by fishermen. All scientific names are unique and may reflect the species' physical attributes. Or, they memorialize a scientist or naturalist who first described the species, or something important about it.

The snook's family name probably describes physical attributes. It likely earned its scientific name because of the razor-like gill plate. Centromidae likely comes from the Greek, kentron = "thorn" or "sting," while pomas,-atos means "cover."

Some fish species wind up with funny-sounding common names, and several species share the same name. Snook – originally pronounced with a long "o" – is the common name of several unrelated species. The word, "snook" may be derived from an old Anglo-Saxon word for "long nose," or the Dutch word for the weapon called a "pike." It's quite appropriate that the word "snook" describes a pointed weapon. In a variety of ways, a snook's head is indeed a weapon.

Ontogeny

Snook, like many other animals, experience changes throughout their life cycle that alter their habitat needs. It is generally accepted that everything in nature is connected, and the movement of animals throughout their life cycle can create linkages between habitats including seagrass meadows, coral reefs and the blue pelagic ocean. Indeed, one of the most interesting and telling ways to examine ecological connectivity is to examine how the migrations of a fish species, throughout its life cycle, create an atlas of essential habitats. There's so much more ontologically to these animals than meets the eye. That's especially true of snook.

Snook species share a similar life history, or ontogeny, though there is some variability depending upon species and geography. Let's focus on *Centropomus undecimalus*, the common snook – one of

the largest and most popular of species that occurs in the western Atlantic, including the Gulf of Mexico and Caribbean Sea.

Spawning

As with all life, snook exist to perpetuate their species. Female snook can live to 21 years and about half of the female population reaches sexual maturity by age five. About half of all males reach sexual maturity by age two, and can live 15 years.

Like many boney, ray-finned fish species (teleosts), snook adopt an R-Strategy for reproduction, vs. a K-strategy. Animals that use the R-strategy usually invest energy into a multitude of offspring that receive little or no parental care, whereas animals using the K-strategy invest energy into a few, large offspring that require considerable parental care.

Snook often hide among manmade structures, such as dock pilings, pictured here. They also use artificial reefs and jetties in addition to natural habitats like mangroves, seagrass meadows, and natural reefs.

Humans, for example, obviously invest in the K-strategy. We care for our young beyond their sexual maturity. But snook, and most bony fishes, will spawn as individuals many times in the course of their relatively long lives. Their strategy of broadcast spawning means that fertilized eggs are cast out into the currents and left to survive completely on their own. Each spawning season, an individual female may only produce one to four individuals that survive to adulthood to reproduce – despite generating several million eggs.

An individual snook will spawn many times throughout its life – possibly even as a male and as a female. Yes, snook change sex. They are called protrandric hermaphrodites, meaning that all snook are born male and some turn into females. This change occurs during the fall, after the spawning season, in as little as 90 days. It occurs in fish between one and seven years of age. Biologists have documented this phenomenon by holding snook that were definitely male (because they were producing sperm) in a pond during the summer, and then during the fall, discovering some females in the group. It is not known what triggers the sex change.

Snook spawn in aggregations between spring and early fall. In the Northern hemisphere, common snook typically spawn April through September. The date is far less important than water temperature and salinity level, and length of daylight and lunar phase. Spawning begins when water temperatures rise to 22 to 23 degrees Celsius, when salinity levels are about 27 parts per thousand or higher; and when the photoperiod (length of daylight hours) exceeds 13 hours.

Spawning efforts increase around the new and full moons, when tides are more extreme and fertilized eggs are likely to travel farther with the currents. In Florida, Gulf of Mexico snook show strong site fidelity to specific spawning aggregation sites – typically Gulf passes. Gulf snook spawn on the outgoing tide, so that eggs are dispersed into the open water. Winds, swells and tides return the larvae into the estuaries.

Snook along Florida's Atlantic coast do not always go back to the same area time after time, meaning they do not show "site fidelity." In fact, these snook migrate north and south, roughly from Port Canaveral to Government Cut in Miami. About half the common snook caught in Florida Bay are Gulf fish; the other half are from the Atlantic population. Atlantic snook spawn multiple times in multiple sites – typically inlets and nearshore reefs – on the incoming tide. The incoming tide sucks the gametes directly

into the local estuary. But because the fish migrate up and down the coast, spawning here and there, this mode of roving and spawning maintains genetic diversity. The fish are constantly intermingling with and spawning with diverse individuals. This tactic produces stronger, healthier populations of snook.

Broadcast spawning requires snook to be highly fecund (produce large amounts of sperm and eggs). Females ovulate as often as every two weeks, and depending on the fish's size and age, can produce hundreds of thousands of eggs. They are what's called indeterminate or "batch" spawners; snook spawn multiple batches of eggs per spawning seasons.

A spawning aggregation of common snook swims into the tide as they prepare to spawn in an Atlantic inlet.

Until recently, it was thought that all female snook return to the same spawning aggregation sites every year. But recent studies show that in fact they are "skip spawners." Some females spend years far up rivers and springs without spawning. The assumption is that some of the female population is left behind during spawning, in case a devastating event such as a red tide happens suddenly enough to wipe large percentages of spawning fish. It would make no sense for all of the sexually mature females to put themselves in a place where predators or harmful algae blooms could wipe them all out at once.

Snook Larvae

Snook larvae are "pelagic." That is, fertilized eggs float high in the water column for about 18 hours before the larvae hatch. Larvae then are subject to the whims of winds and tides until a very late stage in the larval cycle when they may settle in certain microhabitats. Very few larvae survive to become juvenile snook, which is why snook produce so many eggs each spawning season.

Early Juvenile Snook

Late-stage larvae recruit to vegetated shorelines of quiet, shallow-water creeks, canals, and lagoons in both low-salinity (riverine) and high-salinity (mangrove swamp and salt marsh) environments. Once "settled," tiny, early juvenile snook can't venture from microhabitats along shorelines with limited water movement, moderate slopes, and vegetation extending over/under the water. If they attempt to leave these habitats, swift tidal movement would wash them away. Steep shoreline slopes would allow predator fishes enough depth to attack them, and the vegetation provides them with complex cover and food sources.

Like most predatory fish, early juvenile snook depend upon calorie-rich, easy-to-catch prey to make it through this period of rapid growth and extreme vulnerability. Early juveniles (<40 mm in length) feed on copepods and other tiny crustaceans. Slightly older, larger and more capable juveniles (40-50 mm in length) switch to small fish, minnows including mosquitofish and killifish, as well as crustaceans (mainly palaemonid shrimp). The larger prey items offer more energy for the rapidly growing snook.

Juvenile Snook

Throughout their lives, snook primarily associate with structure, including mangroves, docks and jetties, and natural and artificial reefs. But they do forage on grass flats and along beaches as well. Juvenile snook become "braver" and move about more as they grow in size. Though they feed day and night from ambush points in structure, they risk the open flats because the flats offer larger and more nutritious prey items such as blue crabs, mullet, and other forage fish.

Mature Snook

All snook start life as males and some will then change into females. Snook become sexually mature beginning at about 62cm, and as early as 2 years old. Once sexually mature, their movements and feeding patterns tend to revolve around a lengthy spawning season – roughly April through September in Florida.

Big female snook often carry eggs that may be crushed if the fish is held out of the water for too long. It's best to leave at least the belly in the water for photos, and to take photos quickly in order to let the fish breathe properly in the water.

It takes a great deal of energy to generate gametes and to migrate to a spawning aggregation site. Therefore, snook feed more aggressively "pre-spawn," and during the warmer months, vs. the colder months when their metabolisms are slower and they aren't making eggs and moving around much.

Snook are voracious. Though they depend less on crustaceans as they mature, snook feed on shrimp, crabs and other invertebrates throughout their lives. Three of the most important forage fish that snook eat include the pinfish, mullet, and menhaden. Those oily, fat-rich fish provide them with lots of energy year-round. Other favorite forage fish species include small drums called "croakers," catfish, and a small grunt called a "pigfish." They also dine on several species of herring, anchovy, and sardine.

The ways that snook feed – including the form and function of their head, eyes, and neck muscles – is truly fascinating. A snook's eyes are essentially on the top of the head, so that it can see best looking up—which is important for an ambush predator that spends most of its life lurking on the bottom. Snook feed mostly in low-light conditions, such as shade, or are nocturnal feeders. Their eyes are uniquely evolved to gather what little ambient light is available. One of the most important elements of a snook's eye is called the "tapetum lucidum" – a membrane that gathers and reflects light back toward the fish's photoreceptor, which receives the image for the brain. It's the same type of membrane that makes the eyes of a dog, cat, or deer glow.

When a snook attacks its prey, it opens its large jaws so that a suction forms and the prey item is pulled backwards as the snook lunges forward. The suction sound is the loud "pop" anglers often hear when a snook attacks a lure or live bait.

Stressors

Habitat loss due to coastal construction poses the greatest threat to snook populations in Florida and other places facing development pressure where snook species occur. Mangrove and spartina shorelines are often replaced by seawalls and bulkheads. Those structures do not provide juvenile snook with the cover or food that they need. Hard structures also reflect wave energy instead of absorbing it. The waves can re-suspend sediments and block sunlight from plants such as seagrasses that provide cover, food, and oxygen for entire ecosystems.

Even worse, human alterations to watersheds adversely affect snook populations. In Texas, fresh water that flows out of once-great rivers such as the Rio Grande is now measured in trickles. People pull so much water from the Rio Grande and its source rivers for irrigation and consumption that very little brackish habitat remains along the Texas Coast.

Throughout Florida, the natural "sheet flow" of water has been diverted into canals and ditches. Instead of storm water flowing slowly across flat, vegetated landscapes, into filtering wetlands and then into estuaries, the water now drains rapidly into canals and ditches. Such flood-control measures work to keep homes and roads dry, but they cause extreme flushing effects in juvenile snook habitats.

Coming from canals and ditches, the water is much dirtier. While sheet-flowing water carried essential nutrients from soils and arrived very clear, dirty runoff carries pollution from products such as oil and fertilizer directly into the nursery habitats. Scientists studying nursery habitats in Southwest Florida, crisscrossed with canals and ditches, found much less diversity and abundance of forage sources for juvenile snook. The implication is that fewer juvenile snook will make it to spawning age because they could not get the calories and diversity of nutrition they need in such a dirty, contaminated environment.

Fishing is a cherished form of recreation for couples and families. Here a couple of fly angler release a snook. They want to ensure the opportunity for future generations of anglers.

Factors other than fishing regulations that affect survival of adult snook include human impacts on habitat quantity and quality and natural perturbations such as cold kills and red tides. Some of these same factors may also affect the survival of larval and juvenile snook.

Setting Snook Limits

Florida and Texas manage snook harvest with size limits, bag limits, and closed seasons. Florida keeps the fishery closed to all but catch-and-release fishing during December and January, when this tropical species is vulnerable to cold snaps, and June through August, the peak of the spawning season.

Importantly, scientists set catch limits based upon the number of offspring each fish is likely to generate on an annual basis or inter-annual average. This figure is called a Spawning Potential Ratio (SPR), which is the ratio of the amount of spawn produced by a cohort of snook (or other species) over its lifespan under a specific fishing regime relative to the spawn that would have been produced over the cohort's life span had there been no fishing.

A "cohort" is a group of fish that hatched at one time. "Year class" is another term for fish populations stratified by age. Over time, these fish die either from natural causes, like predation, or being harvested.

"Spawn" is the number of eggs produced by a cohort over its life span. In some cases, the number of eggs is proportional to the total weight of mature females, or the "spawning stock biomass." In others, where the ratio of egg number to fish size isn't so proportional, scientists use estimates of egg numbers based on other information. In either case, scientists use schedules of life history to calculate SPR. Older fish are typically more fecund. Therefore, the more mature, fertile fish in the population, the lower managers can set the SPR, which means more fish get to be harvested. This is the case for maintaining a healthy age structure in any given fish population.