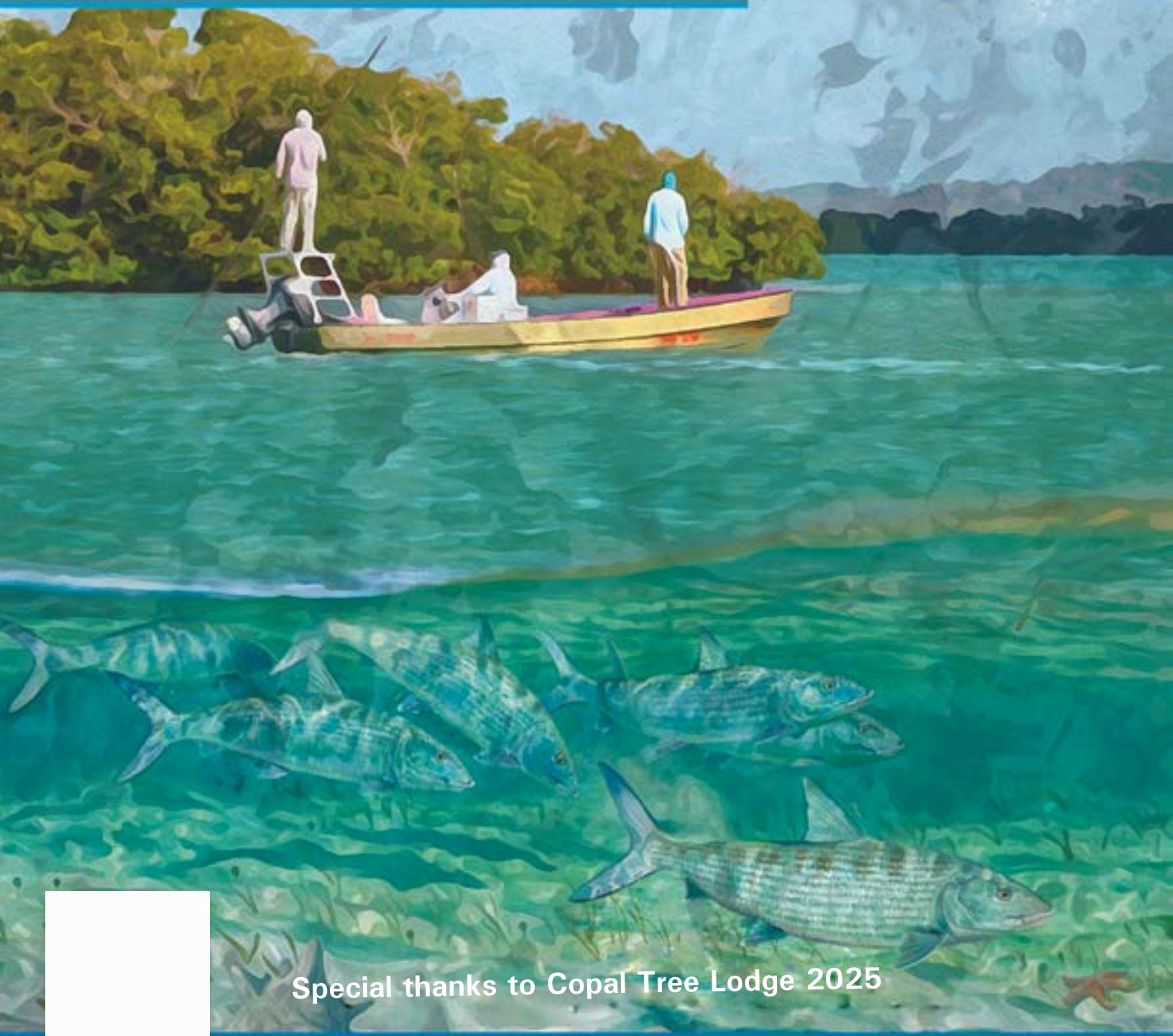
Bonefish & Tarpon TRUST

THE FISH AND HABITAT OF BELIZE

HABITATS • FLATS FISHES • LIVELIHOODS • CONSERVATION



Special thanks to Copal Tree Lodge 2025

www.bonefishtarpontrust.org

PROTECT OUR FISHES, HABITATS & LIVELIHOODS

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INTRODUCTION

Belize is a country with diverse habitats, people, culture and economies.

BELIZE & ITS ENVIRONMENT

Mangrove and seagrass ecosystems important to marine life

Not only that, but our country also boasts coastal ecosystems such as mangroves, seagrass meadows, sandy-muddy flats and even coral reefs. These make great homes for many fishes like bonefish, tarpon and permit, which rely on these habitats to grow, feed, shelter and reproduce.

Connecting the mountains to the sea are rivers which are part of an important ecosystem for various species including birds, reptiles and amphibians.

Belize is known as land of the free!

Belize gained independence on September 21, 1981 becoming a democratic nation thriving on the strength of its people, cultures, ecosystems, flora and fauna.

Belize is bounded to the north by Mexico, west and south by Guatemala and east by the Caribbean Sea.

Belize is also well known for its diverse ecosystems. It hosts an abundance of wildlife that can be found in its terrestrial ecosystems, such as tropical rainforest which covers the magnificent Maya Mountains.

A river connects land and sea in southern Belize

FLATS FISHING COMMUNITIES

Punta Gorda Town in southern Belize

Did you know Belize is world famous for flats fishing, from Ambergris Caye in the north all the way to Punta Gorda in the south?

Flats fishing is a type of fishing along the Caribbean coast of Belize. People from unique coastal communities also known as flats fishing communities depend on this type of fishing for a living.

The rich fishing culture attracts anglers from around the world for their 'Grand Slam' and with added luck a 'Super Slam'.

Flats fishing creates many jobs for Belizean hoteliers, tour guides, chefs, taxi drivers, artists, musicians and even your neighborhood store.

Examples of some flats fishing communities are: San Pedro, Caye Caulker, Turneffe Atoll, Placencia and Punta Gorda.

This activity generates approximately BZ $240 million and directly supports 4,558 jobs, which benefits the entire country.

Undoubtedly, Belize is a Super Grand Slam!
Rich in culture, traditions, adventures and biodiversity worthy of protection for the continuous benefit of all.

Grand Slam -

the catch and release of a bonefish, tarpon and permit by a person in a single day.

TARPON

BONEFISH

PERMIT

+

Super Slam -

the catch and release of bonefish, tarpon, permit and snook by a person in a single day.

SNOOK

HABITATS

Habitat is a place where organisms like fish live.
Important habitats are mangroves, seagrass, sandy flats and coral reefs.

MANGROVES

Mangrove wetlands are important coastal habitats

Worldwide, more than 50 species of mangroves exist. In Belize, we are lucky to have three species. Mangroves are often found along coastal areas and in shallow flats, thriving in the salty water. We can also find buttonwood which is a mangrove associate meaning it is often found in mangrove areas but is not a true mangrove.

Three types of mangroves in Belize:

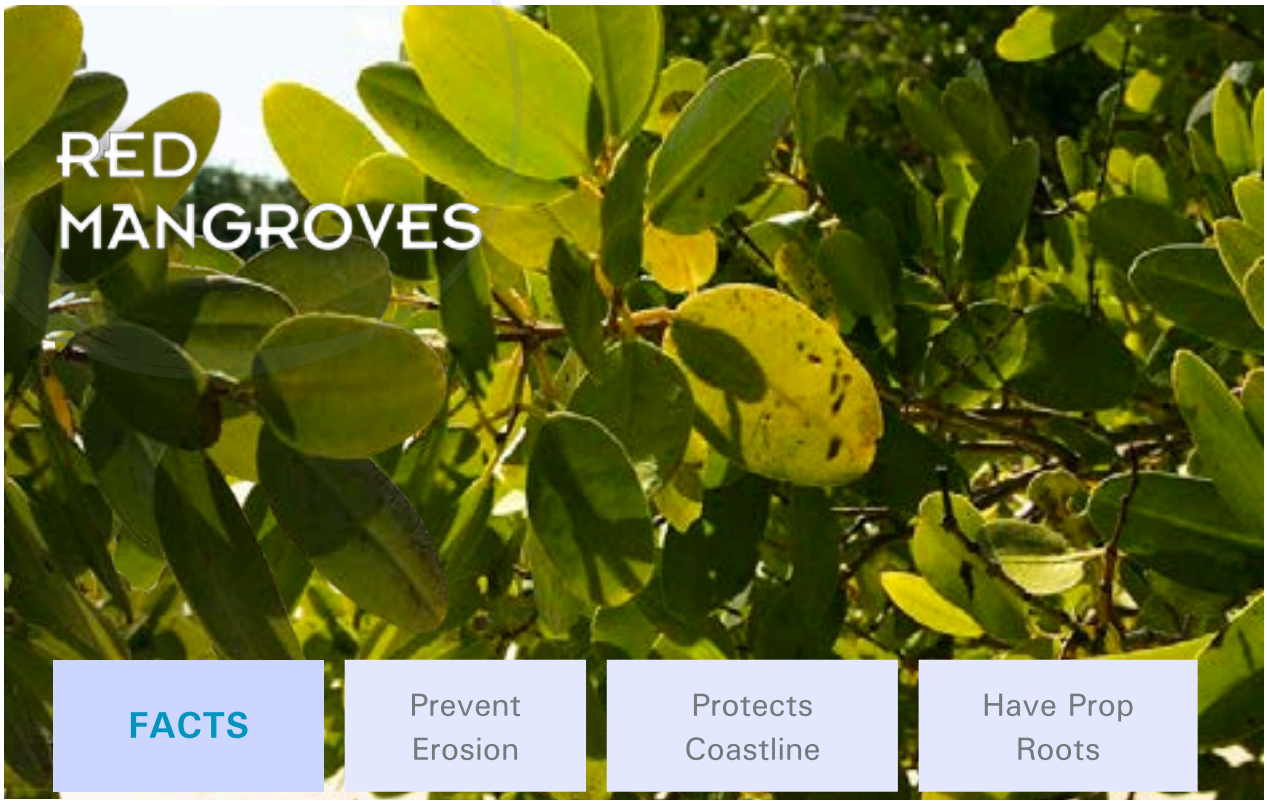
- red mangrove *(Rhizophora mangle)*
- black mangrove *(Laguncularia racemosa)*
- white mangrove *(Avicennia germinans)*

Mangroves can grow well in these areas by using special adaptations that allow them to absorb fresh water in various ways. Each mangrove species requires different conditions to survive and grow.

Each species is important in different ways, and provides important habitat for many species.

Young mangroves populate ecosystems and increase habitat benefits

FUN FACT: Mangroves are the only species of trees that can tolerate salt!



Red mangroves are the species that grows closest to the sea. They can do this because they have prop roots. Prop roots anchor the trees to the bottom. Prop roots support stems and branches above the ground and elevate most of the tree above the water. This adaptation allows red mangroves to grow close to the ocean, estuaries, and rivers.

The prop roots function to keep the shoreline bottom stable and prevent erosion. Especially during a hurricane, these trees offer protection to communities along the coast by reducing storm surge.

Prop roots are habitats to many fish and other organisms.

Prop Roots

Red mangroves are also important because they are habitats for many animals. The prop roots below the surface of the water create an amazing resource for fish by providing shelter from predators and abundant food. Many different species of fishes, shrimp and crabs rely on the red mangrove's prop roots for shelter.

MORE FACTS	Provide Habitat to Wildlife	Seeds are called Propagules

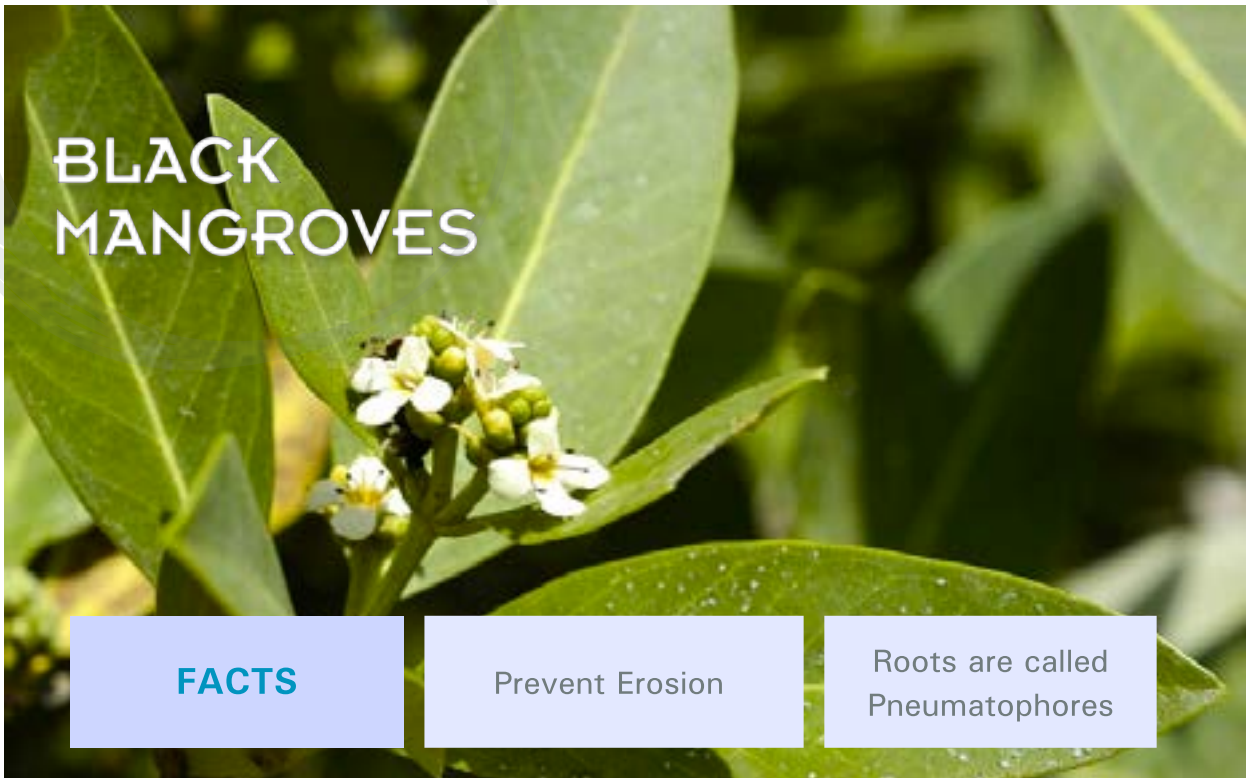
Red mangroves have seeds called propagules. They are long and very skinny and have a soft fleshy inside. When the seeds are ready to grow into new trees, they fall off the mangrove and can travel to a new place and grow their roots.

Can you think of how propagules might travel to another location to begin life as a new mangrove tree?

Answer:

Propagules float! They drift in sea currents to a new place, where they sprout roots and grow into trees.

Propagules



Black mangroves have unique features that allow them to grow well in shallow waters closer to land. Unlike red mangroves, the black mangrove tree grows straight out of the bottom.

Black mangroves have special types of roots, called pneumatophores, that grow out of the bottom into the air. These roots take in oxygen so that the tree can live in harsh environments, like the mud along coastlines, that are low in oxygen and very salty!

These roots act like "snorkels" by taking in oxygen for the black mangrove. Pneumatophores also help to accumulate sand and sediment, which helps to prevent erosion.

Pneumatophores

Black mangroves have another special feature that allows it to grow well in salt water.

Its leaves push out "sweat", salt, through special salt pores. The reason for doing this is simple: all plants need fresh water to survive but the black mangrove lives in salty water. So black mangroves do their best to keep the water and get rid of the salt.

Pretty amazing, right! Be sure to take a close look at the black mangrove leaves and you are sure to find salt on them!

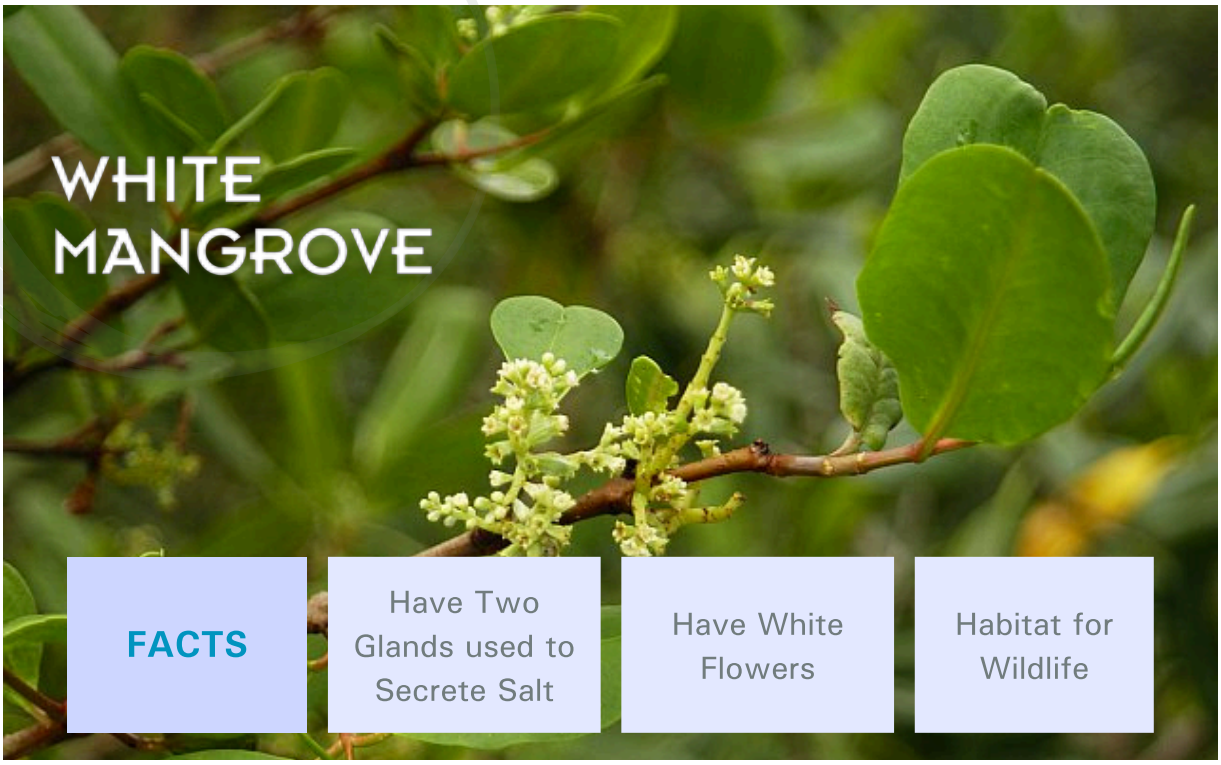
MORE FACTS

Have Two Glands or Salt Pores used to Secrete Salt

Habitat for Wildlife

These mangroves are important habitat for wildlife including birds, fishes and many other organisms that feed, shelter from predators, grow and reproduce in this habitat.

Even pelicans make mangroves their home!



White mangroves grow the highest up on the shore and farthest from the water.

White mangroves have soft leaves that have a white fuzz on them, which is where it gets its name. The white mangrove, like the black mangrove, also secrete salt from their leaves.

White mangroves have flowers these are greenish white and flower all year round.

Like the other mangroves, they also play an important role in coastal communities. They provide shelter and food for many species, and are important nesting sites for birds.

Let's learn more about habitats!

SCAN ME

SEAGRASS

Turtle grass and sandy bottoms are home of many organisms

Seagrasses are amazing plants. Did you know that they are the ONLY aquatic plants that have flowers?

There are three types of seagrass in Belize:

- manatee grass *(Syringodium filiforme)*
- turtle grass *(Thalassia testudinum)*
- shoal grass *(Halodule wrightii)*

Seagrass meadows act as nursery areas for juvenile fish for many species, and are important feeding grounds for larger fish.

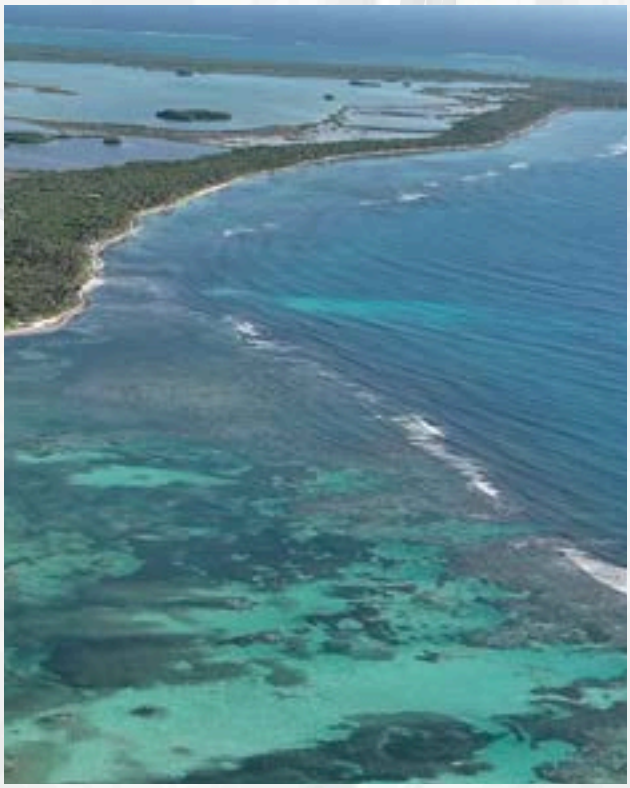
It grows in calm, sandy environments and are most often found in estuaries and bays. These areas are often referred to as seagrass meadows, and when they are in shallow water they are often called "grass flats."

Seagrass also prevent erosion. The seagrass roots and rhizomes are the horizontal stems which run just below the sandy substrate. These help to hold the bottom sediments in place even during hurricanes.

FACTS	Three Types Found in Belize	Act as a Nursery for Juvenile Fishes	A Feeding Ground for Larger Fish	Prevent Erosion

FUN FACT: Seagrasses help maintain sediment (sand & mud) in the sea bottom and produce turquoise waters where coral reefs thrive!

CORAL REEFS



The Belize Barrier Reef is interconnected with seagrass and mangrove ecosystems

Coral reefs are among the most diverse and productive habitats on Earth.

They are found in the warm, clear, shallow waters of Belize and can also be found in tropical oceans worldwide.

There are over 100 species of corals in the Caribbean. Coral reefs are important because bonefish, tarpon and permit use reefs to feed, shelter or as breeding grounds at some point in their life cycle.

The beauty of the coral reefs attract many visitors which in turn creates many job opportunities for Belizeans and revenue for the country.

FACTS	Provide Food to Organisms	Shelter Fish from Predators	Protect the shore from Erosion	Support Many Livelihoods

Coral reefs consist of many species of corals which are made up of tiny organisms called polyps. An algae known as zooxanthellae, which grow within the polyps, provide important sources of nutrition to corals and without them corals are unable to survive.

FUN FACT: The Belize Barrier Reef is the second largest barrier coral reef in the world and it can be seen from space!

THREATS TO HABITATS

Inland industries also affect water quality and river habitats

Coastal ecosystems are made up of many habitats that are vital to the survival of so many organisms and the well-being of people.

Healthy habitats are under threat!

Unfortunately, habitats are under threat across the world. This is primarily due to deforestation and dredging caused by human related activities such as:

- coastal development
- tourism industries
- aquaculture & agriculture
- pollution

Researchers are still learning about how fertilizers, medicines, and other human products that end up in the ocean might hurt important habitats like mangroves even though they have not been cut down.

The more we learn about these habitats, the better we can take care of them.

Sand dredging destroys sandy/muddy bottom and seagrass habitats important to bonefish, tarpon, permit and their prey.

Without habitats fish won't have anywhere to live, and without fish there won't be any jobs and economic gain.

Conserve important fishery habitats.

Sargassum, climate change and indirect impacts

Sargassum also affect habitats and flats fishes!

Sargassum has been common in Belize's coast and beaches. However, the increase in nutrients in the ocean and water temperature from human activities have caused this brown algae to grow in large quantities. Scientists are still determining the full extent of the impacts of sargassum on habitats, fishes, business and people's health.

Sargassum is affecting business and killing seagrass and mangroves.

One of the effects of climate change is that the ocean is becoming more acidic.

Coral reefs are threatened by ever changing environmental conditions caused by human activities. For example the increase in acidity of the water caused by climate change makes it difficult for coral reefs to build their hard skeletons mainly because minerals used by corals accumulate slower in acidic conditions.

Human activities also cause indirect impacts!

Slight changes in the reef environment can have a big impact on the health of the mangroves, seagrass and corals.

Even as tropical cyclones become worse and sea level rises, more people are building structures on the coast. But this development has consequences such as change in ocean currents and flats habitats.

The removal of mangroves and seagrasses to construct beach houses, hotels and restaurants makes the coast less stable because the sand can be easily swept away by the wave action and rising tides. It also displaces many species that rely on these habitats to survive.

Healthy habitats support fisheries and livelihoods.

FLATS FISHES

Bonefish, tarpon, permit and snook are four flats fishes found in the coastal areas of Belize.

BONEFISH

Bonefish (Albula vulpes) are incredible flats species; they are elusive to anglers and much of their behavior remains a mystery to scientists.

Bonefish is know as a schooling fish but are also found swimming solos

FACTS

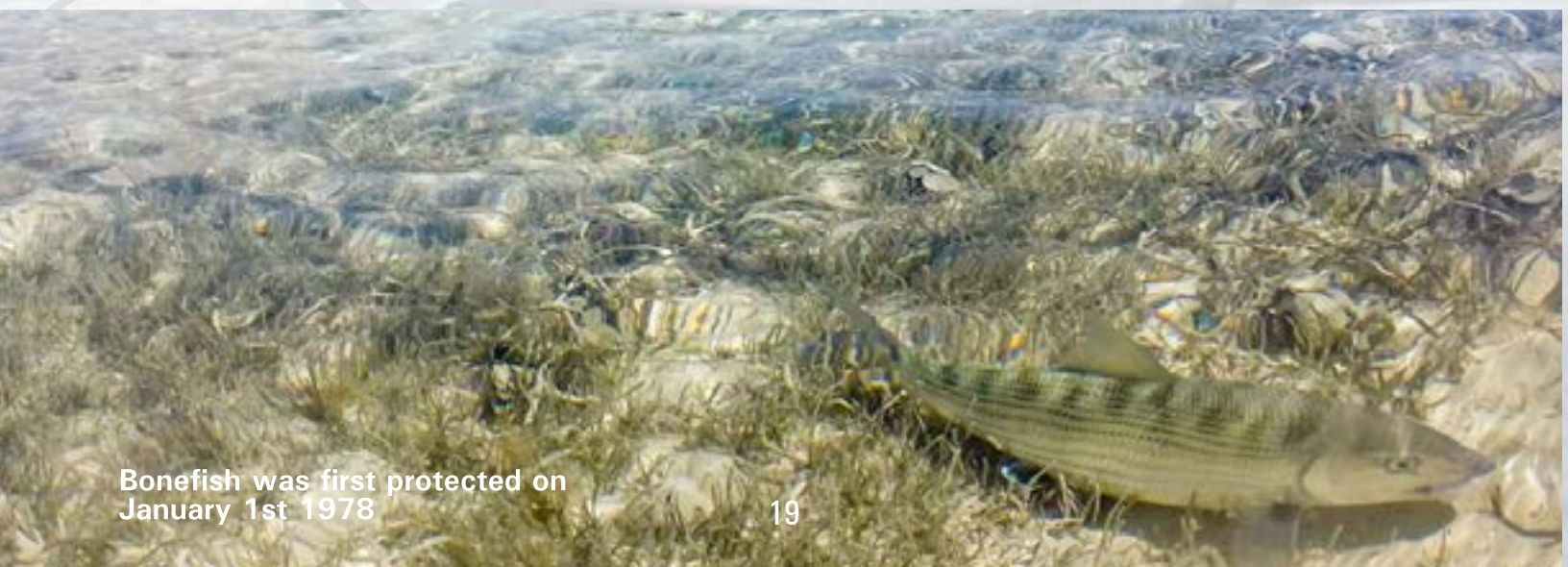
Adults depend on Sandy Flats, Seagrass Beds, Mangroves & Nearshore Reefs

Adults Feed on Crabs, Small Fish, Worms, Snails

Can Grow up to 22 Inches

As their name suggests, bonefish are not a good fish to eat because they are full of countless tiny bones. But as part of the flats fishery, bonefish are worth a lot of money to the communities in the areas where they are caught.

Bonefish actually need many habitats throughout their lives. Adults rely upon many coastal habitats, including sand flats, seagrass beds, mangroves, and even near reefs. Adults mostly feed on organisms that live in or on the bottom, like crabs, shrimp, clams, worms, and snails.



Bonefish was first protected on January 1st 1978

Bonefish are also called the 'Grey Ghost' and can live to 25 years or more!

One of the more unique behaviors of bonefish is called “mudding”, which is when a school of bonefish disturb the sediment, causing the water to become murky, likely in an effort to cloud the vision of potential predators, such as barracuda and sharks.

Bonefish can also be found "tailing" while feeding in shallow mangrove habitats.

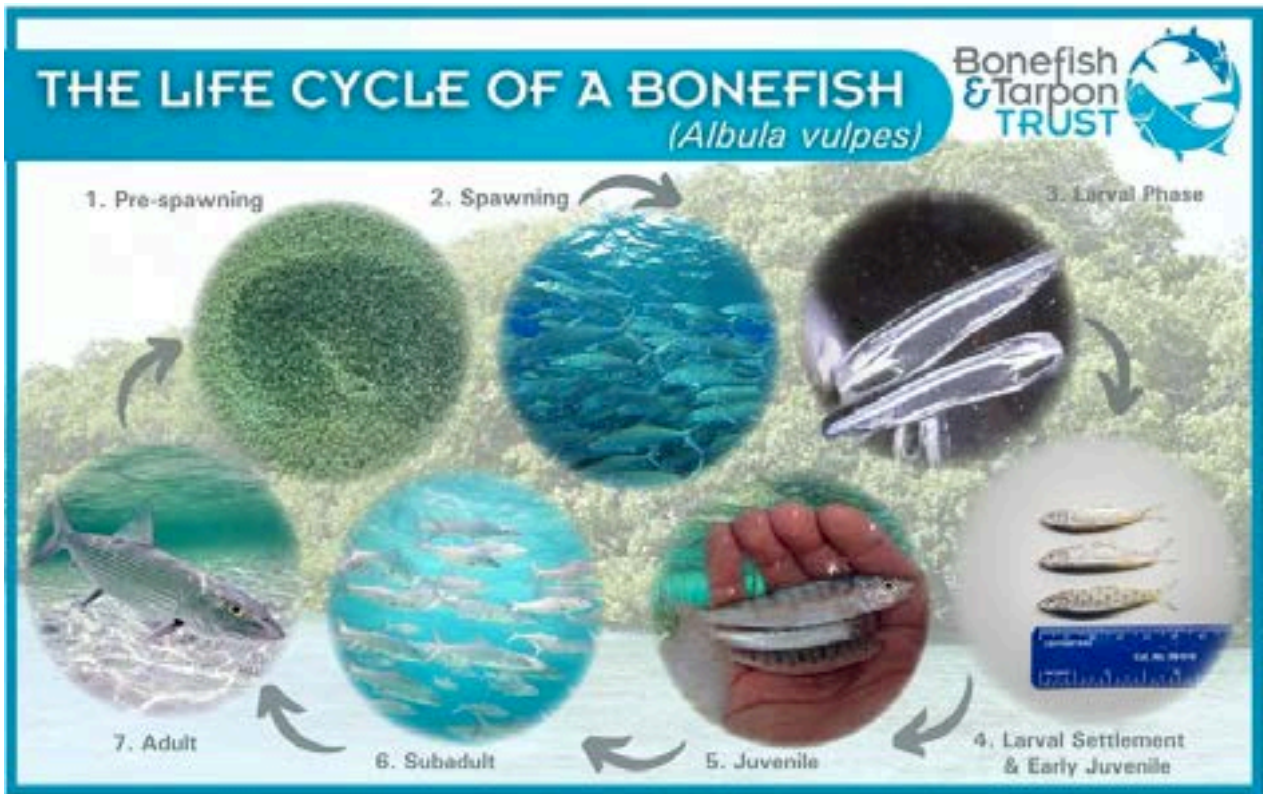
PROTECT THE 'GREY GHOST'

Another interesting behavior of bonefish is that during their spawning season, which is from November through April, bonefish leave the flats and gather in large groups called spawning aggregations.

Let's check out a pre-spawning aggregation!

SCAN ME

https://www.bonefishtarpontrust.org/educational-video/bonefish-pre-spawning-aggregation/



1. Pre-spawning

Protected Bays offer spawning-ready bonefish a safe place to congregate in schools of hundreds to thousands after their migration from their home flats. During this time, bonefish only have in mind "to reproduce" as they prepare to move offshore to spawn.

2. Spawning

Bonefish spawn in deep offshore areas, descending as deep as 130 meters to spawn. Spawning occurs near the full and new moons. Milt from males and eggs from females are released through broadcast spawning. Cell division starts after eggs are fertilized by the sperm. Eventually this process makes a tiny eel-like baby fish called leptocephalus larvae.

3. Larval phase

This phase lasts between 41-71 days, during which larvae are transported by currents. Larval bonefish, called leptocephali, are tiny and transparent, which makes them almost invisible to predators. Early stage leptocephali lack fins and are only 30mm long. Later stage leptocephali have fins and grow to about 63mm.

Bonefish find most of their food in seagrass habitats

Protecting adult and juvenile habitats will keep a healthy population.

4. Larval settlement & early juvenile

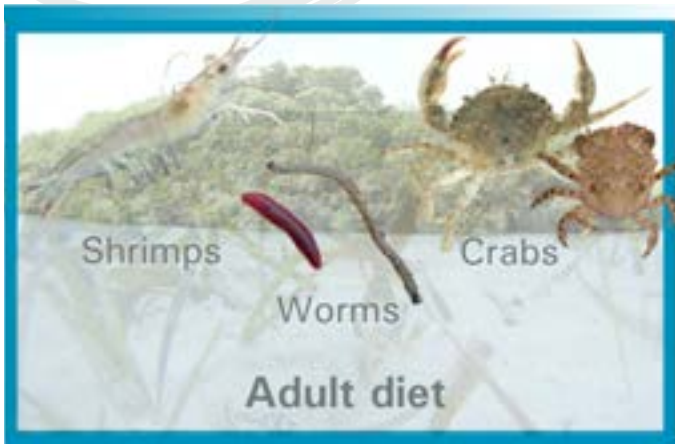
Settlement is when larvae move into shallow flats habitat that is protected from waves and currents, and safe from larger predators. From larvae they change into a little fish with some silvery color and start to look like a bonefish.

5. Juvenile

Juveniles range from 19 – 200 mm, and since they are still small fish they have an elevated risk of being eaten by a predator.

6. Subadult

Subadult bonefish that are larger than juveniles but smaller than adults usually live in calm areas with open muddy or sandy bottom, where their scales reflect their surroundings as camouflage from predators.



7. Adult

Tidally flushed flats, mangroves and creeks are where adult bonefish spend most of their time, where they can be in schools of up to 100 fish. Larger bonefish adults are found in smaller groups of 2-3 and the exceptionally large ones are found by themselves.

PERMIT

Permit (Trachinotus falcatus) are popular fish for sport fishing and this activity draws in many visitors from around the world to Belize.

Flat fishing guides take care of their permit as it means their livelihoods to them

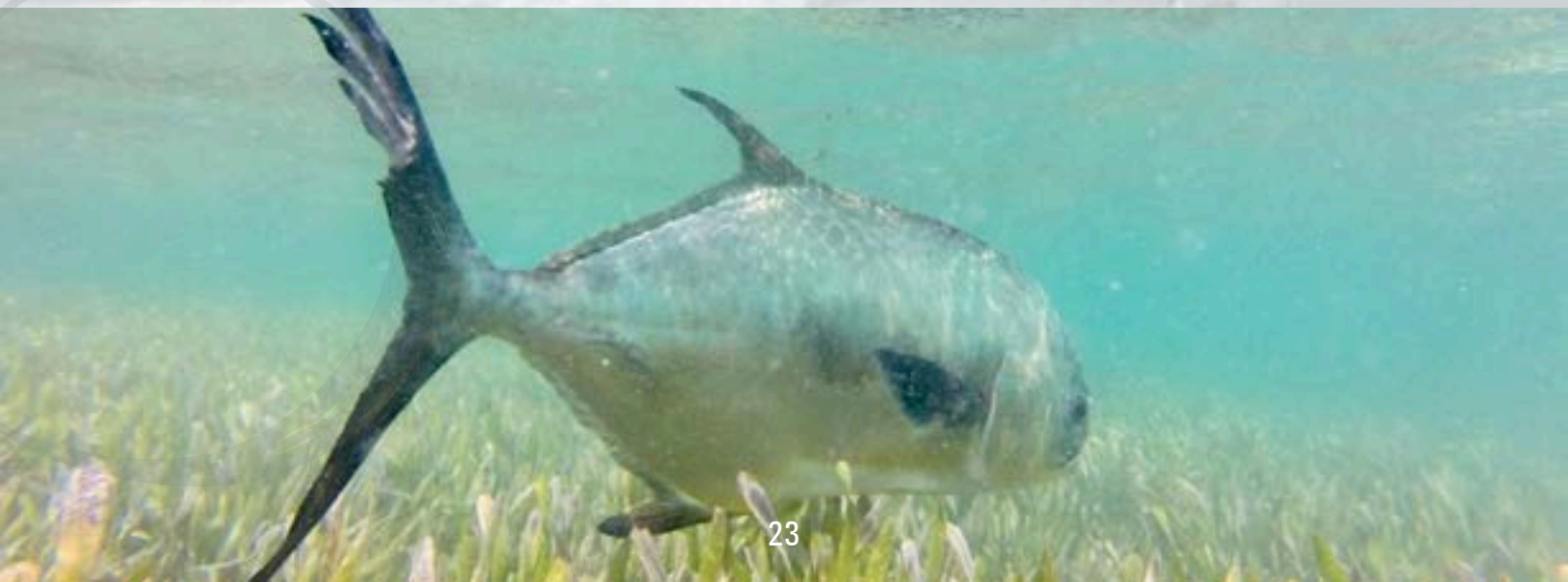
FACTS

Found in Sandy Flats, Coral Reefs, Mangroves, Seagrass Meadows

Adults Feed on Shrimp, Worms & Crabs

Can Grow up to 36 Inches

Permit are known as the 'Black Tailed Devils'!



Permit use many habitats and are usually fished for by anglers on the clear flats of coastal Belize that include shallow coral or sandy and/or grassy bottom, and also along mangrove shorelines.

Because permit are caught in these areas a lot, some anglers think permit live in these areas all the time. But like bonefish and tarpon, permit use many habitats during their life cycle.

Since these species are so important and bring in so much money, it is important that we take care of them, protect their habitats and also have good handling practices.

PROTECT THE 'BLACK TAILED DEVIL'

1. Spawning

Permit also move offshore in deep waters to form groups called "aggregations." When adults start to spawn by "broadcast spawning" their group is called a "spawning aggregation" which normally occurs between February and July.

2. Larvae

Larval duration for permit is about 15-20 days and are 8 and 10mm when settled. After settling in coastal areas, they begin development.

3. Juvenile

Small juveniles mostly depend on sandy beaches and adjacent open sand bottom. They eat crab-like creatures called amphipods, copepods, and mysids - a type of tiny shrimp.

4. Subadult

Subadult permit feed on bottom-living prey like small crabs, surf clams, worms, some species of small urchins, and sand dollars.

5. Adult

Adult permit have small conical (cone-like) teeth in their throats that let them feed on larger, harder, more nutrient-rich prey like blue crabs, snails, large shrimp and urchins. They are schooling fish that feed in shallow habitats, such as seagrass meadows and sandy flats.

TARPON

Did you know that tarpon (Megalops atlanticus) were swimming in the oceans as dinosaurs roamed our planet?

They have been swimming around for millions of years, since the mighty T-Rex was causing havoc on land. These fish are giant and mighty just like their long-lost dinosaur friends were.

Tarpon making their "ballistic dance"

Tarpon are known as 'Silver Kings'. They have large mirror-like scales, which makes them reflect bright silver when they jump, and their jumping ability makes them kings over other flats fish.

Tarpon area unique because they can gulp air at the surface, and take that air into a modified swim bladder. And unlike most other fish, they are able to use the swim bladder similar to a human lung and transfer the oxygen from the air into their blood. This allows them to supplement the oxygen they get from the water through their gills.

FACTS

- Found in Salt & Fresh Water
- Adults Feed on Sardines, Shrimp & Crabs
- Can use its Swim Bladder, in addition to the Gills, to Breathe
- Females become Adults at about 4½ Feet in Length
- Males become Adults at about 4 Feet in Length

Bonefish, tarpon & permit were protected as catch & release only on September 2009

Being able to get oxygen from the air allows juvenile tarpon to live in wetland waters that have levels of oxygen too low for tarpon predators. This means that juvenile tarpon can live in locations where there are fewer large predator fish that could eat them.

Tarpon take many years to reach the adult stage. The minimum size for an adult female is about 4½ feet, and about 4 feet for males. When most tarpon reach the adult stage, they really start to travel! Tagged tarpon have been tracked migrating as far as 1,200 miles.

Adult tarpon can live up to 80 years and these old fish are very wise to the ways of anglers. This is part of the reason catching these silver kings is such a skill and also why people want to catch them so badly.

PROTECT THE 'SILVER KING'

Though tarpon are predators near the top of the food web, sharks eat tarpon, including tired tarpon that anglers fought too long.

1. Spawning

Adult tarpon are also broadcast spawners. They gather in large groups before swimming offshore and spawn in deep waters. They do this in the deep ocean away from land, or "offshore." A spawning aggregation can be hundreds of fish and usually begins spawning far offshore in the pelagic ocean.

2. Larvae

Like bonefish, tarpon larvae are also leptocephali. After hatching from the eggs, the larvae are carried by ocean currents for 2-4 weeks. If they survive, the larvae search for mangrove creeks and wetlands.

3. Juvenile

Juvenile tarpon rely on mangrove swamps, creeks and lagoons.

4. Subadult

Subadult tarpon look like adults, but are smaller and mostly use creek, river, lagoon, and shallow coastal habitats. Their diet includes small fish, shrimp and crabs.

5. Adult

Adult tarpon can grow to more than 200 pounds and can live up to 80 years. They use many habitats, including, rivers, estuaries, beaches, lagoons, and the open ocean. They eat a variety of fish, crabs, shrimp and eels.

THREATS TO FLATS FISHES

Inland industries also affect water quality and river habitats

Healthy Habitats + Responsible Practices = Healthy Fisheries

Healthy fisheries not only depend on healthy habitat, they also depend on responsible handling practices. However, flats fishes are always under threat due to human activities which impact their habitats or their survival.

These harmful activities include:

- improper fish handling techniques
- illegal fishing
- pollution
- coastal development
- accidental catch in traps used for commercial fishing.

Overfishing and habitat loss or habitat degradation can threaten species like bonefish, permit and tarpon by making their population numbers go down.

Researchers are worried that harvesting fish from offshore reefs on or near spawning aggregation sites could bring the number of spawning fish to dangerously low levels.

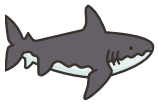
Bycatch or accidental catch of permit, by fishermen who are targeting other species is another threat to flats fishes. Even if these fish are let go, they are usually tired from fighting the fishermen, which leaves them in danger. This is because in areas on the reef with fish aggregations sharks are often present.

FISH HANDLING

Fish have gills and need water to breathe

Catching a bonefish, permit, tarpon or snook can be the highlight of an angler's life. Properly releasing the catch is key to ensuring the long-term health and sustainability of flats fishing. We have worked with dozens of the top guides and lodges to develop the best practices to minimize the impacts of catch and release on these special fish.



Have a plan.	The ten second rule.	Let them off easy.	Revival of the fittest.

1. Have a plan. Everyone should be on the same page on how you will record a catch, and be prepared for the photographing process. The first step is to agree on the fish you will photograph (The first of the day? A personal best?) and how it will be photographed. Making sure the camera is out and ready before lifting a fish from the water is key.

2. The ten-second rule. Using clean, wet hands (No gloves or sunblock), gently lift the fish from the water, leaving it over the water. Take the photo, and gently place the fish back in the water. A fish removed from the water for longer than ten seconds is six times less likely to survive, so doing this quickly is key.

3. Let them off easy. The use of a dehooking device eliminates the need to handle your catch at all. Leaving the fish in the water, the hook or fly can be quickly and cleanly removed in seconds, letting the fish swim away strong.

4. Revival of the fittest. Once you are certain the fish is ready, watch for predators such as sharks, and try not to release a weakened fish where predators might take advantage.

How you handle a fish (or don't) makes a huge difference.

Flats fishing depends on the fish surviving for another day. We can make sure they survive by keeping the fish in the water most of time even when taking pictures.

The most important part of sport fishing is NOT how you catch them.

It's how WELL you let them go too!

Let's find out how to become better citizens.

https://www.bonefishtarpontrust.org/educational-video/bonefish-catch-release/

SCAN ME

LIVELIHOODS

Livelihoods are the activities people do for a living. Some people are fishermen, some are tour guides who conduct snorkeling or diving tours, and others are fishing guides.

THREATS TO LIVELIHOODS

Through science, education and conservation activities, Bonefish & Tarpon Trust is making significant strides since 2019 towards improving the health and management of Belize and Mexico's flats fisheries. BTT's conservation efforts in the region also benefit other fisheries and sustainable eco-tourism activities, as they all rely on the healthy habitats.

THREATS TO LIVELIHOODS

(Destruction of habitats and species affects communities)

- SEAWALLS
- DREDGING
- MANGROVE CUTTING
- POLLUTION
- COASTAL DEVELOPMENT
- IMPROPER FISH HANDLING

Mangrove, seagrass and coral reef habitats also support other fishes important to the people of coastal communities.

Healthy ecosystems support many livelihoods. For example, guides provide guiding services to people that come to fish for bonefish, permit and tarpon, and to people who come to dive and snorkel to see our coral reef.

These and other livelihoods depend on the health of fisheries and their habitats, and we are the voices that can help protect them.

Flats fishing guiding is a generation to generation activity that is seeing more women involved

Let's watch paradise under threat!

https://vimeo.com/654972850

SCAN ME

Let's get more involved in conservation and protect our livelihoods.

CONSERVATION

Conservation activities are actions by people that lead to an improvement of benefits such as long-term use of a resource to better economic benefits for the people who rely on the resources.

WHAT CAN WE DO IN CONSERVATION

All of us must make more of an effort to reduce habitat loss and degradation because these habitats are essential for the long-term benefit of our communities and livelihoods.

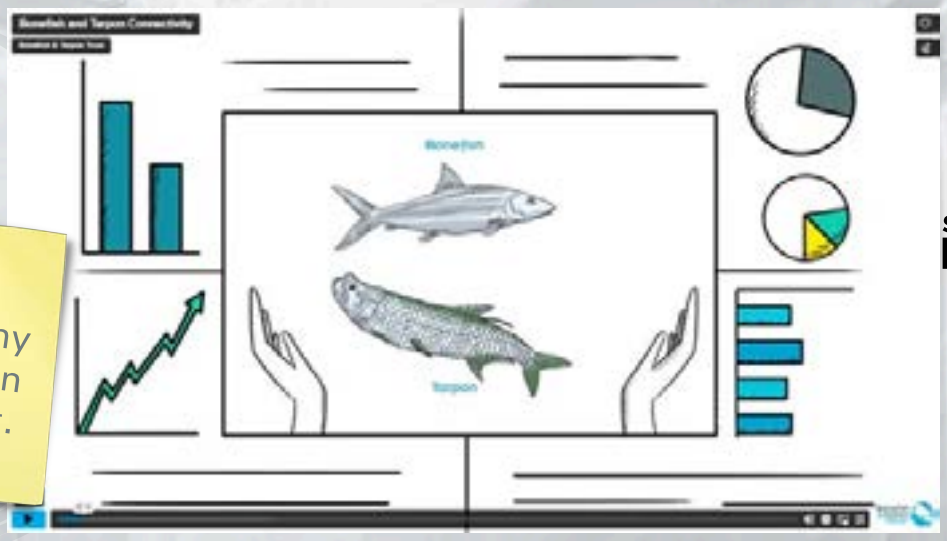
There are many actions we can do to protect the very same habitats and associated species that provide benefits to our livelihoods.

1) Follow the present regulations that protect our habitats and fisheries.

2) Advocate for government protections of habitats, and reduction of conflicts amongst stakeholders.

3) Advocate for conservation and participate in meetings and science activities that target protecting our habitats and livelihoods.

Find out why conservation is important.



SCAN ME

https://www.bonefishtarpontrust.org/educational-video/bonefish-and-tarpon-connectivity/

Don't cut mangroves. Instead, let's follow regulations and do our part to ensure that mangroves continue to thrive so they can support livelihood and economies, and protect our shoreline.

Know the laws of Belize for habitat protection!

- The Forests (Protection of Mangroves) Regulations of 2018 protects red, black and white mangroves that border the coastline and Cayes of Belize by establishing a permit application process for the alteration or trimming of mangroves.
- The government may impose a surety bond of BZ $10,000 per acre of land where alterations are to be made as a condition to grant a permit.
- Anyone failing to comply with the regulations commits an offense and is liable to a fine up to BZ $25,000 or imprisonment not more than 12 months or both.

Report Illegal Mangrove Clearing.

You are the Voice for Habitat Protection.

https://www.bonefishtarpontrust.org/educational-video/silver-kings-habitat-is-the-future-of-floridas-fisheries/

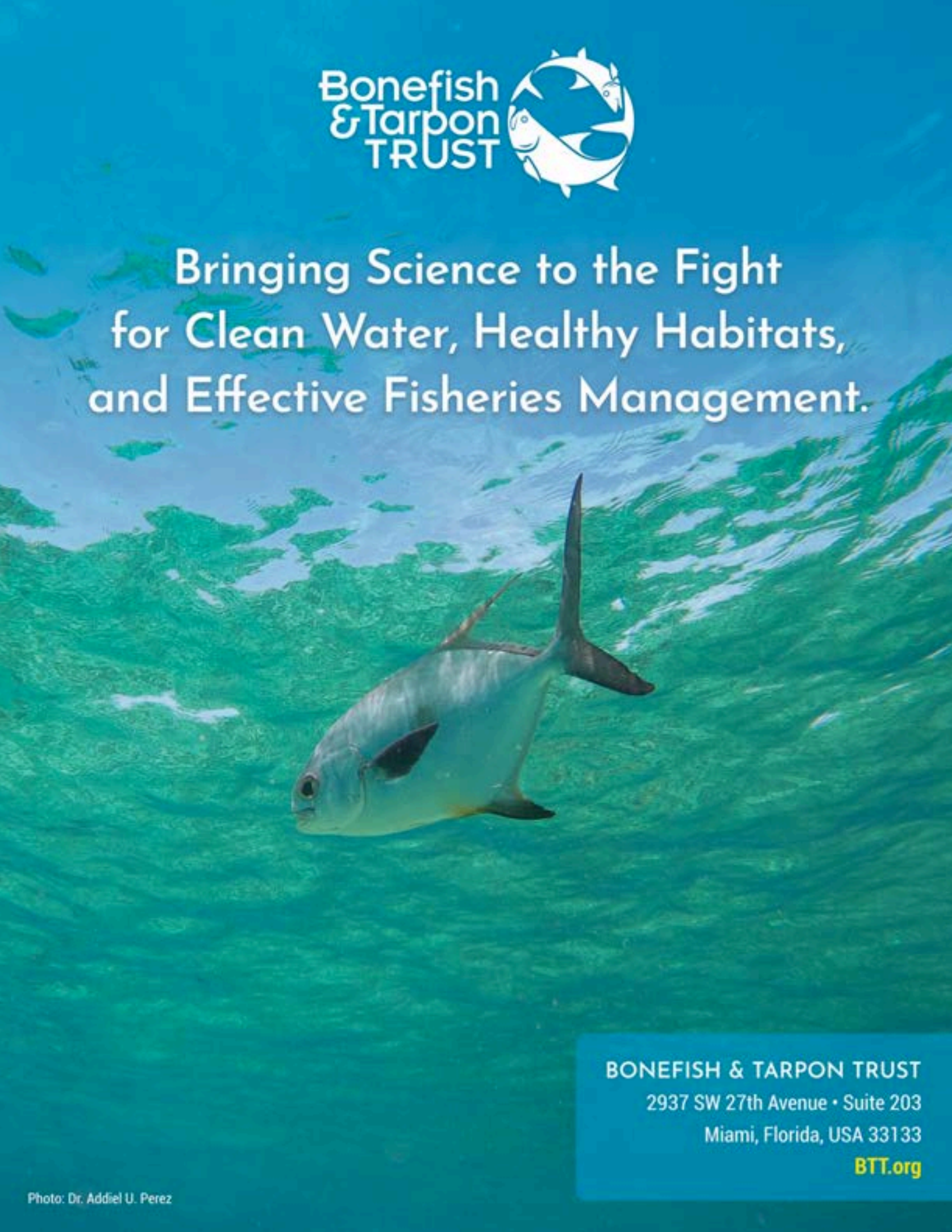
SCAN ME

Reference as:
Bonefish & Tarpon Trust, 2025. The Fish and Habitats of Belize. Pp 40, Miami FL. US.

The country of Belize depends on its natural resources to sustain its people.

Belize has a coastal area with multiple communities along the coastline and on the cayes.

These communities depend on the coastal ecosystems for survival.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Bringing Science to the Fight
for Clean Water, Healthy Habitats,
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