

THE TARPON

(Fourth Edition)

Louis L. Babcock

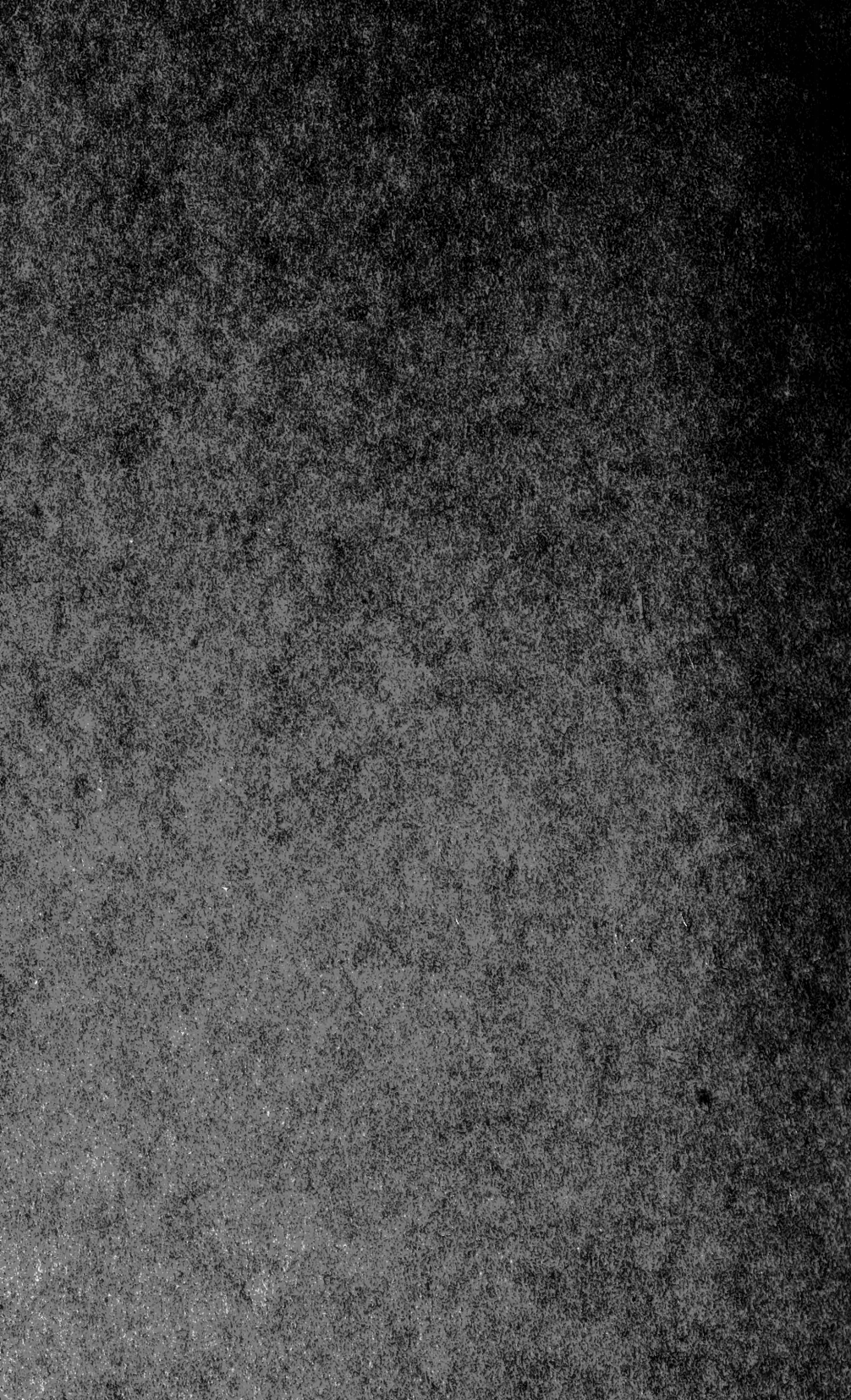


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THE TARPON

BY

LOUIS L. BABCOCK

A DESCRIPTION
OF THE FISH TOGETHER WITH SOME
HINTS ON ITS CAPTURE.

* * *

*"Allah counts not out of man's allotted span
the time he spends in the chase."*

FOURTH EDITION
1936

Two hundred and fifty copies were printed

of which this is

No. 25:

L. L. B.

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LOUIS L. BABCOCK

*This volume
is affectionately inscribed
to my Wife.*

FISHERMAN

By *Edgar A. Guest*

*'Tis good to go a-fishing on river, lake or sea,
The flying gulls above you, and the waters just as free.
Away from wheels of commerce and smoke of factory stack,
A day of joy before you, and duty at your back.*

*'Tis good to go a-fishing, when skies above are blue,
Out of the long year's sheaf of days to pilfer one or two;
To have no thought of money, no urge for worldly fame
To be at heart a fisherman, and a fisherman by name.*

*Men see you from the distance, and this is all they say:
"There goes another fisherman. May luck be his today!"
And be you rich or be you poor, they have no wish to know.
For all the world is friendly to the men who fishing go.*

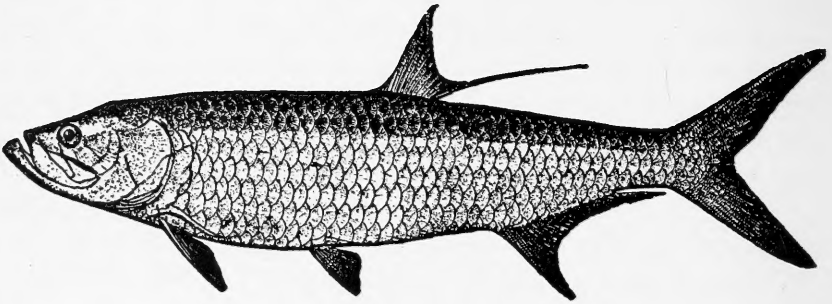
*So let me be a fisherman. No other rank I'll seek,
The care-free man upon the bay of whom the travelers speak.
For there is envy in their eyes which kings may never know,
And every stranger cries, "Good luck" to men who fishing go.*

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PREFACE

SIX YEARS have passed since the publication of the third edition of this book. Some of the material gathered subsequent to that time has been incorporated in the text which has been revised and extended. A new chapter on beach angling has been added.

The tarpon rarely displays any spirit of co-operation with the carefully laid plans of the angler. It is both versatile and inconsequent in its behavior. As a physician gains in experience, he is apt to lose his early confidence in the potency of the remedies he prescribes. So it is with the tarpon angler; and although I suggest certain methods to follow, I have lost far too many fish to assert any claim to infallibility. Yet there are some principles that apply wherever the fish are found and I have tried to set them forth. The angler must rely upon his own judgment and follow the methods which prove to be successful and suited to his temperament. After all, the remark of that wise old Roman, Publius Syrus, is applicable to any sort of angling: "Practice is the best instructor."

I am grateful for the friendships which this little book has created and confirmed. No attempt has been made to interest the general reader. It has been prepared for the use of anglers who are interested in the life history and habits of the fish, the methods employed in its capture, the record catches in weight and numbers and similar data commonly discussed among anglers and guides while awaiting a strike. The life history of the fish remains unknown although progress has been made toward its solution. Its breeding habits are still a mystery. I shall be grateful if fellow anglers will advise me of any interesting facts which may come under their personal observation.

Very little has been written on the scientific side. The anglers who have caught hundreds of tarpon rarely venture into print although there are notable exceptions, like Endicott and Heilner. Usually the enthusiastic angler catches a few fish and hastens to give the world the benefit of his experience. These articles serve to amuse even if they do not instruct the veteran angler.

The fugitive literature relating to the tarpon is extensive; but no American book dealing exclusively with this fish has been produced since Dimock wrote his classic over twenty years ago. That book, although charmingly written, pictures tarpon angling as a great adventure filled with hair-breadth escapes and perils. Its chapters were written for the magazines and it is now obsolete as a guide for the angler.

I am under obligation to Dr. John A. Gaines of Tampa, Florida, who contributed to the third edition an interesting account of the methods which he employs. It will be found in the appendix. Dr. Gaines has captured hundreds of tarpon and his mature observations will repay a careful study. I am indebted to Dr. F. Park Lewis, of Buffalo, the eminent authority on the eye, who has made a careful research on the eye of the tarpon. This is reprinted in the appendix. I also wish to express my grateful acknowledgments to Dr. Samuel F. Hildebrand, Senior Ichthyologist of the U. S. Bureau of Fisheries, and to Dr. John T. Nichols, Curator of Recent Fishes of the American Museum of Natural History of New York, for their aid and advice. When the late Dr. David Starr Jordan, the great authority on fishes, learned from some source unknown to me that I was interested in the life history of the tarpon, he wrote me this brief note:

“If I can be of any service to you in your fish studies, do not hesitate to call upon me.”

He responded to my requests for information with unwearying care and patience. This letter written to a stranger disclosed his kindly nature and his desire to assist a mere student in a field which he did so much to adorn.

The preparation of this edition has been a pleasant task for it has rekindled memories of the far distant Gulf with its fair weather and foul, its balmy air and its beautiful nights, its gorgeous sunrises and sunsets; and the pleasant companionship of fellow anglers who, it must be conceded, are the salt of the earth. Finally, I will add in the quaint language of Isaac Walton that "I wish the Reader also to take notice, that in writing of it, I have made myself a recreation of a recreation."

L. L. B.

726 Delaware Avenue, Buffalo, N. Y.
August 1936.

THE TARPON

CHAPTER I

DESCRIPTION AND HABITS

“I shall stay him no longer than to wish him a rainy evening to read this following Discourse; and that (if he be an honest angler) the Eastwind may never blow when he goes a-Fishing.”

ISAAC WALTON TO THE READER

THE TARPON (*Tarpon atlanticus*) is a survival from another geological epoch, and few teleostean fishes have so old an ancestry. The family of the *Elopidae* is decadent but the tarpon stands unrivalled as a game fish amongst the hundreds of species inhabiting the salt waters of the eastern part of the Western Hemisphere.

The family was very numerous as far back as the *Cretaceous* period and as early as the *Eocene*, the existing type made its appearance. Allied genera have been found in the *Cretaceous* of Europe, Mount Lebanon and Brazil. The *Elopidae* have a bone between the branches of the lower jaw called a gular plate which I am informed occurs in very few, if any other, teleostean fish.

It seems to be the rule that fishes having specialized structures like peculiar teeth or armor and those which are unsymmetrical have usually failed to survive marked changes in the physical history of the earth. The existence of the tarpon is a cogent argument in favor of the conclusion that the least extreme in type are best fitted to survive.

The tarpon has been assigned many scientific names:

Camaripuguacu. Maregrav's History of Brazil. 1648.

Megalops atlanticus. Cuvier & Valenciennes.

Megalops elongatus. Girard Pro. Nat. Sci. Phil. 1858.

Megalops thrissoides. Günther.

The scientific name of our tarpon is *Tarpon atlanticus*. (Cuv. & Val.)

It has been known by many colloquial names. One of the earliest was Tarpum. G. Brown Goode in his Catalogue of the Fishes of Bermuda says this name may have some connection with the one current in Barbados, where it is called Caffum. It is more probable that it is of Indian origin. Captain William Dampier spoke of it in 1675 as the Tarpom and Roman in his Concise Natural History of Florida (1775) did the same. The word Tarpum was used by the Government in its publications but that name has become obsolete. It was known by the Creoles of Louisiana as the Grande Ecaille (large scale); by the Georgians as Jew fish; at Pensacola as Silver fish; by the natives of Massachusetts as Big Scale; and it is called Sabalo, Sadina, Savalo, Savalle and Savanilla by the Spanish-American peoples. The title Silver King has been frequently applied to it by admiring anglers. The name Tarpon is rapidly supplanting all others by the common consent and usage of the anglers who fish for it in steadily increasing numbers. A technical description is here set forth from Jordan & Evermann's standard work entitled "American Food and Game Fishes."

"THE TARPONS

Family IX. Elopidae

"Body elongate, more or less compressed, covered with silvery cycloid scales; head naked; mouth broad, terminal, the lower jaw prominent; premaxillaries not protractile, short, the maxillaries forming the lateral margins of the upper jaw; an elongate bony plate between the branches of the lower jaw; eye large with an adipose eyelid; bands of villiform teeth in each jaw and on vomer, palatines, pterygoids, tongue and base of skull; no large teeth; opercular bones, thin with expanded membranous borders; a scaly occipital collar; gill-membranes entirely separate, free from the isthmus; branchiostegals numerous (25 to 35); gill rakers long and slender;

belly not keeled nor serrated, rather broad and covered with ordinary scales; lateral line present; dorsal fin inserted over or slightly behind the ventrals; caudal fin forked; no adipose fin; dorsal and anal depressible into a sheath of scales; pectorals and ventrals each with a very long, accessory scale; pyloric caeca numerous.

“Genera, 3, species 4 or 5 forming two well marked sub-families, both widely distributed in the tropical seas. The species are not much valued as food, the flesh being dry and bony, but they are among the greatest of game fishes. In our waters we have two genera, each represented by a single species.

“(a) Pseudobranchiae none; body oblong, covered with large scales; anal fin larger than the dorsal; last ray of dorsal produced into a long filament.

.....*Tarpon*

“(b) Pseudobranchiae large; body elongate, covered with small scales; anal fin smaller than the dorsal; last ray of dorsal not produced in a filament.

.....*Elops*

“Genus *Tarpon*, Jordan & Evermann.

“Body oblong, compressed, covered with very large thick silvery cycloid scales; belly narrow, but not carinated, its edge with ordinary scales; lateral line nearly straight, its tubes radiating widely over the surface of the scales; dorsal fin short and high, inserted behind the ventrals, the last ray long and filamentous; anal fin falcate, much longer than the dorsal, its last ray produced; caudal widely forked, and more or less scaly. Only one species known. * * *

“Head, 4; depth, $3\frac{1}{5}$; eye, $4\frac{9}{20}$; snout, 5; maxillary, $1\frac{2}{3}$ D. 12; A. 20; scales 5-42-5; branchiostegals, 23; dorsal filament longer than the head; color uniform bright silvery, darkish on back. The proportional measurements in the young are somewhat different, in examples of 3 inches long being as follows: Head, $3\frac{1}{3}$; depth, $4\frac{2}{3}$; eye, $3\frac{1}{3}$; snout, $4\frac{3}{4}$.”

The scale formula of the tarpon appears to be $45-46 \frac{5}{4\frac{1}{2}-5}$.
The fish has 53-57 vertebrae.

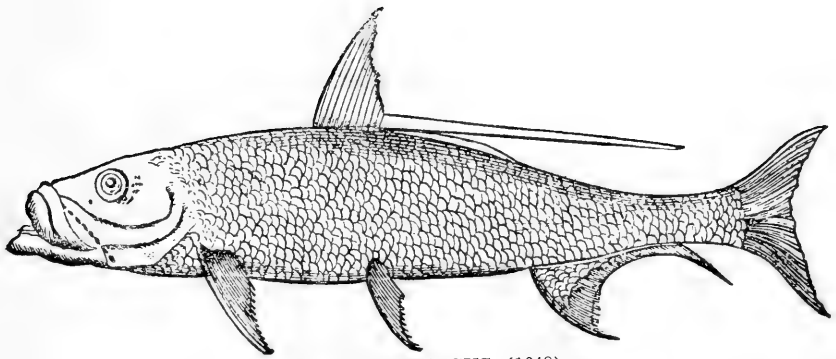
The osteological characteristics of the family have been described by Dr. W. G. Ridewood in the Proceedings of the Zoological Society of London for 1904 (Vol. II, pp. 35-81).

The earliest scientific description of the tarpon or *camaripuguacus* as it is there named, occurs in *Georgius Marcgravius Historiae rerum naturalium Brasiliae* published at Leydon and Amsterdam in 1648. The book is written in latin. A copy of the interesting drawing of the fish is here reproduced, and the latin text has been translated by Dr. Philip Becker Goetz of the University of Buffalo, Diligent search has indicated that this is the earliest description and drawing of the tarpon. The translation follows:

“Among common sea-fish is found the *Camaripuguacus*, which at maturity attains the bulk and size of a man and is exceedingly fat. It possesses a very large toothless mouth, its lower jaw fixed and its upper shorter. The eyes are large and silvery; its tail broad, somewhat forked; and to its dorsal fin when erect there is a long appendage attached like a thick rope running straight toward the tail. The entire fish is covered with scales which are closely placed upon it, and so beautifully diversified is the silver with the blue that it seems coated as if with pure silver. That it may be the more pleasing to the taste, it should be caught young and cooked rather long on account of its thick and solid flesh, which is full of thick spines; for when it is no longer young, its meat would prove tough and fit only for porters.”

Dr. Theodore Gill, one of the great authorities on Ichthyology, in his article “*The Tarpon, the Lady Fish and their Relatives*” published by the Smithsonian Institution in Vol. 48 of its Miscellaneous Collection says:

“The tarpon has an elongated fusiform shape; the forehead is slightly incurved (rather than straight) to the



CAMARIPUGUACUS (1648)

snout; the chin projects and is obliquely truncated; the dorsal (with twelve rays) is on the posterior half of the body nearly midway between the ventrals and anal; its free margin is very sloping and incurved and its long hind ray reaches nearly to the vertical of the anal; the anal (with twenty rays) is about twice as long as the dorsal and falciform; the caudal fin has a very wide V-shaped emargination. The scales are in about forty-two oblique rows."

The late Dr. Charles F. Holder, the noted angler, gave a more simple and colloquial description in his "*Big Game Fishes of the United States*" a book which should be in the library of every sea-angler. He says:

"In appearance the tarpon is long, slender and thin or compressed—the typical herring type. Its mouth is enormous and strikingly oblique and when open, the gill covers expanded, showing the blood red gills, as often seen when leaping, it presents an extraordinary grotesque, even cynical appearance. The lower jaw is very prominent, suggestive of a determination not to be caught; the teeth are minute, like velvet or plush (villiform) and the interior of the cavernous mouth is hard and difficult to penetrate. The eye of the tarpon is large and striking and its glare has more than once given a novice a tremor, as the gigantic fish seemed to hang in the air dangerously near the boat. The dorsal fin is high, but short, shaped like a lateen sail, the last ray long and slender reaching backward halfway to the base of the tail.

"The latter is deeply forked, a powerful organ by which the tarpon leaps. The most remarkable feature is the scales, which are enormous, the largest being three inches and a half in length. One in my possession measures three inches and a half by three inches, almost one-half seemingly covered with molten silver. The upper portion of the back has a metallic blue cast, appearing green in the water; the rest of the body is pure silver."

The tarpon has few kinsmen. The *Megalops cyprinoides* is the type of the *genus* and is found in the Indian Ocean, Africa and Northern Australia, where it is known as the Ox Eye.

The posterior insertion of the dorsal fin distinguishes the tarpon from this fish, which carries its dorsal fin above the ventrals. (Jordan & Evermann). There are other distinguishing features not necessary to refer to here.

Elops saurus, commonly known as the "ten pounder" is a kinsman and it too has a blood brother in the Congo and in the waters of Western Africa bearing the scientific name of *Elops lacerta*. There are very few survivors of *Elopidae*, once a great and numerous family. The tarpon ranges over a wide domain, for its deeply forked tail and symmetrical and streamline body fit it for swift and enduring action. It is found as far south as Argentina and is common along the coast of Brazil. It has been recorded twice as far north as Nova Scotia; once off Isaac's Harbor and once at Harrigan Cove, where it was speared in eel grass. The latter specimen was taken on September 6th, 1906, and is in the Provincial Museum at Halifax (Check list of fishes of the Dominion of Canada, 1913). These facts indicate that the tarpon can live in cold water if the temperature slowly declines. It frequently ranges as far north as the coast of Massachusetts, where it has been taken in fish traps and nets. The fish was described as occurring in Long Island Sound in the Proceedings of the Academy of Natural Science, Phil. 1858. The author is indebted to Dr. C. H. Townsend, Director of the New York Aquarium, for the following interesting information:

"The Aquarium (New York City) has had living tarpons at three different times, all of which were taken in summer in the southern part of New York Bay.

"The tarpon is known to visit our coast as a late summer straggler. Two specimens were captured in a pound net in the lower bay on July 27, 1906. They were brought to the Aquarium and placed in a large pool, where they

lived two months. They might have lived longer had the pool been supplied with pure sea water, but the supply at that time was derived from the harbor, which is brackish and sewage laden. The other tarpons lived about as long."

In 1928, the Aquarium had another specimen for a few days but it died owing to an injury it received in the net.

The tarpon is a littoral fish but it has been found in the Northern Atlantic as far east as Bermuda, although it is extremely rare there. It is apparently fond of fresh water and it ascends fresh water rivers for a considerable distance—over one hundred miles in several reported cases. It can live in fresh water for a long time, if not permanently.

It has been observed far up the Apalachicola, Peace, Homosassa and many other rivers in Florida and in various rivers in Texas and Mexico, as well as Nicaragua Lake, "which has long been famous as the home of the species" (Gill). The following statements are taken from "The Nicaragua Canal," by W. E. Simmons (Harper & Bros., N. Y., 1900). The author is referring to Lake Nicaragua and its outlet, the San Juan River, which flows into the Caribbean and is about one hundred ten miles long. He says:

"But the game fish *par excellence* of the fresh water is the 'Savalo-real' or tarpon, which fairly swarms in the river and lake. I am inclined to think that the San Juan River and Lake Nicaragua are the principal breeding places of this fish and that it is a mere migratory visitant to our coast. Wherever there is a shoal place in the river it is to be seen breaking by the hundreds and at the Toro Rapids above Castillo they are so numerous that they frequently jump into the boats ascending or descending. As many as five measuring from 4' to 6' in length have been known to jump into a boat on one trip down the rapids, which are only fifteen miles long. They are apt to *bite* the occupants of the boat or injure them by floundering about and so a boatman usually stands ready armed with a

machete to cut their heads off as soon as they strike the deck. They are not esteemed for eating and nobody attempts to catch them."

Lake Nicaragua is over one hundred feet above the Atlantic and its outlet has five sharp rapids. It is probable that fine sport can be obtained in the river although Simmons' statements are possibly too highly colored. (See: Miller's Art. "Fresh Water Tarpon" listed in bibliography.)

Dr. Townsend and Mr. Henry D. Whiton found great numbers of tarpon feeding on cutlass fish about a foot long in Calcasieu River, Louisiana, which flows into the Gulf of Mexico about thirty miles east of the Texas line. After the river leaves a lake it flows through the Calcasieu Pass and enters the Gulf. In this Pass the tarpon were so thick that the oars of the boat frequently hit them. The water was brackish and the time was August, 1928. As the water was shallow and the bottom was lined with oyster reefs which cut the line, it was found almost impossible to land the fish which refused mullet and crabs but took a Wilson spoon and a tuna lure as soon as they hit the water.

The fish has been reported from all the States of the Atlantic seaboard, as well as Central America and all the West Indies. It abounds at the spillway of the Gatun Dam, where it is caught on a fly at any time during the year. Dr. Samuel F. Hildebrand observed them in Miraflores Lake between Pedro Miguel and Miraflores Locks. No doubt by this time they have entered the Pacific, where they probably will prosper. I have a doubtful record of one having been caught in the Pacific near the Canal. As it is a warm water fish it is natural that it should retire toward the tropics during cold weather; and therefore, it is not found at the northern and southern extremes of its range, save when it is warm. The ocean absorbs but few of the sun's rays and heats up very slowly for it requires a greater amount of heat to raise the temperature of a given quantity of water than any other substance. In a very cold season I assume the fishing is late, even in Florida, be-

cause tarpon shun the cool water. Few fishes seem to be able to withstand marked and sudden changes in temperature, and the tarpon is no exception. During a cold wave in Florida which occurred on January 26-27, 1905, the tarpon were benumbed by the cold and large numbers became so helpless that they were easily harpooned. (Mr. E. J. Brown in *Forest and Stream*). It apparently cannot stand sudden changes in temperature; but it is indisputable that it has a range over 80 degrees of latitude.

Its breeding habits are unknown and so far no one has definitely reported that he has seen the spawn of the tarpon.

My investigations have been confined to the waters in and about Charlotte Harbor, which is a large bay about sixty miles south of Tampa Bay and one hundred and fifty miles north of Key West. A few Passes connect it with the Gulf of Mexico. It has an area of 111 square miles and a mean range of tide of 1.4 feet. Peace River flows into its northern end and it drains about 2000 square miles of Florida. The Miakka River empties into the Harbor on the northwest shore about six miles from Punta Gorda. Southerly lies Pine Island Sound and San Carlos Bay, into which the Caloosahatchee River flows. The Harbor extends to the east about eleven miles and its mean width is $5\frac{1}{2}$ miles. Its waters are shallow and in places brackish. Its bottom varies from coral formation to earth covered in places with water loving vegetation interspersed with bare spots. If the tarpon breed in this latitude, it would seem that this Harbor and the streams which flow into it afford every variety of food, depth and character of water suited to their needs.

Some fish can be found at any time along the West Coast of Florida, but comparatively few large ones winter as far north as Charlotte Harbor. There were many tarpon at Boca Grande in November and early December 1934; but normally few are seen during these months. Some large ones seek deep holes and remain during the Winter. Small fish can always

be found in the rivers and creeks on the West Coast of Florida. They begin to show along the Coast in January, and from that time their numbers slowly but steadily increase up to July. They do not take the bait readily till April, or later, if the Spring is cold. The fishing here is at its best in May, June and July.

For three or four days, in October, 1924, the fishing at Boca Grande was excellent. A friend of mine caught ten in three hours but they soon disappeared. The late Lewis Bremer, informed me that he never saw larger fish or had better fishing in May. Tarpon ascend to the head waters of Floridian rivers. On the East Coast of Florida they are caught at any season, but they are never so plenty as on the other coast. The tarpon feeds upon mullet, pinfish, sea catfish, sardines, shrimp, needlefish, crabs and such like prey.

Several years ago while fishing in Boca Grande Pass, my attention was directed to immense schools of minnows close to the beach. There were myriads of them in the clear water, six feet or less in depth. They remained in this neighborhood for several hours, a prey for the birds above and the fish below. We observed the tarpon swimming through these schools with open mouths, catching the minnows by the hundreds, inhaling them, so to speak. The tarpon were so preoccupied by their good fortune that they permitted our boat to come very close. I never saw this occur except on this occasion.

The very young of the tarpon were not observed for many years. A ten or eleven-pound fish was rarely caught, and until 1900 the smallest tarpon in the National Museum was nine inches long. Many years ago Dimock recorded the capture of tarpon weighing less than two pounds in the Harney River near the Everglades and stated that the Allen and Turner rivers on the West Coast are nurseries for them. He caught them on an eight ounce rod with a fly.

I am indebted to Mr. George E. Bruner of Kokomo, Indiana, for some very interesting facts. Mr. Bruner has a winter residence at Everglade, Florida. In a personal letter he says:

“For ten years I have fished for and caught tarpon, the gamiest of all fish, among the Ten Thousand Islands that surround my winter camp, and farther down the Coast around the mouths of Chatham, Losmans, Rogers, Harvey and Shark Rivers. We get them to bite here long before they appear at Captiva and Boca Grande. I have caught them in every month from October to May. Last winter (20-21) in the upper Shark River during the month of February I found the water full of small tarpon from eight to twelve inches long. They were jumping and striking constantly, thousands of them, and had the water churned up and dirty from their activities. I had gone up there to fish for black bass, the water being fresh, but the small tarpon had evidently driven the bass away for I could not get a strike from a bass although a few weeks before we had had wonderful bass fishing. I used my fly rod with dry fly, small spinner and small pieces of cut bait and succeeded in catching several but found them hard to hook. A few years ago while fishing for bass with artificial bait in the headwaters of North River which flows into White Water Bay a tarpon perhaps five feet long struck my bait and carried it with a goodly portion of my line away with him, which proves that at times they like fresh water.”

Mr. Frank Gray Griswold, in his beautifully printed volumes entitled “Sport on Land and Water” (privately printed) calls attention to the fact that while tarpon are in rivers and not in motion they lie upon the bottom, coming to the surface at intervals for a mouthful of air which comes up in bubbles for some time after they have again retired to the bottom. A very small tarpon which he placed in a tub of water did the same thing. He has searched about twenty Cuban rivers for tarpon, finding them in only five, viz.:

Zaraguanacan (north coast),
Jatibonico (south coast),
Rio Negro “ “
Damuji “ “
Los Angeles (Isle of Pines).

He states that the fish move up and down with the tide in schools of twenty or more, and that small fish seem to remain for several years in brackish waters before going to sea. I doubt this latter conclusion. Fish of from three to five pounds are plentiful in these Cuban rivers. He says that they do not seem to go above the tide into fresh water. The natives eat them fresh and salted.

Mr. Griswold says:

“There is a pond of brackish water back of St. James City, Florida, with no outlet, with many small tarpon in it (from one to four pounds). The spawn must have been dropped by birds or carried from the beach by alligators. The fish do not grow for they have but little food. It is my belief that the tarpon grow very slowly and that the large ones are of great age.”

He advises me that tarpon frequently remain in the deep holes of certain rivers in Florida during the entire Winter and show themselves on warm days when the water reaches 68° or upwards.

The late F. G. Aflalo, the author of that attractive book “Sunshine and Sport in Florida and the West Indies” records the fact that very small tarpon are found in land-locked waters of the West Indies. They are found in ponds in Westmoreland, Jamaica, and in the Lakes of Antoine and Levera in Granada. They are caught in the Black and Milk Rivers of Jamaica and off Port Royal.

I have reports that tarpon are present in large numbers in the Guanajibos River near Mayaguez, Puerto Rico.

They appear along the Louisiana Gulf Coast early in May and remain until the water becomes cooler early in October. (Belden)

The mature fish begin to arrive in considerable numbers at Aransas Pass, Texas, about March, but they do not take the bait readily till May or June. They disappear from this locality about November 15th. The fishing here is at its best during June and October.

Mr. J. E. Cotter of Aransas Pass informs me that the females are full of roe in May and June and he is of the opinion that they spawn in the near-by bays during these months. He reports that he has caught 3" tarpon in a cast net in this locality.

The Panuco River at Tampico, Mexico, and its tributary streams are also supposed to be breeding places. They are found there in great numbers from November to April, which roughly corresponds to the months during which they are scarce along our Southern Coasts. In May the tarpon school and refuse bait of all kinds. They may be breeding.

Mr. William Markham of Cristobal, Canal Zone, has been on the Isthmus many years and is a close and accurate observer. He informs me that tarpon as small as 10" have been caught there on a fly, but he has never seen smaller fish in these waters. Great quantities of small fish come down the spillway of the Gatun Dam and are greedily devoured by thousands of waiting tarpon. The tarpon are present perennially at this point. Mr. Markham has used small nets to obtain bait for mackerel for many years but he never caught a very small tarpon in any of the creeks or coves of this region. He has made inquiries of the natives at my request but they report they have never seen the very small tarpon. I have a record of a fish caught in Canal waters of 118 pounds, 6' 6" in length. Mr. Markham has had the best success when fishing with a brown fly of his own construction.

In the Government publication entitled "Fishes of Porto Rico" (Evermann & Marsh, 1900), Dr. Barton W. Evermann reported that tarpon evidently spawn near that island. The Government report describes the specimens taken as follows:

“The four examples are from Hucares, from 7.5 to 11.5 inches long, and were seined in a small brackish pool of dark-colored water not over five feet deep in the corner of a mangrove swamp and at that time (February) entirely separated from the Ocean by a narrow strip of land scarcely twenty-five feet wide. The thirteen others are nearly all very young of 2.25 to 3.25 inches collected at Fajardo. No large individuals were seen.”

Fajardo is on a coast poorly protected against the northeast trade winds.

As these fish were obviously very young the evidence afforded by their capture at Puerto Rico as bearing upon the breeding place of the fish is significant. Gill states that all of these fish were the young of the first year.

In March 1902, Eigenmann and Riddle collected fish in Cuba. I quote from their report in Vol. XXII (1902) at page 222 of the publications of the United States Fish Commission.

“*Elopidae*

TARPON ATLANTICUS

Cuvier and Valenciennes.

“Pinar Del Rio, 4 specimens 20—119—182 and 192 mm. from a deep pool beneath the wagon bridge, many miles from the sea. They are locally known as ‘Sadina’ and we had been told that we should find them in this spot.”

I endeavored to locate the specimen reported by these gentlemen to be only 20 m.m. long, which is less than an inch. Two of the larger fish they collected are now in the California Academy of Sciences but the one sought could not be found. It may not have been preserved by Dr. Eigenmann, which is a pity. It is somewhat strange that the Doctor and his associate did not appreciate the value of their discovery.

Margaret Storey and Louise M. Perry report that in April 1934, a tarpon 8.46 cm. (3.33 inches) was captured in a large brackish pool on Sanibel Island, situated in Lee County, Flor-

ida, on the Gulf of Mexico. I believe this is the smallest tarpon ever taken in this locality. (See *Science*, Vol. 78, p. 284, where this important discovery was reported.) I have one 4 $\frac{5}{8}$ " in length which came from this locality.

It is believed by some that the young of the tarpon pass through what naturalists call a leptocephalus stage before developing into perfect fish. Gill states:

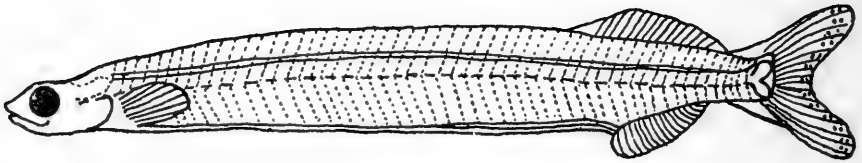
"The very young or larvae will doubtless be found to be like those of *Elops* and *Albula* elongate ribbon-like animals of translucent and colorless texture with a very small head and small fins. They are probably so transparent that their eyes alone are apparent in the water unless a very close examination is made. The youngest of the specimens (2.25 inches long) observed by Evermann and Marsh were probably not long before developed from the larval condition. Such are the little fishes to be looked for as the very young of the great tarpon.

"Most of the large tarpons caught along the Coasts of Florida and the Southern States have attained full maturity * * * they are probably nearly or over three years old. Growth, however, is continued in some much above the average, one of three hundred and eighty-three pounds it is claimed having been harpooned."

It is not at all certain, however, that these fish breed in pools or in rivers. The consensus of scientific authority seems to be to the contrary. Dr. Gill has expressed the following opinion:

"It apparently demands a temperature and conditions which the reef-forming coral animals require and sheltered brackish or fresh water for oviposition."

In some fishes there is a change from a larva to a true fish. This is termed a metamorphosis. The first organisms are termed by naturalists, leptocephali, which are semi-translucent, ribbon shaped and entirely different and larger than the fish that finally develop. Miss Gloria Hollister writes me



LEPTOCEPHALUS LARVA OF EAST INDIAN TARPON, *Megalops cyprinoides*.

(1936) that she studied a lady-fish *leptocephalus* for ten days. It shrunk in length from two and one-quarter inches to less than one inch when it looked like the adult fish. Probably this change in size likewise occurs in the development of the tarpon. If the tarpon develops into a true fish from this stage possibly the larva has been overlooked by observers.

Gill's prediction as to the early stage of the tarpon is supported by the discovery of P. N. van Kampen of the larva of the *Megalops cyprinoides* in the brackish canals of Batavia, which is here illustrated.

van Kampen reports that when in the water it is quite transparent and only its eyes and swim-bladder are distinctly observable. The specimens collected by him varied in length from .897 of an inch to 1.17 inches. It is not strange that so minute and indistinct an object has eluded the scrutiny of observers for so long and it is possible that the larvae of our tarpon abound in our local waters. I am, therefore, presenting a drawing of the East Indian specie in the hope that some keen eyed fisherman may identify the young of the tarpon. It is not known when the larva changes into the true fish. The translation of van Kampen's note will be found in Dr. Beebe's fascinating book, entitled "Beneath Tropic Seas", which should be read by every sea angler.

The most interesting fact relating to the young of the tarpon reported since the last edition of this book has been supplied by Dr. Hildebrand. The following is from his paper in *Copeia* (April, 1934, No. 1):

"THE CAPTURE OF A YOUNG TARPON, *TARPON ATLANTICUS*, AT BEAUFORT, NORTH CAROLINA.—In an article in *Science* (78, Sept. 29, 1933: 284-285) entitled, "A Record of Young Tarpon at Sanibel Island, Lee County, Florida," by Margaret Storey and Louise M. Perry, reference is made to a young tarpon taken at Beaufort, North Carolina. It is stated that the specimen is in the Bureau of Fisheries. Unfortunately,

this fish no longer is extant, having been destroyed inadvertently. The present writer regrets exceedingly that he is unable to offer an illustration of the specimen, which was only 20 millimeters long; not 25 as reported by Storey and Perry. A specimen of the same length once was reported from Cuba by Eigenmann (U. S. Fish Comm., Vol. XXII, page 222), entirely without description. An unsuccessful effort was made to locate that specimen. Fortunately, a description of the specimen from Beaufort had been prepared before it was destroyed and is offered herewith. It is hoped that the account may be of some aid in identifying this stage in the development of the tarpon when it is retaken.

“Body quite strongly compressed, the fish being in transition from the leptocephalid to the adult form. Head small, quadrate in cross-section; snout depressed, two times as long as eye; eye small, bulging, entirely lateral; mouth moderate, terminal, the gape reaching under eye; teeth small, evident only in upper jaw; gular plate not clearly visible externally. Body myomeres very distinct, except on distal part of tail, about 52 (an adult examined had $32+23=55$ vertebrae). Fins, exclusive of ventrals, fairly well developed; caudal fin broadly forked; dorsal fin short, with 12 rays; anal fin long, with 20 rays, its origin under base of dorsal; pectorals rather long, inserted very low and close behind margin of opercle; vertical finfold still evident on caudal peduncle. Alimentary canal visible under magnification along ventral edge of abdomen, not yet fully invaginated. Color entirely wanting in the preserved specimen.

“The specimen upon which the foregoing description is based was taken in the mouth of Core Creek, Beaufort, North Carolina, on August 21, 1929. The water at the place of capture was 8 to 10 feet deep and decidedly brackish.

“The tarpon does not occur regularly on the coast of North Carolina, and no evidence indicating that it spawns there has been secured. The young one captured may have strayed to North Carolina from a more southern locality.

“The identification is believed to be correct, because specimens of the young in the transition stage of both the lady-fish, *Albula vulpes*, and the ten-pounder or big-eyed herring, *Elops saurus*, the only other local species, exclusive of the eels, that pass through a leptocephalus stage, were at hand for comparison. The young tarpon is distinguished from these two species (a) by the short dorsal fin, which has 12 rays, whereas the lady-fish has 16 dorsal rays and the ten-pounder 22; (b) by the long anal which has 20 rays and its origin under the base of the dorsal, whereas in the lady-fish this fin has only 8 rays and in the ten-pounder 13, and in both species the origin of the anal is behind the base of the dorsal; and (c) by the small number of myomeres of which there are only about 52 in the tarpon, as compared with about 65 and 80, respectively, in the lady-fish and the ten-pounder.”

Dr. Hildebrand wrote me as follows:

“Referring to your letter of March 31, it is true that we captured a larval fish which was identified more or less positively as a young tarpon. However, the rest of the story is quite disconcerting. I sent the specimen to my friend, Doctor E. W. Gudger, in the American Museum for examination and verification of the identification. Although the specimen presumably was very securely packed the vial containing it was broken in shipment and the tail of the specimen was severed from the body. After Doctor Gudger had examined the fish, he asked my permission to stain and clear it in order that the vertebrae could be counted. This permission was granted, and that was the end of our young tarpon, as it went all to pieces in the process, evidently through a mistake made by the

technician. Unfortunately, I had not had the specimen drawn. Consequently, all I have left is a brief description and a comparison of this supposed larval tarpon with larvae of the related species, *Elops saurus* and *Albula vulpes*, which pass through a leptocephalus stage like the tarpon and the eels."

It is to be regretted that this specimen met such a fate before its identification was complete but no one who knows the Doctor will doubt the accuracy of his conclusions.

An important contribution relating to the life history of the tarpon has been supplied by the distinguished scientist, Dr. William Beebe. In one of his expeditions to Haiti so charmingly described in his book *Beneath Tropic Seas*, he gives the following account of his discovery of very small tarpon:

"About fifteen miles west of Port-au-Prince, Haiti, along the shore of the Gulf itself, are two interconnected, land-locked lagoons known as Source Matelas, I visited them first with General John H. Russell on the 13th of January in the hope of getting a brace of ducks. At the last minute, I put a small seine in the car in case any fish might be procurable.

"We had bad luck as regards ducks, for there was only a quartet of blue-winged teal and these left before we got within gun shot. Willets, Louisiana herons and yellow legs composed the remaining bird life of the lagoon. Gray king birds and mocking birds called and sang in the tops of the low trees and grass quits and migrating warblers hopped about the under brush.

"The more western of the lagoons was a rounded body of water about 100 yards across, on a marshy promontory backed by low, rolling hills. These were covered with the usual semi-arid vegetation, consisting of cactus, cereus and acacias. From the waters of the golf the lagoon is separated only by a narrow dike built up apparently by the action of the storm waves at high water.

"I walked into the ooze at the edge of the lagoon and out to the center. There I found half a foot of mud and

about eighteen inches of water. This was green and muddy, but not slimy. It was impregnated with sulphur and the odor of this element rose strongly from the disturbed bottom. A few miles away was a constantly flowing sulphur spring, used to bathe in by the natives, and this lagoon has apparently some connection with the same source of supply.

“This unprepossessing liquid was filled with innumerable small insects, which, upon examination, proved to be water-boatmen, both adults, with handsomely variegated, yellow elytra, and young, which looked at first glance amazingly like copepods. * * *

“I saw no signs of fish and was about to return to shore when something nipped my ankle. This happened again, and I called for the seine. We had hardly commenced to draw it when small fish began leaping high to escape it. Closing the net I secured a considerable number, and when we examined our catch on the shore I found thirty-six tarpon, ranging from two to eight inches.

“When I recovered from my first astonishment at seeing these clean-scaled, virile fish living in this sulphurous, stagnant pool, I examined the smallest for any hint of the leptocephalus stage through which it is assumed they must pass early in life. Neither this, nor a later, much more thorough examination showed in these young fish any hint of such phase—even the smallest was as normal and perfectly formed as any six-foot giant of the Florida waters. This may mean only that the leptocephalid characters disappear when the fish are still smaller.

“The second lagoon was absolutely barren of fish life, and a haul made in the shallow Gulf water just outside the dike of the lagoon yielded nothing but thirteen small puffers.

“My next visit to Source Matelas was on Jan. 23. This time there were several hundred wading birds about the

lagoons, including willets, greater yellowlegs, herons, stilts and several species of sandpipers. Dr. Jamieson and I made a haul with the seine in the same place and secured a heavy load of tarpon. Tee-Van and Crosby took good still and motion pictures of the process.

“When we counted our catch on shore, we found 154 of the young fish, from three to seven inches in length. One individual measured thirteen inches. Several times as many tarpon as we took escaped by leaping over the top of the seine as we were pulling it, some of them rising three feet clear of the surface. We threw back all but the few which we wished to keep as specimens.

“My third visit was two months later, after heavy storms had set in, on March 21. Birds were abundant, including a pair of black-necked stilts, which we shot for specimens; a flock of greater yellowlegs, two great blues, four Louisiana herons and a half dozen or more coots, while a flock of eight blue-winged teal got up as we approached.

“I found the lagoon dike broken through and the tide pouring into a three-foot sluiceway. A thorough seining of the first lagoon netted six tarpon, measuring from four and a half to seven inches, together with a two-inch snook. Ultimate hauls failed to secure another fish of any kind.

“A seine haul in the second lagoon yielded four small mojarras, recent emigrants from the open water outside. The water-boatmen were as abundant and the sulphur smell quite as strong as ever, in spite of the infiltration of the water from the Gulf.

“The most interesting development of this last haul of young tarpon was that when we examined five of the fish in aquariums on the schooner, we found that there was something the matter with their eyes—a gray, translucent film clouding the tissue of the lens or the humor behind it, the aspect being wholly unlike the appearance of the eyes

of the fish taken two months before. They seemed to be quite blind. Whether this affliction was connected with their remaining in the lagoon after the hundreds or thousands of their fellows had escaped to the open Gulf can be only surmised. It could hardly have interfered with their feeding, as the water-boatmen were present in uncounted millions, and a single scoop with a quart jar secured large numbers.

* * *

“A few tarpon, from 6 to 8 inches long, have been taken on the north shore of the Gulf of Mexico in Florida, and L. L. Babcock, in his excellent monograph of the tarpon, records a three-inch specimen taken in a cast net on the coast of Texas. He also gives the world's record tarpon as 8 feet, with an estimated weight of 350 pounds. This was taken in a net by Florida fishermen.

“My discovery of young tarpon in a land-locked lagoon in Haiti suggests that the Porto Rican record is not a casual accident, but a usual phenomenon in the life of these fish. On account of the shallowness and the muddiness of the Haitian lagoon, it would be impossible for an adult tarpon of any size to enter it and deposit her eggs. We can only surmise that the eggs are scattered out in the waters of the Gulf, sink to the bottom and hatch, and that the young, either as leptocephalids or as very small larval fish, make their way into the lagoon before the season when it becomes cut off from the Gulf. Here they live and thrive, with an abundance of food, sheltered from voracious fish, and other dangers of the open sea, having to guard only against the keen eyes and sharp beaks of the larger herons and such unthinkable catastrophes as visiting scientists. * * *

“One of my Haitian fishermen took two good-sized tarpon in his seine not far off shore from Source Matelas. These were thirty-six pounders, more than forty-one

inches in length. When diving on Lamertin Reef, several miles across the Gulf, I saw a large tarpon again and again. For a number of days in succession this great silver fish would swim toward me on my first submersion and pass slowly within eight or ten feet, looking me over.

“When I learned that this would probably happen every time I went down, I devoted all my attention to estimating his exact length. Once he swam past two very tall tube sponges, and I could see distinctly that he overlapped the distance between them in actual body length, not including his tail. I measured this distance and found it six feet three inches. So, even ignoring the slight overlap, he was a full six feet in length of body. He showed no fear, only a gentle curiosity, rolling his great eye about as he passed. His scales reflected the light, even at a depth of twenty-five feet, as a dazzling sheet of bluish silver.

“I could learn of no tarpon being caught on a hook in Haiti, although anglers have made many attempts. The native fishermen were familiar with them, and, as I have said, occasionally found them in their seines.”

Dr. Alfred C. Weed, of the Field Museum of Natural History, at Chicago, wrote me the following interesting comments on Dr. Beebe's discovery:

“I am inclined to disagree with Dr. Beebe's idea that it would be impossible for the tarpon to spawn in his Haitian lagoon, regardless of the muddiness or shallowness of the water. At Point Isabel, Texas, in 1924, I repeatedly saw tarpon in the shallow, muddy waters of Laguna Madre. They seemed quite at home in water not nearly deep enough to cover the fish and so muddy that one could not see the bottom at a depth of six inches. My own reaction to Beebe's account is to say that if he found two-inch tarpon in Source Matelas on January 13 and on January 23 found the smallest ones three inches long, there were probably specimens not much over an inch

long in the same lagoon the latter part of December and that there were probably spawning fish in the lagoon at some time between the end of July and the first of December.

* * * * *

“From what I know of similar land-locked pools I should expect that there would be a time every year and at about the same date each year when the bar would be broken and stay open for several weeks or, perhaps, months. I should expect that the tarpon would enter the lagoon at that time and spawn. Beebe’s description seems to indicate that the lagoon would offer almost optimum conditions for the growth of the young fish up to a length of perhaps three or four inches and somewhat less favorable for some time after that. Certainly, a dense growth of unicellular algae, such as he describes, is very distinctly favorable for the growth of very small fish at about the time they begin to feed. I believe that continuous observation of Source Matelas from June to January might and probably would go far toward a solution of the question of the early stages of *Tarpon atlanticus*.”

The ladyfish abounds on the bars which border the channel leading to Boca Grande Pass and it probably breeds in that locality. Yet I have never heard of anyone identifying the leptocephalids of that fish although it has been proved to pass through that stage of development. If the young of that common fish have escaped detection, it is not strange that the larva of the tarpon has never been identified. The observer looks for a young fish resembling in form the mature tarpon instead of an indistinct ribbon-like organism almost transparent. When this stage is passed, the young tarpon probably goes to sea. Haiti is eight hundred long sea miles from this Pass and it cannot be true that the ripe fish of both sex one occasionally sees at the Pass travel to Puerto Rico or Haiti to breed. After

consideration of all the facts, one is led to the conclusion that tarpon breed over a very wide area.

Many fish deposit their eggs in the open sea and the tarpon may do the same, which accounts for the fact that the larval condition has not been noticed. The subject is worthy of patient investigation in the field and I hope that all sportsmen and guides will report any facts which may come to their attention throwing light upon this obscure subject.

Dr. Alexander Meek, M. S., in his book entitled "The Migrations of Fish" considers the spawning habits of the *Elopidae*. Attention is invited to his statements bearing in mind that the term "anadromous" is applied to a fish which migrates from the sea into fresh water like a salmon." "Contranatent" signifies swimming against and "denatent" swimming with the current.

"The family *Elopidae* includes *Elops lacerta* of the West Coast of Africa where it enters rivers and *E. saurus*, which is generally distributed in tropical waters. The latter also enters rivers as in East Africa, where it is called Cape Salmon. But it is evident that spawning takes place at sea, since a leptocephalus stage is known. The tarpon (*Megalops atlanticus* of the Atlantic tropical and southern region and *M. cyprinoides* of the Indian Ocean and the seas of the East Indies) is well known in the open seas and periodically visits the coasts, even ascending the rivers in pursuit of shoals of fish. At the period of its visits to the coast it attracts the angler, who, in search of adventure, essays with success to capture a giant fish with the rod. *Megalops* is represented in the marine Lower Eocene of Sheppey and probably *Elops* as well and allied genera have been obtained from the Cretaceous of Europe, Mount Lebanon and Brazil.

"It is probable that these more oceanic allies of the herring have pelagic eggs, and that spawning takes place

out at sea, but this does not preclude an anadromous migration taking place.

“The spawning migrants appear to migrate towards the coast before spawning takes place, but the spawning region is sufficiently far from the Coast to demand a denatent drift of the eggs and larvae to the Coast where the early life is spent. After metamorphosis the young stages are passed in comparatively shallow water. The life history of these fish may be said to be, therefore, and it applies as well to the bathypelagic *Pterothrissus*; a denatent drift of the egg and larvae to or towards the shore; after a season spent in shallow water a short contranatent migration, a return denatent migration, a stronger contranatent movement into deep water and, finally, a spawning migration, which, as has been said, is probably an anadromous one from the oceanic region of dispersal.”

An accomplished and sound authority, Dr. J. T. Nichols, of New York, to whom this matter was submitted, wrote the following comments on Dr. Meek's text:

“I take it the theory is something as follows:

“When about to spawn, the fish migrate towards the coast but the eggs are actually deposited rather off-shore, though after or at about this time the adult fish enter the mouths of rivers. When the eggs hatch the young drift in-shore and are found near shore, presently moving off-shore again. They move in-shore for the second time when of fairly good size, but move well off-shore for the second time to attain their final growth before coming in as adults.”

The following article is from *Copeia*, of April 25, 1921. Dauphin Island is situate on the south side of Mississippi Sound in Alabama.

“A RECORD OF YOUNG TARPON

“So little is known regarding the life history of the tarpon that the following note should be on record.

“In November, 1920, the Bureau of Fisheries received from Mr. James Mallon of Dauphin Island, Mobile County, Alabama, a young tarpon which was submitted at the instance of Mr. William Holabird. The specimen was 25 cm. in length and from an examination of its scales, which showed no trace of a winter ring, Mr. W. W. Welsh tentatively concluded that it was less than one year old. Further information was furnished by Mr. Mallon through Mr. Holabird in a letter which, slightly edited, is as follows:

“‘The little ones I caught last year were taken somewhere about the middle of January. Some of them were 6 to 8 inches and were caught on the south side of Dauphin Island in the Gulf of Mexico. I killed them with a stick as they were running along the beach. I killed seven of them, the smallest 6 inches and the biggest 8 inches long. The one I sent was killed with an oar at the entrance of Dauphin Bay on November 19, 1920. As to the age of the fish, it must be a year, as I think.’

“In his book entitled, “The Tarpon” (1920) Louis L. Babcock has well summarized the available data regarding the capture of young individuals of this species. It may be inferred that there is not a previous record of the capture of so small an example of tarpon on the northern shore of the Gulf of Mexico. The smallest specimens of record are those taken by Evermann and others in a shallow brackish pool in Porto Rico in February, 1899.

R. E. COKER,

U. S. Bureau of Fisheries.”

I submit that one is safe in concluding that the tarpon breed in many places widely remote, for the facts disclose that very

young fish are found in Florida, Puerto Rico, Haiti, Cuba, Trinidad, Aransas Pass, Lake Nicaragua and in the Bahamas.

While fishing at Boca Grande on June 5th, 1921, I captured a female tarpon which weighed 142 pounds and was 6' 8" long. The ovaries were full of immature eggs and were carefully dissected out of the fish after being measured. They were 28" in length and about 3" in diameter in the thickest parts. I enclosed them in two glass jars partially filled with the formalin solution and sent them to Dr. Nichols for his examination and deductions. Dr. Nichols found that the gross weight of these eggs, including the membranes enclosing them, was $82\frac{3}{4}$ ounces. He caused a portion of an ounce of eggs to be counted and found that there were 163,840 eggs per ounce. After deducting 10% for the weight of the membranes in the mass it is evident that this fish contained approximately 12,201,984 eggs. While the estimation was not exact it is safe to say that a large female carries over ten million eggs. If each egg had developed into a fish as large as the parent the sea would have been enriched with 866,340 tons of tarpon. Such is the prodigality of nature!

I examined the eggs from nine females taken from June 5th to June 22nd, 1920. One female was spent, having very few eggs left in the ovaries and these contained minute specks of blood. She was bright and healthy looking, having the appearance of being fresh from the sea. It is not uncommon to see a tarpon which has a distinct yellowish color, which probably denotes a comparatively long sojourn either in fresh or shallow water. The eggs from this fish were not perceptibly larger than the others examined. In several cases eggs were ejected by slight pressure along the belly of the fish. I have seen males eject milt in the act of leaping while on the hook, and heard of many cases where this was observed by fellow anglers. The evidence seems to point to the conclusion that some of these fish were ready to spawn. I experimented to see if the eggs

would float in sea water but they slowly sank to the bottom. The small fry greedily devoured them.

The ripe fish certainly spawned in the vicinity of Boca Grande.

Dr. Alfred C. Weed of the Field Museum at Chicago is one of our authorities on fishes. He writes me as follows:

“Where fish are so ripe that the sexual elements are released on slight pressure or in their efforts to escape capture, they will not move far before spawning. I seriously doubt their being more than a mile from the spawning grounds. This is a general statement and refers to smaller fish. In the case of the tarpon, it might be three or four miles.”

One year I arranged with my guide, Mr. Mack Mickle of Boca Grande, to examine fish after I had gone home. He took ten or fifteen samples of eggs from June 22nd to about August 5th, 1920. He also found several spent females and sent me samples of the eggs he took. The last eggs collected showed no noticeable increase in size over those taken a month earlier. Dr. Nichols kindly measured these eggs. They ran from 0.6 to 0.75 mm. in diameter. As some of these specimens were taken from spent fish I am reasonably certain they were fully developed. It, therefore, seems to be fairly well established that the eggs of the tarpon are exceedingly small and remarkably numerous.

Dr. Nichols in a personal letter says:

“Anadromous fishes as a rule, have large and few eggs as compared to fishes spawning in the sea. Trout and salmon eggs are large and few. The eggs of the sea herring are much smaller than those of the related shad, and about equally numerous, though the shad is a larger fish. The rule is not absolute, for the alewife (anadromous) has eggs somewhat more numerous and only somewhat larger than the sea herring. But the eggs being exceedingly small and exceedingly numerous, the probability is that the tarpon spawns in the sea. If your results, that the tarpon egg

is heavy, not buoyant, are correct, and I see no reason why they should not be, it would naturally follow that the fish spawn in shore waters or on banks, not in the deep sea.”

It seems that the following deductions are warranted:

- (1) As the mature eggs of this fish are very small and exceedingly numerous the tarpon is probably a salt water spawner.
- (2) As the eggs sink in sea water the fish probably spawn somewhere off shore in shallow water or in sheltered brackish waters.
- (3) The indications are that the time of spawning on the West Coast of Florida is from late June to September.
- (4) That the tarpon spawns over a large area for the small fish so widely reported are evidently very young.

These deductions are partially borne out by the observations of the late W. V. Heusted of Fort Myers, a very intelligent and experienced fisherman, who wrote me as follows:

“I have seen the tarpon spawning in Charlotte Harbor along the Cape Haze shore from the Cape up to the Miakka River. They are always in pairs along in July and August, in white sand holes along the shoals. My brother and I have watched them three different seasons and we have also killed them to see the roe and have watched them deposit the spawn.”

Captain Heusted impressed me as a reliable observer.

I visited the locality to which he refers. The bottom is covered with marine vegetation with here and there sand pits or holes of various areas. The water as a rule is from five to seven feet deep. I regret I could not verify Captain Heusted's observations. My guide visited the locality several times in July and, although he reported he saw hundreds of fish rolling over this spot, he could not observe any fish in the act of spawning.

Over thirty years ago a railroad was constructed on Gasparilla Island, connecting Boca Grande, Florida, with the

mainland. The material forming the roadbed was borrowed from the adjacent right-of-way and holes were excavated. These filled with water which seeped in from Charlotte Harbor, a hundred feet or so away. In 1932 I learned that a boy had caught a tarpon in one of these ponds and my guide and I visited the place. It was about six hundred feet long, thirty feet wide and five to six feet deep in places. The water was slightly brackish but the hard rains had so diluted it that it was almost fresh to the taste. The bottom was mud into which we sank to our knees. There were a few small alligators in the pool and many obstructions which made seining a difficult task. It was full of small tarpon and we netted about fifteen, ranging in size from eleven to nineteen inches in length. We released all but four. The fish persisted in jumping over the net which added to our difficulties for we were up to our necks in the water and nearly stuck in the mud.

They were bright colored and in good condition. I dissected one and found it had been feeding on very small minnows and shrimps. It was interesting to find such fine fish in so scummy a mud hole, which at the time had no connection with either the waters of the Gulf or Charlotte Harbor.

A heavy storm would doubtless flood the pond but I could not learn when this had last occurred. Later that year about twelve of these fish were seined out and placed in an artificial pool on the grounds of the Boca Grande Hotel. Some of them prospered until this year (1936) when the pond was dredged and lengthened.

In December, 1935, this part of Florida experienced freezing temperature and the mercury went to about 28°. After the frost, Mr. William H. Crosby, of Buffalo, and George Wilhelm, his guide, visited the railroad pond and the latter counted over one hundred dead tarpon, which no doubt were killed by the change in the temperature of the water. Many fish are killed by the sudden drop of only 15° in the water they inhabit.

I visited the pond this year (1936) and saw several tarpon coming up for a mouthful of air, so some survived the freeze unless a storm had contributed a fresh supply.

In 1934 I found a pool in the woods which had its sole connection with the waters of Charlotte Harbor through a railroad ditch. During high tides the waters ran up to the pool, a distance of several hundred yards, but at times the ditch was dry. The pool was full of tarpon. We tried to seine it but the water was too shallow and the mud too deep. In 1935 the ditch was blocked up and the pool had disappeared.

Why are the tarpon attracted to places little better than bogs when the adults shun muddy water in the Passes? Why do they venture up fresh water creeks and channels into very shallow water and ill-adapted surroundings? A tarpon nineteen inches long is probably in the second year of its life. If they are spawned in June, July or August and pass through a leptocephalus stage, they may only reach a growth of twelve or fourteen inches during the first year of life. I reach that conclusion from reports on specimens the Bureau of Fisheries has examined at my request. When a fish is confined within a narrow range, where food is limited, it grows very slowly. I doubt if the fish seined out of this railroad pool attained any material increase in size while they were there. Nothing less than eleven-inch tarpon were taken. I confess I cannot think of any reasonable explanation to account for their seeking to use a scummy pool instead of the pure and salt waters of the Gulf or Harbor with their wide range and unlimited supplies of food. The fresh or nearly fresh water may rid them of parasites but it is unlikely that they ascend streams or inhabit pools for that purpose. They doubtless breed nearby but I never saw very small tarpon in this vicinity. The keeneyed fishermen are seining minnows for bait in this locality throughout the year but they have never captured a very young one.

In February, 1933, Dr. C. M. Breder, Jr., of the New York Aquarium, visited Andros Island, which lies about 150 miles

off the southeast coast of Florida. He seined nine tarpon out of a small stagnant pool, smelling strongly of hydrogen sulphide and filled with opaque red-brown water, not over a foot and a half deep. The tarpon ranged in length from $7\frac{3}{8}$ " to $13\frac{3}{8}$ ". The bottom of the pool was of soft mud into which one sank to knee depth. The water in the pool was much deeper at one time and it was said by the natives that it was brought in by the hurricane of 1926. Dr. Breder was advised by Mr. E. W. Forsyth, the Commissioner of the Island, that tarpon are found in land-locked ponds where only unusual tidal waves could account for their existence. He stated that these ponds dry up except at a few moist places on the surface. Sometimes small holes containing a little water exist, yet the tarpon reappear after the heavy rains. Dr. Breder observes it is highly improbable that the millions of tarpon which roam wide areas are recruited from such places and I am sure he is sound in this conclusion. I have seined small tarpon from pools on Gasparilla Island, Florida, of precisely the same character. This locality is over 400 miles from Andros Island.

The facts probably warrant these conclusions:

(1) As it is probable that tarpon spawn in July and August, the young must be abundant during the hurricane season. It is not strange they are carried into the interior pools by the high water, which usually follows these violent storms.

(2) Once the young fish is swept into an interior pool, it fails to attain a large size although the food may be sufficient for its needs for a considerable period. At first it may grow at a normal rate but continued growth is checked by lack of food.

My reason for this last statement is this: Each year for four successive years I closely observed tarpon which were placed in a stagnant, dark-colored, land-locked pool in 1932. They ranged from about 12" to 19" in length when they were transferred to their new home. They failed to grow appreciably from 1932 to 1935, inclusive. In the open sea some of them would have attained a length of at least 60" during this period.

(3) I understand that eggs taken in sea water are usually fertile. They may be carried to the ponds by water fowl. After hatching the fish grows for a time as stated but never reaches large size.

In 1933 the Department of Conservation of the State of Louisiana published an admirable work, entitled, "The Fishes and the Fishing of Louisiana". My attention was drawn to its descriptions of the bowfin (dog fish) and the gars. These fishes are survivals from another geological epoch. They have cellular lung-like tissues in their air bladders and at times breathe atmospheric air. Living bowfins are reported to be plowed up in the cultivated fields. They breathe by the lungs and they survive for weeks in the mud. The gars have swim bladders containing lungs adequate to supply sufficient air for the needs of the body without resorting to gill breathing. (See Bul. No. 23, Dept. of Conservation, La., pp. 379-387). Both of these fish rise to the surface to breathe and, like the tarpon, frequent pools where the water is poorly oxygenated. When the water is foul any fish will come to the surface for air but in most cases death soon occurs because the gill structures are not adequate to withstand such conditions. It is otherwise with the bowfin, the gar and the tarpon.

Thousands of anglers have observed the tarpon roll and, after submerging, emit air which bubbles to the surface. They fish where they see the ascending bubbles for this is assumed to indicate the approximate location of the fish. If a tarpon pool is watched, one will soon see a fish come to the surface for a mouthful of air. I consulted the literature on the air bladder to discover some reason for this habit so persistently followed. Many species have auxiliary breathing organs of some nature although in most of the teleosts the swim bladder serves only as a hydrostatic organ or float. The Australian and South African lung fishes, and a few other species, can also live on the land. When the pools they inhabit become dry some species are able to remain in the mud in a torpid condi-

tion until the rains once more fill the pools. The authorities I consulted were silent on the air-breathing habit of the tarpon. I determined to seek scientific aid so I sent a 19" tarpon to Dr. Hildebrand and requested him to examine the structure of the air-bladder. This fish had been immersed so long in the solution that it had decomposed. I tried again and on June 26th, 1936, I wrote him in reference to two small tarpon I was sending him, saying:

"Please examine the swim bladder and note its connections. You will remember that the last tarpon I sent you was too far gone to enable you to reach any conclusion in this regard. The air-gulping habit of this fish is peculiar and the air-bladder may reflect it in some way."

These fish also spoiled in transit but I persisted and finally two small fish in good condition reached the Doctor. He dissected them and wrote me on July 24, 1936, in part as follows:

"(c) Specimen 300 mm. (12 inches) long from tip to tip; 245 mm. from tip of snout to base of caudal fin. Greatest depth 62 mm.; greatest width 27 mm.; girth 157 mm.; weight $\frac{1}{2}$ lb.; scales between lateral line and origin of dorsal $4\frac{1}{2}$ rows; 5 rows between lateral line and origin of anal; oblique series between margin of opercle and base of caudal, counted just above lateral line, 45. Dorsal rays 14, including 2 rudiments; anal rays 23, including 2 rudiments. Stomach contents, 1 small silverside (*Menidia sp.*). The air bladder is firmly attached to the gullet slightly posterior to the anterior end of the bladder. In the center of the attachment is an orifice large enough to be seen without magnification even in the comparatively small specimen. No other openings were found.

"To determine if openings were present a small blow-pipe was inserted in a puncture made at about mid-length of the air bladder after one side of the abdominal wall had been dissected away, leaving, however, all internal organs intact. The specimen was immersed in water. Then, blow-

ing in the pipe the escape of air bubbles was watched, as in finding punctures in an automobile tire tube. Bubbles were seen to emerge only from the gullet. Upon dissection, the opening from the air bladder into the gullet (or oesophagus) was plainly visible as already stated.

“Upon cutting open the air bladder the interior was found to contain bands of cellular or lung-like tissue, which lay principally in two longitudinal bands, one larger than the other, and re-divided posteriorly. Two ‘lungs’, as in the higher vertebrates, therefore, are suggested.

“(d) Specimen 275 mm. (11 inches) from tip to tip. Vertebrae 34+23. Gill rakers on lower limb of first arch 40. Stomach contents, 3 small silversides (*Menidia sp.*). The air bladder was examined in the same way as in specimen (c) above. The opening into the gullet again was plainly visible, and the inside structure of the bladder agreed in all respects with specimen (c).

* * * * *

“The connection of the air bladder with the gullet, and the development of lung-like bands of tissue within the bladder, no doubt explains how young tarpons are able to exist in the extremely stagnant pools in which they sometimes are found. Perhaps it explains, also, why tarpons frequently come to the surface. However, before philosophizing on the behavior of the adults in this respect it would seem advisable to examine the air bladder of adults for a connection with the gullet and for cellular tissue, as there is the possibility of changes with age. If you could at this time, or later, furnish the internal organs with the air bladder attached of one or more adults, I should be glad to make an examination.

“The development of the air bladder of the small tarpon examined is very similar to that found in the fresh water gars and in the bowfin, but not so far advanced as in the lungfishes.”

* * * * *

Upon receipt of this letter, I procured an adult tarpon, weighing about ninety pounds and had it shipped to Dr. Hildebrand. I quote from his report on this specimen:

“Referring to my letter of August 21, I have now examined the air bladder of the large tarpon more closely. I find the structures essentially as in the small specimens reported upon sometime ago. There is, however, this slight difference: In the large fish the two main bands of lung tissue are entirely separate, whereas in the young they are attached to each other, except for a short distance posteriorly. In addition to the two main strands there are two small well separated ones.

“Two large blood vessels in the wall of the air bladder parallel the two principal bands of lung tissue.

“The short tube forming the connection with the oesophagus has very heavy walls about $\frac{1}{8}$ ” thick in the large fish.

“I would judge that the large specimen, in proportion to its size, has equally as large an amount of lung tissue as the small ones.

“The stomach of the large fish contained the remains of six marine catfish, all of about uniform size. I would judge from the remains that the fish were about eight to ten inches long. Identification is uncertain, but they most probably were *Gaelichthys milberti*.

The following measurements and counts were taken:

Total length	177.5 cm.	Width	9.0 cm.
Standard length	148.7 “	Girth	80.0 “
Head	38.7 “	D. 15 (including 2 rudiments)	
Depth	31.2 “	A. about 25 (Rays very difficult to count because of the heavy tissues on the rays).	
Scales 5-46? (Series of scales between lateral line and anal too irregular to count).			

It is hoped that the foregoing information will be of value to you. I have saved the air bladder which will be available for further examination."

Many of the old families of fishes doubtless had lungs or breathing organs of some character but the air-bladders of most of the mature modern teleosts fail to disclose their existence. A layman, like myself, having only a superficial knowledge of the principles of evolution, would assume that this organ would have developed to greater efficiency in the modern fishes. Instead it has degenerated.

If the reader is interested in an explanation of why this degeneration has taken place, he is referred to the paper of Mr. Charles Morris, entitled "The Origin of Lungs; a Study in Evolution", first published in the *American Naturalist* of December 1892, and reproduced in Jordan's "A Guide to the Study of Fishes", (Vol. 1, p. 98).

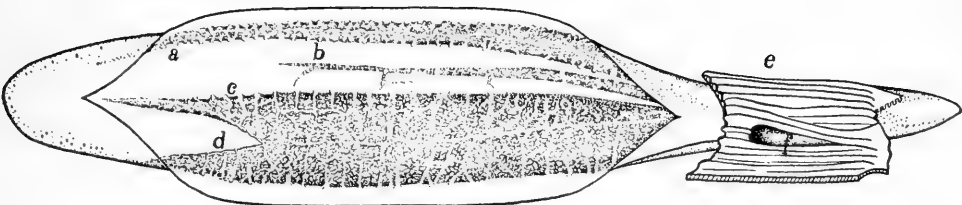
The lung tissues in the air-bladder of the tarpon afford further evidence of its antiquity and imply that it has lived in waters so deficient in oxygen content that it was forced to breathe atmospheric air or perish. In the course of time, nature provided the fish with an accessory breathing apparatus which it now retains and still employs. This accounts for the ability of the fish to live in stagnant pools as well as for its habit of coming to the surface for air even when it is in the pure and oxygen charged waters of the open sea.

It seems clear from this careful investigation conducted by Dr. Hildebrand that the tarpon secures the oxygen it requires not only from its gills but also through the cellular lung-like tissues in the air-bladder. The latter organ functions somewhat similarly to the lungs of the higher vertebrates. It is a respiratory as well as a hydrostatic organ.

But why did not these lung tissues in the air-bladder of this fish degenerate? Does not their present existence force one to the conclusion that the tarpon habitually lives for at least a portion of its life in poorly oxygenated waters? I leave the solution of this question to the Ichthyologists.

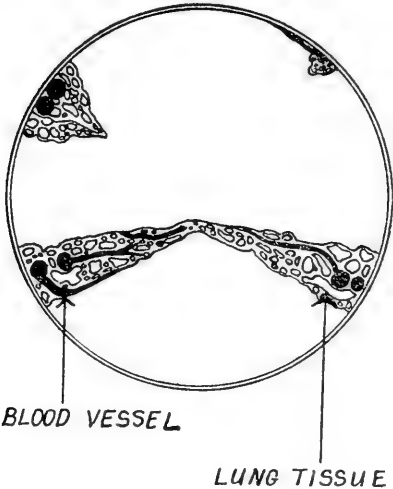
Miss Luella E. Cable, Junior Aquatic Biologist of the Federal Bureau of Fisheries, has kindly prepared a drawing of the air bladder. Another cross section drawing shows the blood vessels running through the lung tissues.

I again express my grateful acknowledgments to Dr. Hildebrand. His patient labor and technical skill have made this research possible.



Air bladder of *Tarpon atlanticus* cut open to show lung tissue. (From specimen 30 cm. long.)

- a and b. Small bands of lung tissue.
- c and d. Large bands of lung tissue connected by membrane along pale median line.
- e. Gullet cut open.
- f. Orifice between gullet and air bladder.



CROSS SECTION

In March, 1928, Dr. C. H. Townsend wrote Mr. Madison Grant of the Museum of Natural History of New York the following letter which found its way into the bulletin of the Society and thence into the newspapers:

“In conversation with Mr. S. A. Venable of the Zone Police Force, an experienced tarpon fisherman, I was informed that the fish is viviparous. He has repeatedly observed the females seeking shallow water, generally less than 4 feet deep, where a continuous stream of young fish was poured from her vent, the young being apparently little more than $\frac{1}{4}$ inch long. The young immediately seek refuge in groups, under the large scales of the mother, each scale standing outward at an angle of probably 30 degrees. The young clustered in these scale shelters as thickly as they could. Mr. Venable’s many observations led him to believe that the young shelter under the scales ten days or more, when they are $\frac{3}{4}$ inch long. The mother soon rids herself of the young by shaking herself and by leaping.

“I have myself no personal or book knowledge of the tarpon. The above notes may be a record of something entirely new, and may explain the remarkably large scales of this fish. If it isn’t new to science, it is to many, including myself.”

When the article was called to my attention I wrote Mr. William Markham of the Canal Zone and requested him to investigate the matter. I was informed that the fish which Venable had reported and produced as tarpon were in fact young herring, one species of which has a prolonged ray of the dorsal fin, and that there was no foundation whatever for the yarn which he spun to the Doctor—a story that reflects great credit upon Mr. Venable’s imagination.

Although I have corresponded with officials, societies and anglers at many places, I have not been able to gather anything more than the data here set forth.

The reason the tarpon is so rapid in the water is its symmetrical body and its deeply forked tail, which avoids the space behind the axis of the body where the stream lines converge after following the sides of the moving fish.

The dorsal and anal fins can be folded into the body and they are carried in this position when the fish is swimming rapidly. This is done so the streamline form of the fish may not be broken. They are extended when the fish desires to slow down or turn. The paired pelvic fins maintain the stability of the fish while the pectorals aid it in slowing down or changing direction. These fins are likewise folded while the fish is proceeding at top speed.

The mucous which the tarpon exudes from its body also tends to increase its speed.

The part of the anatomy of a fish which apparently is least understood by naturalists are the lateral lines which extend down the sides of the body and which every angler has observed. If one will detach one of the scales on this line, clean it in water, and hold it up to the light, it will be observed that it is perforated by small holes. I understand it is partly through them that the mucous is discharged which enables the fish to swim more speedily, or, to put it in another way, to slip through the water with greater ease. But the lateral line system plays a still more important part in the life of a fish. Tubes underlie the scales and communicate with the exterior by canals branching off from them and ending in pores. These mucous tubes radiate widely over the body. Sense organs are present which communicate with the brain.

It is supposed that this complicated apparatus gives a fish a sense of hearing and touch denied to other animals and enables it to detect the presence of other fishes, its prey and obstructions in its path. The precise functions of the lateral line system is not fully understood, which is another illustration of the veil which nature has so cunningly thrown around an animal so familiar as a fish and one which has been studied since the dawn of history.

The Bureau of Fisheries is authority for the statement that the sense of smell, along with that of touch, plays a greater role in the life of a fish, so far as obtaining its food is concerned, than that of sight. The sense of sight in fishes seems to be limited more to the perception of changing lights and shadows since a fish will usually snap more quickly at a moving object.

The theory of the leap of a fish is explained in the *Locomotion of Fishes*, (C. M. Breder, Jr., 1926, 4 N. Y. Zoological Society, No. 5) where it is said:

“The leaping of fishes may be considered simply as a rapid swimming up through the surface of the water, momentum alone carrying the fish forward after the tail has left the water entirely. In leaping, the passing into air, a less dense medium, comparatively accelerates the speed and makes possible leaps that otherwise would appear too great for what seems to be a slight effort. The active propulsion is obtained in water, a dense medium, with its patent advantages of comparative solidity whilst the glide produced by momentum is in a light medium which has comparatively little resistance. The course the fish takes after leaving the surface is dependent on the manner in which the body is held and is modified by external forces, such as wind velocity and the angle of its direction to the fish.

“If the body is held rigidly in a straight line the path will be straight, barring external factors. If the body be flexed, the fish follows the curve and falls to the concave side. *Salmo* and *Tarpon* usually show this. The final stroke before leaving the water is often of great amplitude in those fishes and sends them upward in a great curving path.”

The tarpon is a most prodigious and consistent jumper. It throws itself into the air by the aid of its caudal fin assisted by a powerful sweep of its lithe and muscular body. Its clean

and athletic form is well adapted for high jumping. Cool observers have estimated the leaps at from twelve to fifteen or even eighteen feet vertically and thirty feet horizontally. I have observed a fish make a horizontal leap of about twenty-two feet. Sometimes it will go into the air ten or twelve times, dependent upon the way the angler plays it or the depth of the water, but so many successive jumps are rare. When a strain is applied it will frequently leap and while in the air shake itself violently to dislodge the hook. It falls back into the water just as it happens, and whether free or line bound it makes no particular effort to make a clean dive. Males are more active than the females as they are usually lighter and more lithe. The tarpon has been known to jump upon a man sitting in a chair on the deck of a steamboat. One knocked a negro guide out of a boat at the mouth of the Brazos River. The man was stunned and drowned. In Galveston Bay a tarpon leaped and broke a boatman's neck. At Avery's Island, La., a man fishing in a skiff was hit and died from his injuries. "Net fisherman dread to see him in their nets for they have known of men being injured by their attempts to leap out" (Stearns). Many people have suffered injuries from its wonderful leaps. One must have the experience of welcoming an active and vigorous tarpon into a small boat to obtain a just appreciation of its liveliness and strength. A fair-sized fish will scale six feet in length and if it jumps straight out of the water so that its tail is six feet above it, its snout will be twelve feet in the air. Such a jump will be frequently observed. But to say that a tarpon can leap clear of the water for twelve feet is another matter. A vertical jump of ten or at most twelve feet would seem to be the limit, but it is destructive to one's judgment to see a mass of molten silver suddenly shoot from an azure sea with a great flurry of water and project itself into the air to a towering height close to the boat. One's estimate of such a performance is apt to be distorted and untrustworthy.

One night in June 1936, I was enjoying excellent fishing at Boca Grande Pass. The time was ten o'clock. The water was smooth, the mosquitoes were absent and since sunrise I had taken four tarpon. All was well and the goose hung high. The lights of the thirty-odd guide boats resembled a distant village; but the quiet of the evening was vexed by the shouts of the excited anglers, the splashes of the jumping fish and the roar of the motor boats as they changed positions. Long experience had accustomed me to such sounds and scenes so common in May and June at this paradise for tarpon anglers. But unexpected events were in train. The guide stood near the engine ready for a strike whilst I, rod in hand, sat serenely in the stern chair awaiting what fortune might bring. A boat close by struck a tarpon which jumped near our boat; but that was too common an occurrence to arouse our interest. Suddenly an apparition shot out of the deep. It was my first impression that it was a veritable "Jabberwock with eyes of flame"; but it turned out to be nothing but a seventy-pound tarpon. It struck me on the shoulder and passing close to my head dived to the floor of the boat between my chair and the rail, a measured distance of only thirteen inches. Its next move was to break the watch on my wrist and to smash the searchlight on the chair in front of me. The boat carried a large fire extinguisher securely lashed to the shaft of the steering wheel. The fish broke this loose and tipped it over. The extinguisher, although taken by surprise, promptly went into action, thereby adding to our troubles. The tarpon then flapped its way forward, looking, as my guide afterward asserted, for some Budweiser beer which we carried in the bow. The boat was splattered with blood, scales, slime and feces. The noise made by the flopping, jumping fish and the commotion in our boat excited the mirth of everyone nearby but we could not bring ourselves to share their point of view. Finally, my guide, after wrestling with the fish awhile, threw it overboard, still fast to the hook of the angler who had struck it.

I naturally concluded that such an experience was not likely to recur for although many tarpon had hit the boat in the past, none had ventured to remain.

The next night I fared forth and after catching one fish, struck another. The guide promptly started the boat but the fish ran with it and leaped toward the boat. The first intimation I had of this was when it struck the starboard rail and slapped me across the back precisely as the other had done the previous night. Crossing over the stern within a foot or so of my face, it hit my reel and jammed my right hand against the rod, injuring one of my fingers. It then struck the other rail a resounding blow and vanished into the darkness. All this happened in an instant. An aching shoulder, some slime on my reel, a bruised finger and the blood on my shirt were all that remained to remind me of the visitation. On successive nights a fair-sized tarpon passed within a foot or so of my head and one fish, at least, was still attached to the angler's line. Surely the Patron Saint of all fishermen was kind to me on these occasions.

It is difficult to understand why serious accidents have not befallen anglers from such occurrences for they happen several times each season. The leaping fish, vibrant with energy, and traveling with great speed across or into a boat could strike a savage blow. The result might be fatal if one leaping high landed on a person. Then, too, the thin steel leader, five or six feet long, would cut like a knife. Yet I never heard of a serious accident at these Passes although at times forty or fifty boats enjoy good fishing in close proximity and frequently at night when the vision may be poor.

In the daytime an angler can often protect himself against this ever-present danger; but on a dark night he is quite helpless. Usually one can guard against an injury from his own fish. The imminent risk arises from the leaps of a fish on the hook of a brother angler. A cabin boat is safer than an open low-riding craft. When I sadly departed from the Pass that

last evening, I recalled C. F. Holder's remarks on the dangers incident to this sport. In his "*Big Game at Sea*," he says:

"The angler is always taking a chance. I have seen a tarpon wreck a boat hurling chairs, tackle, oars into the air. Tarpon fishing is without doubt the most sensational and exciting of sports and one of the most dangerous when persistently followed. Between tiger hunting and tarpon fishing as a steady occupation, the former might be chosen as the safer pastime."

I was in a mood to believe almost thirty per cent of these statements.

A few years ago, my attention was called to a footnote in Dr. Breder's paper on the "Locomotion of Fishes," reading as follows:

"*Tarpon atlanticus* possess a long wisp at the posterior margin of the dorsal. This is concave below and tapers to a slim point. Mr. L. L. Mowbray ascribes a special and definite function to this with reference to the famed leaping habits of the species. Preparatory to making a leap, according to Mowbray, the tarpon lashes this whip around to one side of the body and clamps it tight to its side. Here it adheres because of suction as the grooved piece lifts slightly from the body at its center. The dorsal is thus held rigidly to one side so aiding in determining the course. Even in a dead fish the adhesion is considerable when the ray is applied in the manner described. The turn is made toward the side to which the ray is adhering."

In Breder's "Field Book of Marine Fishes of the Atlantic Coast," (Putnam's 1929) which should be in the kit of every salt water angler, the author says:

"The produced last dorsal ray functions in the tremendous leaps that the tarpon is famed for. It is concave below and adheres to the side of the fish, bending and secur-

ing the dorsal to the right or left so determining the direction of the fall.”

Ever since I heard that anyone entertained the belief that the jump of a tarpon was influenced by the action of the prolonged dorsal filament, I have watched many fish leap so as to verify this conclusion. When a free fish is pursued by a shark it sometimes jumps. A portion of its body is exposed while rolling and infrequently it clears the water when not pursued. When on the hook five or six jumps are commonly observed and eight or nine are not uncommon. Whether free or on the line it is most erratic in its jumping and falls back with a splash, apparently heedless of the part of its body which will first strike the water, and it does so in a most awkward fashion—not at all like a kingfish, whose jumps are calculated and clean. When in the air, ordinarily but not always, the body of the fish is bent in convulsive struggles. There is nothing in the anatomical or muscular structure of the tarpon that lends color to the theory that the fish controls its jumps by manipulating its dorsal fin by the use of the ray and after observing hundreds of fish I am satisfied that this is not the case. I bring this interesting theory to the attention of keen-eyed guides and fellow anglers for more extended observation.

The tarpon leaps from fear, if a fish can be said to have fear, to escape an enemy, to throw off remoras, and also for pure enjoyment. It will habitually come to the surface and blow and roll, as the phrase is, without attempting a leap. When in this mood it is usually hard to induce it to take the bait. It leaps to avoid the shark—its ancient enemy since the Mesozoic. It steals or dashes upon schools of mullet and other small fish, usually seizing them by the tail (Gill). It will follow these schools up fresh water rivers and along shallow places near shore. Dr. Townsend reports that the captive tarpon in the N. Y. Aquarium took the fish fed them “with a sidewise snap.” Its hard month is well adapted to feed on crabs which in season is a favorite bait.

The indiscriminate capture of the mullet, by net fishermen all along its range in the semi-tropic seas, may have a serious effect upon its future welfare and numbers. Many other fish love to feed upon the mullet and their netting during the spawning season should be regulated both in the interest of sport and also to conserve the rapidly decreasing schools of mullet, a very important food fish for the South.

For many years I have tried to observe a tarpon feed upon various kinds of food so that I might determine how it takes the bait. In 1928, a five-foot tarpon was secured by the New York Aquarium, which was captured off Sandy Hook by net fishermen. Dr. Townsend kindly advised me of its acquisition and promised to let me know when the fish began to feed for it was injured before it reached the Aquarium. Here was a chance to try the tarpon on live bait of various kinds so as to observe how the fish takes its food and other interesting facts. But the fates were unkind and one day I received the following note from the Doctor:

“Dear Mr. Babcock:

July 26, 1928

We regret to announce the death of *Tarpon atlanticus* who passed away this morning refusing the consolation of nourishment. ‘Requiescat in pace’.

Yours regretfully,

C. H. Townsend.”

One thing is certain. A tarpon takes the bait in a variety of ways. Sometimes it strikes it hard and again only by a movement which when transmitted over the rod and line resembles the strike of a small fish like a bass. It may hit the hook on the shank brushing it aside, or the hook may be so taken that it lies flat in the fish's mouth after the strike and the angler in striking back pulls it out without its engaging. Frequently the fish misses the hook entirely and strikes the leader.

In still fishing with cut bait, the fish usually picks up the bait and carries it for quite a distance before gorging it. I am satisfied that many fish escape without the slightest fault on the part of the angler. When the fish are voracious, they are easy to hook; but every angler of experience has fished at a time when the tarpon were feeding so delicately that it was almost impossible to hook them.

After long experimentation, a naturalist discovered many years ago that when a fish is not sharp set, it first noses and smells the bait, taking it, if at all, only in a languid fashion; but when ravenous, it bolts its food. This may serve to explain the difference in the vigor of a tarpon's strike, which every angler has experienced.

It would be very interesting if one could watch a feeding tarpon when the water is clear and observe its action on different kinds of bait. I hope that such an experience will be reported for the benefit of tarpon anglers.

The large ones at least are not edible. According to Schromburgk (1848), they are considered delicate eating in the Barbados. Mr. W. H. Barrall writing in 1874 to *Forest and Stream* said they are very palatable. Dimock cured and dried the meat and speaks very enthusiastically of the fishballs his guide made from it. Several years ago tarpon were sold in the public markets at New Bedford, Mass., but the people did not like them owing to the toughness of the flesh. They are eaten in the West Indies and are sold in the Havana fish markets under the name of Sabalo. The Mexicans salt and eat them. Dr. Jordan is my authority for the statement that people who relish raw fish meat like the Hawaiians and Japanese, prefer the meat of the *Elopidae* to a more close fibered and tender fish. The very small fish *may* be good; but the old ones are unpalatable and coarse. The *Megalops cyprinoides* of the Indian Ocean is kept in fresh water tanks for consumption by the natives and is highly relished. Mr. T. Saville Kent in an article

in *Badminton Magazine* (1895) describing the so-called Ox Eye herring around Australia says it is there considered most excellent eating.

In a very interesting and early article entitled "Tarpon Fishing in the Gulf of Mexico," written by Thomas C. Felton in *Outing* (1887), he says:

"The tarpon is, when freshly caught, of good quality upon the table. He may be served in any of the following manners: fried in steaks, boiled with butter and egg sauce like halibut or cod, or baked with stuffing and brown sauce."

But it will be observed that the author refrains from stating that he ever tried to eat the fish in any style. I have had this experience.

Aside from the angler the adult tarpon has no enemy worth considering save the sharks with which it has occupied the same waters for thousands of years. This indicates that it is very difficult for a shark to kill a tarpon in normal condition. Every angler of experience has observed a shark attack a tarpon while it is struggling against the angler's efforts to capture it. Even if the tarpon is tired and somewhat logy from its exertions it will usually outrun the shark if given a free line. It, therefore, seems clear that sharks do not destroy many healthy and vigorous fish.

Dr. Gaines informed me in June 1936 that he was advised porpoise would devour tarpon and that several persons had seen this occur at the basin at Tampa, where he keeps his motor boat. I asked Mr. W. J. Leiman, of Tampa, to verify this fact. He wrote me June 11, 1936, in part as follows:

"On May 31, between 4 and 5 P. M. and also on June 5 during the same hours, no less than eight people, all of whom are familiar with both porpoise and tarpon, saw the porpoise knock several tarpon out of the water and catch them."

These fish weighed about fifteen pounds. I express my thanks to Mr. Leiman who made a careful investigation and I do not doubt the accuracy of his report.

In October and November, 1916, many thousands of dead fish of all kinds were cast ashore on the West Coast of Florida between Boca Grande and Marco. It was estimated by Government observers that these fish would have been sufficient to supply for a year the entire State of Florida. Among them were many tarpon. The Government made a careful investigation as to what caused this mortality and the results were published in the Bureau of Fisheries Document No. 848 under the title "Mortality of Fishes on the West Coast of Florida." Mr. Harden F. Taylor, the investigator, was unable to reach any definite conclusion. Such catastrophes are not unusual. In 1894, millions of tile fish were killed by a sudden change in the temperature and the dead fish covered an area of about 7,500 square miles of water. It was estimated that about one billion fish perished.

In his "*Florida Wild Life*", Charles Torrey Simpson cites another striking instance of the destruction of fish life following a marked change in temperature:

"After the great freeze of January 18, 1886, billions (?) of fish of a great number of species were washed up on the shores of the West Coast of the State and all bays and rivers were covered with them. Immediately after the cold I went out on the Coast in a sailboat, and returning to the mouth of the Manatee River at nightfall undertook to row a skiff home but the entire surface of the water was literally packed solid with dead fish. It became impossible to dip the oars in the water, they simply skidded over the fish and finally I had to paddle but I made such slow progress that I only reached home along towards morning, a distance of perhaps three miles from my starting point. During hurricanes vast numbers of fish are driven close in to shore and the sand is

so disturbed that it gets into their gills, finally choking them to death. After such storms I have wandered for miles along the beaches on which these poor dead fish were actually piled in places.”

A slight change in the balance of nature works havoc among fish precisely as it does among birds. It is, after all, catastrophic changes in natural conditions that have caused the destruction of many species formerly inhabiting the earth.

As a rule fish having exposed gills die very quickly when taken from the water, whereas those like the cat fish or sharks can survive for some time. They die because the filaments of the external gill openings dry up, stick together and are prevented from functioning. (Norman.)

If you wish to keep a tarpon alive for a short time for any purpose, you can accomplish this by wrapping a wet bag or cloth around its gills and applying water freely to keep the wrapping well soaked.

In the last edition I stated that for some time past I had been trying to ascertain the age of the tarpon. Since then (1930) but little progress has been made.

The age of many fish like the cod, hake or salmon can be determined, at least approximately, by an inspection of the scales. If a scale from one of these fish is examined, it will be found to be composed of numerous concentric rings, the distance between which varies in a definite manner. As Dr. Nichols expressed it in a letter to me:

“A fish scale grows from the center to the margins by addition of concentric rings. If the growth is periodically accelerated and retarded, examination of sufficient material of that species enables one to recognize such periods of acceleration and retardation and to count them. In high latitudes they correspond to recurring winter seasons—therefore to the age of the fish in years. It will be a question whether in any tropical fish like the tarpon such annual circles would exist.”

There are stones in the ears of most fish which are called otoliths. Their function is not well understood. They show concentric rings which confirm the age indicated by the scales. I have examined those of the tarpon but they did not throw any light on the problem.

The annual growing period of a scale is represented by evenly spaced rings while the narrow compressed and broken rings indicate the cessation of the growth in the winter. Each group of growths represents a year of the fish's life and its age can be determined by counting the number thus shown.

All this sounds very simple but when this theory is applied to the tarpon, many difficulties arise to confuse the observer. In the first place there is possibly a checking of the growth during the spawning season and the rings may also indicate the cessation of growth due to that condition. The tarpon is a warm water fish, living in the midst of plenty. It has not been observed to hibernate and may grow steadily throughout the year. If there is any cessation of growth during the spawning period, the rings do not appear to reflect it. A few years ago, I collected a series of ten scales from fifteen fish which were labelled with the length, weight and sex as each fish was caught. I sent sets of these scales to five noted ichthyologists with the request that they determine the ages of the fish from the samples so taken. In due time I received the reports but none of them checked; on the contrary, they widely differed. The letter from the Federal Government expert is quoted to show the difficulty which confronts the student:

“The tarpon scales sent in by Mr. Babcock have been studied carefully. While the scale of this species appears rather promising as a means of determining age, considerable data, scales from many fish, and careful study, are required to arrive at results in any way near correct. According to my judgment the scales at hand were analyzed as follows:

WEIGHT	LENGTH	SEX	CAPTURED	LOCALITY	POSSIBLE AGE	
32 lbs		—	7/ 2/24	Florida	8	years
— “	4'-6"	—	7/—/24	“	9 or 10	“
70 “		Female	6/—/24	“	12	“
102 “	—	“	6/21/24	“	13 or 14	“
103 “		“	6/20/24	“	14	“
127 “		Female	6/30/24	“	16	“

“It appears that the scale of each species of fish must be given individual study in order to determine the correct characters that will aid in showing the age. The cod, the pollock and the haddock scale, although of the same type, have their peculiarities. Because of the great abundance of these species, the wide range in sizes, their commercial value, certain well known factors of their life histories and the fact that the scales are of a type that shows annual growth rather clearly, these 3 species are quite satisfactory to work with. Other species like the herring are more difficult while with the shad we have been able to make scarcely any headway in determining age beyond the first year.

“No doubt there are many species of fish whose scales will show the age satisfactorily after a reasonable study, but as yet this method—age determination by scales—is in its infancy and comparatively few species have been tried out.

“The tarpon comes in that group of fish whose scales have received but little attention. It might be thought that because of its large size the tarpon scale is simple to study, but registration of the growth rather than size of the scale is the important factor in determining age.

“About three-fourths of the tarpon scale is composed of concentric rings while the remainder, the exposed portion, is marked with radii. The important part of the scale is usually the rings, in this case the incompleting rings. The inner part of the scales at hand contain many rings close

together but the lines of demarkation between widely spaced (relatively) and closely spaced rings is so indefinite that annual growth for the first few years is more of a guess than a positive determination. Working out toward the periphery, after what appears to be the 6th year, well defined lines can be seen which may be both annuli and spawning marks.

“Although the scales of most species show a marked difference in growth as between winter and summer, we cannot be positive that each well defined crowded area of rings on the tarpon scale marks a year of growth. It is possible that the closely situated rings, denoting slow growth, may form at no definite season of the year or more than one such mark may occur during the course of a single year. These are factors that can be determined only by the study of a large amount of data and scale material, especially of the smaller fish.

“Because of the uncertainty due to the meager knowledge of tarpon scale reading, the ages given in this report must be accepted as tentative.”

I am advised that the determination of age by the structure of the scales has not been established in the case of any warm water non-hibernating fish.

J. R. Norman, the Assistant Keeper, Department of Zoology (Fishes), of the British Museum, the author of that interesting book, “*A History of Fishes*”, wrote me in part as follows:

“I know of no reliable work on the scales of tropical fishes, and personally view with suspicion any attempt to determine the age of these fishes from their scales. In the case of *Salmonidae*, the scale reading has been checked by marking experiments and its value has been proved up to the hilt, but I am quite certain that the method cannot be applied indiscriminately to all fishes. Unless feeding slows down in winter as in the salmon there would be no ‘check’ in the growth of the scale, and, if such a

'check' was shown as a 'zone', how are we to be certain that this is an annual one.'"

It is not necessary to weary the reader with a recital of the investigations which I have undertaken to determine the age of the tarpon for they have led to no definite conclusions. I have examined hundreds of scales taken from fish from three inches to six feet long but after the most patient study with the aid of microscopes, I have been forced to conclude that the problem is insoluble so far as I am concerned.

The growth of a fish depends largely upon its range and food supply. A black bass or trout confined in narrow quarters without a natural and ample supply of food will never develop into a large fish. The large mouth black bass is one of the most widely distributed fish in the Eastern United States. In its northern habitat it rarely gains a weight of over eight pounds, while in Florida where food is abundant and the water warm, the same species reaches a weight of twenty pounds.

The Bureau of Fisheries, at Washington, furnishes this interesting information which no doubt accurately states the facts relating to the age and growth of fishes.

"The question is frequently asked whether it is possible to tell the age of a fish from its length or weight. The question of the age of fishes is of great interest to the fishery expert as bearing on the problem of the conservation and maintenance of supply of commercial fishes. The angler is also frequently interested in knowing the age of the fish which he captures, especially if it is a specimen of unusual size. The question of the age of fishes is quite complicated and an extensive study of each particular species is required for its solution. Leaving out technical details, an attempt is made in the following notes to state the problem from the layman's point of view.

There is very wide variation in the size of fishes of the same age. In addition to variation among individuals of

the same lot, living under approximately the same conditions, the size of fishes is very markedly influenced by a number of factors, the most important of which are temperature and food supply.

The effect of temperature on the growth of fishes is very marked. In the winter fishes usually grow very slowly. As the temperature rises their digestive capacity is increased, they eat more and grow faster. This difference is not only seasonal but is also influenced by latitude. The black bass, for instance, grows more rapidly in southern waters, because of the higher temperature and the longer growing season. It is, therefore, possible for individual fishes of the same age and coming from different bodies of water of varying temperature to differ greatly in size. In considering the effect of an increase of temperature on the growth of fishes, it is to be remembered that there is an optimum temperature, that is, a temperature at which they grow best. If the temperature is raised beyond the optimum point growth will, apparently, be retarded. Moreover the optimum temperature varies with the species. For example, trout thrive best in water of a moderate temperature, and are not able to exist permanently in too warm water. It may confidently be expected that such species which thrive best in the cooler waters will be retarded in their growth when living in a body of water having a temperature somewhat higher than the optimum.

The abundance or scarcity of food supply in a body of water is perhaps even of greater effect than temperature in determining the growth of fishes. The young of fishes usually feed on the minute free-swimming organisms, known as plankton, which are present in the water. The larger fishes live on the smaller species and other aquatic organisms, which, in their turn, are dependent on the plankton. Since the supply of plankton varies greatly in

different bodies of water—this phenomenon being akin to the varying fertility of different soils—the growth of fishes will vary with it. Fishes living in waters having a rich food supply will grow very rapidly, while those living in barren waters will be stunted; and all intermediate conditions may be found in nature. For this reason it is frequently found that fishes living in one body of water may be double, or even treble the size of other individuals of the same age, but living in another body of water.

The rate of growth also varies with age. In general, growth is comparatively more rapid in the young. As the fish grows older the rate of growth slows up considerably, and in older fish, the difference in size due to a difference of one year in age is usually comparatively small. Consequently as a fish grows older, the size as a criterion of age becomes increasingly more difficult of application.

From the foregoing discussion it may be summarized that it is impossible to state a definite size for a fish of any given age. The best that may be done is to give the maximum, the minimum and the mean or average size, and even these figures will vary greatly with the locality and the body of water. Consequently, it is not possible to state definitely the age of a fish when the length or weight are given. The age is usually determined by an extensive study of the scales, otoliths, or other parts of the skeleton.”

The tarpon lives in the midst of plenty and in warm waters. It is an active and exceedingly speedy fish, well adapted to capture any fish it may desire to feed upon.

The female tarpon usually captured on the West Coast of Florida likely reach a weight of at least sixty or seventy pounds by the third year and probably breed the third or fourth year as Gill suggests. After the fish reaches maturity, it increases in length and weight much more slowly, which seems to be the law governing the growth of all fishes. Finally, it dies

of old age or becomes so decrepit that a wandering shark runs it down. After a consideration of the size reached by other species, I see no good reason why it may not attain a weight of at least 300 pounds, provided it evades the sharks and finds itself in an environment favorable to its greatest development.

After a study of the rate of growth of other species, I am of the opinion that a female tarpon reaches twelve or fourteen inches the first year, twenty or twenty-five inches additional the second year, and at least fifty or sixty inches in total length the third year. But this is little better than a guess. I refer to the growth of the female as the males are smaller.

When the tarpon leaps the angler may observe it dislodge a slender fish. This is the interesting remora or sucking fish which has a disc upon the top of its head by which it adheres to its host. The tarpon probably leaps even when free of the hook in order to rid itself of this parasite. If the angler will look sharp when his fish is being released he may see a small remora four or five inches clinging to it. If he tries to capture the remora with a hand net it will disappear instantly, but when the tarpon is turned over the remora usually will be found attached to the other flank. They change their position with great rapidity. Those which I have observed range from 4" to 14" in length. They use the host as a conveyance. A large remora was so firmly attached to its host that it supported a pail of water weighing 24.25 pounds when tested in the New York Aquarium. They are used by the natives in the East to capture fish and turtles. A string is attached to the remora's body near the tail, and the remora permitted to swim till it follows its habit and attaches itself to some other fish, which is then pulled in and captured. These remoras detach themselves when the tarpon is pulled out of the water. I am informed they are not found on the fish in fresh water.

Occasionally you will find one or more sea-lice adhering to the fish which are somewhat difficult to detach. They are about $\frac{1}{2}$ " in diameter and of a dull whitish hue. I sent one to the

United States National Museum at Washington for examination. It was identified as the *Nerocila acuminata*. Sawfish, porgies and some other fish are also infested with the same parasite. They are rarely found on the tarpon caught at Boca Grande in the Spring and Summer months. It has been suggested that this fish seeks fresh water to rid itself of this parasite. The sea-louse has not been reported from fresh water but it does occur in brackish waters. (Dr. Holl.)

Some fish are fast while others are slow. They swim against backgrounds of many different formations. Some inhabit grasses or coral formations. They live over sandy, stony, gravel and muddy bottoms and in waters of many colors. Nature has cunningly devised protective colorations, markings and forms to protect them from the keen-eyed birds above the waters and the enemies with which they are associated in their own element. Bars, stripes, spots and blotches all serve to give them immunity. Highly colored fish when seen in an aquarium appear conspicuous but even vivid colors do not make them conspicuous in their natural habitat.

Norman in his "History of Fishes," says:

"Fishes habitually swimming at or near the surface, such as the Herring, Blue Shark, Mackerel, or Tunny, are colored silvery or white on the belly and sides, and the back parts are dark green, black or steely blue, sometimes ornamented with black spots or streaks, but as a rule more or less uniform. The water in the sea being generally bluer and clearer than that of rivers, the olivaceous hues of the fresh-water fishes give place to these metallic shades, and seen from above against a background of dark water, or from below against a light sky, the fish is inconspicuous to its enemies whether they be birds or other fishes. Larval fishes, swimming for the most part at or near the surface obtain similar protection by the absence of pigments being either transparent and colorless or with the head and body covered with minute black dots some-

times locally aggregated to form larger masses, whose purpose is to break up the outline of the moving body."

The tarpon is a good example. Its back has the metallic hues and its belly and sides are light colored although its great speed probably affords adequate protection save when the fish is resting on the bottom or not in motion. When the human eye rests upon the larval fish no doubt it will be seen to conform to Mr. Norman's statement respecting the coloration of very young fish. The tarpon, no doubt, has flourished since an early day not only because of its speed but also by reason of its protective coloration.

On May 20, 1936, Mrs. John L. Kuser, of Titusville, N. J., caught an albino tarpon at Boca Grande Pass. I saw the fish later that month after it had been prepared for mounting and its colors had partly faded. When first caught it was described, as follows: Instead of being blue on top, it was gold with four or five dark scales. The belly was coral pink and its fins and mouth were lemon yellow. The eyes were much lighter than an ordinary tarpon's eyes and of a pinkish cast. The tail was of a whitish shade and almost transparent.

Norman says: "It is probable that a number of such cases occur in a natural state; but the fish are at such a great disadvantage in the struggle for existence, being visible to their enemies against almost any background, that comparatively few of them survive to reach maturity." I have inspected thousands of tarpon but I have seen only one albino.

Last year (1935) I carefully measured two tarpon with the following result:

	No. 1.	No. 2.
Total length	6' 4"	6' 2"
Girth	34½"	36½"
Length to caudal fin	66½"	62"
" of head	16"	15½"
" of snout	6"	

	No. 1.	No. 2.
Horizontal diameter of eye	2"	2"
To origin of dorsal	36"	35½"
“ “ “ anal	46½"	46"
Base of dorsal	6"	5"
“ “ anal	11"	13"
Depth of body	15"	14½"
Depth of caudal peduncle	5"	4.75"
Weight by scale	120 lbs.	125 lbs.
Weight by formula	114 "	123 "

In No. 1 specimen the length was 6' 4" measured in a straight line from the lower jaw to the tip of the caudal fin. It was 6' 5½" following the contour of the body. The scales may not have been quite accurate and the weight included the rope by which the fish was suspended. The matured eggs in a female's body will increase the normal weight from about three to five pounds.

A six-foot fish of normal conformation will have a girth of about 32-33". It will scale from 95 to 105 pounds. You can estimate its weight quite closely if you get the length. A simple way to obtain this dimension is to lay off a distance of six feet along both rails of the boat near the stern. If the guide will hold your fish on top of the water opposite the scale for a moment before it is released, its length can be approximately estimated. If the boat rides too high to do this comfortably, mark off a similar distance on a harpoon or lance shaft and use it as a measuring stick. I wish to emphasize the fact that I am speaking of normal fish. I have carefully weighed several tarpon of about six feet in length and had them vary as much as fifteen pounds.

If you will refer to the above measurements, you will note that fish No. 1 had a length of 6' 4" and No. 2 6' 2". The shorter tarpon was 2" larger in girth and the heavier fish. If the latter fish had a measured girth of one and one-half inches more (38"), it would doubtless have weighed over 130 pounds. The girth is the determining factor and tarpon differ quite widely

in this respect. If you are fortunate enough to land a fish six feet six, or over, tie it up and bring it to the scales. You may be high rod for some time.

CHAPTER II.

THE HISTORY OF ITS CAPTURE BY ROD AND REEL

“*As no man is born an artist, so no man is born an angler*”

ISAAC WALTON TO THE READER

CAPTAIN WILLIAM DAMPIER, the English buccaneer, has written of his exploits as a sacker of towns and ships and as an explorer. He had as keen an eye for natural history as he had for prizes and loot. His travels read like a romance. In the course of his journeys to the Bay of Campeche, just west of Yucatan (1675), he gave a description of tarpon fishing which is one of the first recorded. It deserves inclusion here. He is describing conditions near the Bay:

“A little to the East of the River is a Fish-Range and a small Indian Hutt or two within the Woods; where the Indian Fishers who are subject to the Spaniards lye in the Fishing-Seasons, their Habitations and Families being further up in the Country. Here are Poles to hang their nets on and Barbacues to dry their fish. When they go off to Sea they fish with Hook and Line about four or five Leagues from the shore for Snappers and Gropers which I have already described in my Voyage around the World.

“Since the Privateers and Logwood-ships have sailed this way these Fisher-men are very shy, having been often *snapp'd* by them. So that now when they are out at Sea, if they see a Sail they presently sink their Canoas even with the edge of the Water; for the Canoas when they are full of water will sink no lower and they themselves lye just with their heads above Water till the Ship which they saw is passed by or come nigh. I have seen them under Sail and they have thus vanished on a Sudden. The Fish

which they take near the Shore with their Nets are Snooks, Dog fish and sometimes Tarpoms. The Tarpom is a large scaly Fish shaped much like a Salmon but somewhat flatter. 'Tis of a dull Silver Colour with Scales as big as a Half Crown. A large Tarpom will weigh 25 or 50 Pound. 'Tis good sweet wholesome Meat and the Flesh is solid and firm. In its Belly you shall find two large Scolops of Fat weighing two or three Pound each; I never knew any taken with Hook and Line; but are either with Nets or by striking them with Harpoons at which the Mosquito-Men are very expert. The Nets for this Purpose are made with strong double Twine the meshes five or six inches square. For if they are too small so that the Fish be not entangled therein he presently draws himself a little backward and then springs over the Net; Yet I have seen them taken in a Sain made with small Meshes in this manner. After we had enclosed a great number, whilst the two ends of the net were drawing ashore ten or twelve naked men have followed; when a Fish struck against the net the next Man to it grasped both Net and Fish in his Arms and held all fast till others came to his Assistance. Besides these we had three Men in a Canoa in which they mov'd Side-ways after the Net; and many of the Fish in springing over the Net would fall into the Canoa. And by these means we should take two or three at every draught. These Fish are found plentifully along that shore from Cape Catoch to Trist especially in clear Water near sandy Bays; but no where in muddy or rocky Ground. They are also about Jamaica and all the Coast of the Main; especially near Carthagen."

To this day the San Blas Indians of Panama build corrals of brush into which the tarpon are driven and killed with harpoons.

Thousands of anglers since Dampier's day have felt a sudden strike and been amazed to see a huge silvery fish suddenly

break water and go bounding away with their tackle, while they gazed upon it with envious eyes. But, apparently, its capture by rod and reel was never considered a possibility. It was taken by harpoon or on hand lines precisely as the big shark is now captured.

In an article written in 1876 on the Game Fish of Florida, S. C. Clarke, the noted angler, said:

“The tarpum I have not seen. It also is rare and is described to belong to the mackerel family, growing to the weight of 80 to 100 pounds. A surface fish, very active and strong, with brilliant silvery scales the size of a dollar. It is rarely taken with hook and line, as it generally carries away the tackle, however strong. It goes in schools and leaps from the water when struck, either with hook or spear. The only successful way of killing the tarpum, I am told, is to strike it with a harpoon, to which is attached, by a strong line, a small empty cask; the fish by struggling with this buoy, exhausts itself so that it may be approached in a boat and killed with a lance.”

In an article on fishes written in 1884, it is said:

“Imagine a herring-shaped fish, five or six feet long, with brilliant silvery scales the size of a half a dollar, in schools of a dozen or twenty, leaping from the blue surface of a summer sea. This is all that the angler usually sees of the tarpon. Sometimes one of these glittering, rushing monsters takes the hook. What follows? The line runs out with great speed till it has all left the reel, when it parts at its weakest point, and the fish goes off leaping seaward. When hooked on a handline similar results follow. No man is strong enough to hold a large tarpon unless he is provided with a drag or buoy in the shape of an empty keg attached to the line which may retard or even stop the fish after a while. The tarpon is sometimes taken with a harpoon or seines.”

Just before anglers began to take these fish with a rod and reel that celebrated angler, Dr. James A. Henshall, the authority on black bass, thus described their capture:

“The boat being poled quietly along the fringe of mangrove bushes at the edge of the channels, the man standing in the bow with the grains ready, at length spies a great tarpum some six feet long, like a giant fish of burnished silver, poised motionless in the shade. When within striking distances, he hurls the grains by its long handle with a skillful and dexterous thrust and unerring aim, born of long experience, which strikes home with an enormous thud, when the monster tears away with a tremendous spurt, leaps clear of the surface, and, falling back, makes the water fairly boil and seethe in his desperate efforts to escape. But the barbed grains hold fast, and the long stout line is as tense as a bowstring. The great fish tows the boat around like a cockle-shell until his fierce struggles and grand leaps begin to tell on him, and at length he is towed ashore completely exhausted. Sometimes the boat is capsized or swamped by an unusually large and powerful fish.”

It apparently never entered Dr. Henshall's mind, a cool and experienced angler, that it would be feasible to attempt the capture of a large tarpon with a rod and reel. The methods of capture he described were the same as those employed when Captain William Dampier, the buccaneer, tried his hand off the coast of Yucatan, two hundred and nine years before.

In the issue of the *Forest and Stream* for April 9, 1885, the following item from a local correspondent appeared, bearing the date of April 2, 1885:

“A Mr. Wood of New York took at Punta Rassa last week a tarpon measuring five feet eight inches and weighing sixty-eight pounds; tackle rod and reel.”

In the issue of the 23rd of that month Mr. W. H. Wood stated that his first fish was caught in Tarpon Bay, Fla., on

March 25, 1885. It was 5 feet 9 inches long and weighed 93 pounds. It was taken in 26½ minutes. He caught another the same day in 21½ minutes weighing 81 pounds, which was 5 feet 7 inches long. Mr. John Smith, who at that time was living at Fisherman's Key near Punta Gorda, was his guide. In a letter now in my possession, Mr. Smith states that Mr. Wood's fish was the first one caught by rod and reel. Mr. Wood caught three more near the mouth of the Caloosahatchee River on March 31, 1885. All these fish were taken with rod and reel and for some time it was believed that the record of capturing the first good-sized tarpon by rod and reel was held by Mr. Wood. In May, 1885, Mr. S. C. Clarke wrote to the same journal:

“Mr. Wood's capture is, however, not the first of that kind. A tarpon was killed in the Indian River, East Florida, with rod and reel by S. H. Jones of Philadelphia, some years ago, I think about 1878. This specimen measured over seven feet in length, 32½ inches in circumference at the dorsal fin and weighed 174 pounds. The contest lasted more than three hours and was carried on from a boat which was towed some distance by the fish. I heard of this affair in Florida the year after it happened and got the dimensions of the fish from the boatman who waited on Mr. Jones, who himself gave an account of the capture to an angling friend of mine; so I have no doubt as to the correctness of the story.”

As Mr. Wood's exploit was widely published and Mr. Clarke's communication was disregarded, it apparently was generally believed that the record for the first capture should go to Mr. Wood.

The news crossed the Atlantic and the *London Observer* of August 26, 1886, had this to say:

“Here, at last, there is a rival to the black bass of North America, to the *Siluris glanis* of the Danube, to our own European salmon, and possibly even to the sturgeon, were

that monster capable of taking a hook and holding it in its leechlike sucker of a month. Sportsmen may go to Florida for the tarpon, as they now go to the Arctic Zone for the reindeer, walrus and musk-ox."

In the *Forest and Stream* of January 9, 1890, Dr. Henshall, in the course of an article descriptive of Floridian fishes says:

"The tarpon has achieved notoriety as a game fish within the past five or six years, principally through the writings of Dr. C. J. Kenworthy; and Mr. W. H. Wood has received credit generally of killing the first tarpon of over 100 pounds with rod and reel in March, 1885; but justice compels me to state that the first event of this kind occurred in the winter of 1880-81 when Samuel H. Jones of Philadelphia killed a tarpon of 170 pounds on ordinary heavy striped bass tackle in the Fort Pierce channel of Indian River Inlet on the East Coast of Florida. I was in this locality the winter following this feat and learned the full particulars of this extraordinary performance from Mr. Thomas Paine (son of Judge Paine of Fort Capron), who was Mr. Jones' boatman on the occasion referred to. Afterwards I received a full account of it from a son of Mr. Jones, who was also with him and witnessed the capture of this immense fish with striped bass rod and tackle and trolling spoon for bait. Mr. Jones was two hours in securing the fish. Honor to whom honor is due. Mr. Wood has glory enough in being the champion tarpon slayer of 1885, and he has an enviable record. He was the first to make known through the sporting press how the thing could be done."

Dr. Holder in an early article stated that Mr. Jones took the first tarpon with rod and reel and that it weighed about one hundred and thirty pounds. He says it took over two hours to land it and that Mr. John Weier of New Smyrna was the lucky guide.

Mr. W. H. Gregg in his "Where, When and How to Catch Fish on the East Coast of Florida," published in 1902, gives credit to Mr. Jones and locates the capture at the same place. But he says the capture occurred in the winter of 1884, and that Captain John Gardner was the guide. He says this tarpon was taken on a large Buel spoon; that its length was 7 feet 4 inches, and that it weighed 172½ pounds. It will be observed that these accounts differ in essential particulars and the subject merits further investigation. It may well be that some native fisherman caught a tarpon on rod and reel long before either of these gentlemen.

Soon after Mr. Wood's exploit became known anglers turned their attention to the tarpon and attempted its capture with various kinds of tackle. Mr. Wood took a fish on May 6, 1886, 6 feet 5 inches long and weighing 140 pounds on a 15-thread line and a No. 10 O'Shaughnessy hook rigged onto a three-foot link chain. He used a five-foot bamboo rod and a Silver King reel. Dr. Henshall and Mr. A. W. Dimock very early took tarpon in both brackish and fresh waters with a fly on a heavy fly rod. These fish weighed from ten to forty pounds.

All the sporting periodicals were filled with accounts of tarpon being caught with tackle suited to the individual tastes of the particular angler. Gradually, makers of tackle evolved reels, rods and lines suited to the angling. Fishing began at Texas points and, finally, Tampico became noted for its tarpon fishing. Panama is now coming into its own. In all probability the best place to fish is not yet known. Lower Mexico or Central America may prove to be the Mecca for the lovers of this splendid sport.

It is unnecessary to recount the progress made by anglers during the years between 1884 and the present, save to say, that the indiscriminate slaughter of the fish so that photographs of the catch may be exhibited is rapidly passing away. They were taken on light tackle many years ago; but up to recent times the tackle used by most fishermen has not given the fish a fair chance.

CHAPTER III

RECORD FISH

“And yf the angler take fysshe; surely thenne is there noo man merier than he is in his spyryte.”

DAME JULIANA BERNERS (1696)

IN his delightful book entitled *Fishing and Shooting Sketches*, Grover Cleveland makes a strong argument in favor of the veracity of fishermen and in the course of it while pointing out the handicap under which the fraternity labors, he remarks that “tarpon fishing has added greatly to our responsibilities.” So it has, for no other kind of angling has given currency to so many inaccurate yarns. It is difficult to verify the stories told by anglers of the weight of the fish they catch. Usually scales are remote or inaccessible and the tape has been forgotten or is difficult to apply. When the fish does reach the scales it may have been exposed to the hot sun and a too liberal allowance is made for shrinkage. The rope by which the fish is hung, a few quarts of water inside it, and alleged shortness of weight in the scales all play a part in the recorded result. Then, too, some of the guides practice deception on this party with the kindest motives and make statements about the weight of fish which are very wide of the mark.

Many years ago, we had just landed a fish which I wished to save for examination. While we stood in the surf on the beach, a novice at the game brought in his first tarpon, a sixty pound fish. As his guide pulled it up to the shore and the sun shone upon its argent sides revealing a perfectly formed fish, it was easy to see that the angler was satisfied that his trip to the Pass had not been in vain. When he eagerly inquired its weight his guide squinted at the fish and then turned it over so as to secure an accurate idea of its

size before delivering his decision. Finally he put the weight at one hundred and thirty-seven pounds. But my guide disputed his estimate and said that the fish would not weigh a pound less than one hundred and forty-five. That man today believes that he actually caught a fish of that weight.

Then, too, anglers of a certain type love to rush into print with lurid tales not only of the weight but the difficulties incident to the capture of the fish.

Dimock's book on the tarpon is charmingly written and fine to read to stimulate one's enjoyment of a coming trip; but it is so overdrawn in its statements that it is utterly unreliable. No such tarpon as he portrays ever existed and their acrobatic feats were tricked by the photographer holding the camera near the water and pointing upward at the leaping fish.

I have tried to verify the records here set forth. The sporting journals should refuse to print records till they are verified not only by actual weight on tested scales but also measured in length and girth before competent witnesses. A form of an affidavit suitable for use in establishing a record will be found in the appendix.

The tarpon probably attains a weight of over three hundred pounds and a length of over eight feet. One was captured on a hand line which was said to scale eight feet three inches but this fish was so emaciated that it weighed only 209½ pounds.

Dr. John T. Nichols and Mr. Van Campen Heilner have compiled the records for fish of various species. This compilation is my authority for the statement that the largest tarpon ever caught was netted by fishermen at Hillsboro River Inlet, Florida, on August 6, 1912. Its weight was estimated at 350 pounds. Its length was 8'-2".

The following schedule covers some of the record fish.

- (1) W. A. McLaren at Panuco River, Mexico, March 27, 1911. Length 7'-8"; girth 47 inches; weight 232 lbs.

(Note: length measured from tip of longest fin to end of lower jaw which was *open*)

Tackle: vom Hofe rod and reel and a No. 27 thread line.

This was the world's record up to 1934.

- (2) J. M. Cowden, Midland, Texas. Captured in the Panuco River, Mexico, on March 4, 1934.
Length 7'-6"; girth 3'-10"; weight 242 lbs.
The world's record.
- (3) Dr. Howe, Tampico, Mexico.
Length 6'-8"; weight 223 lbs.?
- (4) N. M. George, at Bahia Honda.
April 8, 1901.
Length 7'-2"; girth 46"; weight 213 lbs.
- (5) Edward vom Hofe, Captiva Pass, Florida.
April 30, 1898.
Length 6'-11"; girth 45"; weight 210 lbs.
- (6) W. L. Dawley, Aransas Pass. 1906.
Length 7'-10½" (not weighed).
- (7) C. W. McCawley, at Aransas Pass.
Length 7'-10"; girth 46" (not weighed).
- (8) Mrs. W. Ashby Jones, West Coast, Florida.
7'-5" long; 43½" girth; weight 210 lbs.
This fish won the Field and Stream First Prize for 1916.
(This seems to be the women's record.)
- (9) P. P. Schutt, Oct. 1, 1916; Caloosahatchee River, near Fort Myers.
Length 7'-5"; girth 47"; weight 205 lbs. seventeen hours after capture.
- (10) Charles J. Iven, Boca Grande Pass, May 15, 1925;
Length 7'; girth 43"; weight 190 lbs.; fish caught on 10 oz. tip with 18-thread line.
- (11) The largest tarpon mounted in the Museum of Natural History in New York has a length of 7'-2½".
- (12) George D. B. Bonbright.
136 lbs. 12 oz. 9'-3" bamboo fly rod.

March 1933 near Long Key, Florida.

Time 1¾ hours.

Lure: The Bonbright fly, described in his article in the August 1933 number of *Field & Stream*.

(This seems to be the record fish caught on a fly.)

(13) A. J. Walser, San Antonio, Texas. (1933.)

135 lbs. on three-six tackle.

Time: 1 hr. 20 min. *Field & Stream*, Nov. 1933.

This is probably the record for this class of tackle.

Mr. Edward Trainer of Germantown, Pa., assisted by two others captured a tarpon in the north fork of the St. Lucie River, Florida, on March 28, 1929, which when weighed scaled 221 pounds. It was 7' long and had a girth of 47". The fish was weighed by Mr. F. C. N. Parke, the taxidermist of Bangor, Maine, *forty-eight hours* after it was captured. It is fair to assume its weight exceeded 230 pounds before it dried out. Mr. Parke kindly verified these facts in a personal letter and as he is entirely competent and reliable, the catch seems to be authentic. The fish was caught on a Wilson spoon. It is not a record because Mr. Trainer was assisted; but it seems to be the largest tarpon ever taken on rod and reel in the United States.

Mr. Cowden's world's record fish was entered in the National Sportsman's Fishing Contest and was authenticated by witnesses, a sworn affidavit and a photograph. The record was accepted by the American Museum of Natural History in New York and was included in *World's Record Fish*, compiled by Messrs. Van Campen Heilner and Ray Schrenkeisen. There seems to be no doubt of the authenticity of the record.

Mr. Cowden writes me under date of August 21, 1936, that it took three hours to land the fish. It was caught in the afternoon and weighed at ten o'clock the next day on the Custom House scales at Tampico. The tarpon then weighed 242 pounds.

Some anglers seem to think it clever to publish exaggerated catches, usually for home consumption. I have not included any so-called records which are not well established.

The loss of a fine fish after a long struggle is disheartening. Let the angler who has this experience console himself by reflecting upon the dire misfortune which befell Mr. L. P. Schutt, the manager of the Casa Marina at Key West, several years ago. Mr. Schutt hooked a fish which he thought was a shark. He worked hard to get it close to the boat so that he could cut it off without losing too much of the new 24-thread line he was using. At the expiration of thirty minutes he brought it close enough to see that he had a tarpon. The sun was setting during the first part of the struggle and darkness soon closed down. After over an hour's hard work the fish was brought up to the boat ready for gaffing, when a shark bit it off just behind the dorsal fin. The head was mounted and measures slightly over nineteen inches from the chin to the extremity of the gills. The piece salvaged weighed 156½ lbs. With the mouth closed, the distance from the chin to the back of the dorsal fin was fifty-eight inches, whereas the McLaren record fish of 232 pounds now mounted at Tampico has a corresponding length of only forty-eight inches. The girth of the portion saved was forty-seven (47) inches. Surely this would have been the American and probably the world record fish had not the shark intervened. So when you lose a fish, solace yourself with the reflection that even harder luck befell Mr. Schutt, for after careful study of the length and measurements of the remaining fragment, his fish may have weighed over 240 pounds. The shark and Mr. Schutt jointly hold this record.

In 1924, at the Boca Grande Pass, I caught a tarpon weighing 76 lbs. on 3-6 tackle, that is to say, a rod weighing six ounces for both tip and butt, measuring six feet in length and a six-thread line. On the same day I captured this fish, Mr. John R. Jack of Punta Gorda caught a tarpon weighing

79 lbs. on a steel fly rod and a six-thread line. Numerous fish have been landed there on bait rods; but I never heard of one being captured before or since on straight 3-6 tackle for the reason anglers are not equipped with it. I lost eighteen fish before catching one and made a general nuisance of myself as the anglers had to move so often out of my way. Mr. L. G. Murphy of Converse, Indiana, in June 1916 landed a tarpon 6'-9 $\frac{3}{4}$ " long on light tackle at Aransas Pass, Texas.

There have been some great catches with rod and reel. On June 6, 1916, at Boca Grande Pass, Mr. Benjamin W. Crowninshield of Boston took 25 tarpon between sunrise and sunset, which I believe is the world's record for large tarpon.

In 1928, Mr. James Jordan of Miami, landed a tarpon weighing 13 lbs. 7 oz., 36 $\frac{1}{4}$ " long with a girth of 17 $\frac{1}{8}$ " on No. 24 thread sewing cotton.

Fish must be weighed on accurate scales to be eligible for record. For instance, Mr. A. C. Yarnall, an experienced angler kindly gave me the information that Mr. John Cutter of New York City, one June years ago, while fishing on the East Coast caught a tarpon weighing 205 $\frac{1}{2}$ lbs., which was 7'-7" long but which had a girth of only 40", yet this slim fish was able to make eleven jumps. The scales must tell the story, not the measurements, for the formula usually goes to pieces when applied to large fish.

NOTE.

The metric system is sometimes used to record the measurements and weights of fish so the following table may be helpful:

Millimeters \times .03937 = inches

Centimeters \times .3937 = "

Decimeter = 3.937 in. = 0.328 feet

Grams \div 28.35 = ounces

Kilograms \times 2.2046 = lbs.

In estimates where extreme accuracy is not required, 25 millimeters are counted as one inch.

CHAPTER IV

TACKLE AND EQUIPMENT

“But you must have all these tacklings, and twice so many more, with which, if you mean to be a Fisher, you must store yourself.”

ISAAC WALTON.

IN VIEW of the fact that the angler can buy high class tackle from many dealers, especially adapted to the capture of the tarpon, it is not necessary to enter into a technical description of the rods, reels, lines and other equipment required for this fishing. Only a few general suggestions seem to be called for. All tackle should be subjected to a moderate test before it is used. This rule applies to all fishing. The angler will find it more satisfactory to provide the necessary tackle before he starts on the trip.

Rods—The Tuna Club of Catalina Island, Cal., has been conducted on a high plane ever since it was founded by the late Charles F. Holder. Its rules and specifications for the various types of rods have exercised a strong influence upon sea-fishing everywhere. It will be observed that three types of rods are recognized. The following specifications govern the standard rod in the heavy tackle class.

“Heavy Tackle—Rod to be of wood or cane, with usual mountings, and shall consist of butt and tip and shall be not shorter than 6 feet 9 inches over all. Tip shall be not less than 5 feet in length and shall weigh not more than 16 ounces. Line shall not exceed standard 24-thread linen line and shall have a maximum breaking strain when dry of not to exceed 66 lbs.”

This tackle is amply heavy to capture any tarpon that swims. A sixteen ounce tip is too heavy even for beginners. A twelve ounce tip is more suitable. The rod should be built of bamboo although bethabara, hickory, greenhart, or lance-

wood, are cheaper and durable. A tarpon caught on heavier tackle than specified by the Tuna Club should be deemed ineligible for record. A line up to 30-36 threads is sometimes used around the trestles on the East Coast or in very cramped quarters, but they should be used only with the heavier tips. Tarpon rods of the heavier grades usually have a double line of opposite guides. The heavy sinker and the resistance of the fish at the end of a long line will give any rod a pronounced set if it is neglected, and the double line of guides enables the angler to turn the tip over and thereby to straighten it while fishing. But the high-grade rod can be kept in good condition by bending it straight after each fish is taken or by hanging it up with a weight attached to the butt. The line sometimes catches in the empty guides and many anglers prefer a single line. Personally, I never found any virtue in the double guides. Unless the rod is equipped with an adequate lock to securely fasten the reel, it should be lashed to the rod so that it cannot become loose and drop off while playing the fish. I have used the Leonard and vom Hofe rods for many years and their reel fasteners have given complete satisfaction. After a few tarpon have been captured I suggest that the angler use a tip of from 10 to 12 ounces and an eighteen-thread line.

The Long Key Fishing Club specified an eighteen-thread line and a tip to weigh not to exceed twelve ounces—a very sensible requirement.

*“Light Tackle—*Rod to be of wood or cane, with usual mountings, and shall consist of butt and tip and shall be not shorter than 6 feet over all. Butt shall not exceed 14 inches in length. Tip shall be not less than 5 feet in length and shall weigh not more than 6 ounces. Line shall not exceed standard 9-thread linen line and shall have a maximum breaking strain, when dry, of not to exceed 26 lbs.”

The Long Key Club specified a 12-thread line and a six ounce tip for this class.

At the Aransas Pass Tarpon Club it is permissible to use a butt eighteen inches in length.

Mr. L. P. Streeter first caught a tarpon (5'-9" long) on this tackle at Aransas Pass on June 25, 1907, and on that evening he organized the Aransas Pass Tarpon Club which adopted the rule that to qualify for membership applicants must catch a tarpon not less than 4'-6" in length on a rod of this character using a 9" thread line. Since that time many fish have been so caught and this tackle is strong enough to capture the ordinary run of tarpon if luck favors a cool and experienced angler and he has plenty of room to play the fish.

The next class is the:—

*“Three-Six Tackle—*Rod to be of wood or cane, with usual mountings, and shall consist of butt and tip (Butt may be of metal), and shall not be shorter than 6 feet over all. Butt to be 12 inches in length. Weight of entire rod shall not exceed 6 ounces. Line shall not exceed standard 6-thread linen line and shall have a maximum breaking strain, when dry, of not to exceed 16 lbs.”

The 6 ounce 6 foot rod and the 6-thread line give this class the name “Three-Six”. The rod should be constructed of bamboo and its workmanship and materials must be of the highest grade. The tip is about 61½" over all, and the butt 12" over all, making the rod when the tip is seated exactly 6 feet in length.

Any one of several different manufacturers put up rods of all classes and kinds which answer every purpose. The beginner should use a reasonably heavy rod and line at the outset until he has gained confidence and has become accustomed to the maneuvers of the fish. Many anglers like to construct or repair their own rods. The reader is referred to Frazer's “The Angler's Workshop” (Forest and Stream Pub. Co. New York) for an interesting and practical textbook. The author

there gives specifications for a home-made tarpon rod and describes clearly how to build, varnish and wind them.

The angler should carry two rods, for accidents frequently happen, usually to the tips, and rods may fail or be injured under the best of care. It is a pleasant occupation to purchase extra tips, fitting the butt and to mount, wrap and varnish them during the winter. The invisible knot is easily learned and Frazer clearly describes how to perform every stage of the process.

The tip-tops on all rods should be entirely of metal. The agate tops are apt to be chipped by the swivel when the line is reeled in and the line is then cut by the fractured parts.

In playing a heavy fish, it will add to your comfort to have a wrapping of heavy cord at the upper hand grasp. A king-fish line or one a little larger is generally used. Women will find this a great aid. This simple expedient will decrease the task of landing a fish at least twenty per cent if your hands are weak or tender. Manufacturers supply a rubber band for this purpose which is efficient, but the line wrapping is better. Your guide will put it on in five minutes. Be sure to remove it before your rod is laid away after your holiday.

Reels—This part of the angler's equipment plays the most important part in the capture of the fish. The reel made by Edward vom Hofe and catalogued as the "Universal Star" is used by many tarpon anglers. The one used with the 24-thread line (No. 6) will hold about 600 feet of line when *wet*, bearing in mind that laid lines then swell. It is built like a watch and costs nearly as much as the remainder of the tackle. It has a light drag upon the left side, and an adjustable drag upon the other. It is so constructed that the handle does not revolve when line is being taken by the fish, thus avoiding injury to the hand from the action of the handle. Its use enables almost anyone to capture a large fish if its mechanism is understood and it is skillfully manipulated. vom Hofe's No. 4, or some other reel of similar size, is suit-

able for use with the lighter lines. I am informed that the Pflueger Atlapac reel is an excellent one and there are several others well adapted to this fishing. Smaller reels are used with lighter lines. The angler should learn the mechanism of his reel so thoroughly that its manipulation becomes a habit. All reels should be fitted with a thumb pad, which in skillful hands, serves the purpose of a drag, if the angler has a muscular thumb. A reel should be sent to its maker and overhauled at frequent intervals. It must be kept well oiled so it will not "freeze".

I have a vom Hofe reel which has given good service for over twenty years and the only attention it has received has been the light repairs made upon it by my guides. But it has been kept well oiled and free from dirt.

Butt Rests—Heavy fish are usually played with the butt of the rod inserted in a leather butt rest secured to the upper side of the angler's revolving chair seat. With light tackle the angler may find it convenient to wear a leather butt rest strapped around the waist. This is carried by all the outfitters. It is also well to equip the butt of the rod with a rubber pad having a flat rim for use when necessity arises. This acts as a fulcrum when the rod is pressed against the body which it protects. The Leonard rod comes equipped with a pad. Dealers supply them to fit any rod.

Lines—Linen lines are either laid (twisted) or braided. The former is the stronger, but it kinks easier than the braided line. A silk line does not stand salt water well, for it rots; but it is stronger than the linen line. The first-class linen tarpon line is guaranteed by dealers to be twisted out of from six or more threads of yarn having a tensile strength of two or three pounds per thread. It is made from a grade of linen yarn known in the trade as No. 50.

The laid line takes its number from the units of threads it contains.

The following schedule explains itself:

NO.	ADAPTED FOR	LENGTH RECOMMENDED
6	Regulation 3-6 tackle.....	900 feet
9	Regulation light tackle.....	900 feet
12-24	General fishing for tarpon.....	600 feet
27-30	Tarpon trolling and fishing in cramped quarters; or where sharks are very bothersome and the fish must be captured as soon as possible. Their use is not recommended. Four hundred (400) feet is amply long.	

A new line should be thoroughly wetted in fresh water, stretched and dried in the shade. This sets the lay of the line, prevents kinking and evens its strength. Holder says that no one was able to capture a heavy tuna till both the reel pad and the line were wetted just before beginning fishing, which prevented the burning of the line through the friction of the pad on the line on long runs of the fish. The line is the most vulnerable part of the tackle. Then comes the leader.

I wrote to several manufacturers of linen lines to ascertain how to care for a linen line after its use in salt water. It was the opinion of one that the line should be rinsed in fresh water each day after use and then dried in a large coil around some article where metal cannot come in contact with it. Another suggested a more elaborate plan. He advised that the line be taken off the reel and rinsed in fresh water. An extra twist should then be put into it by rolling it between the hands whilst the line is wet. It should then be dried out and stretched. The line should not be kept in too dry a place and before it is again used it should be wetted. He concludes by saying:

“The idea of putting an extra twist into the line while it is wet is to get kink into the fibre, for then if it is kept from drying out too much before using it will stay in fairly good condition. Care must be taken not to leave any moisture in the line as it mildews and this rots the line very fast.”

The third manufacturer made no suggestion worth quoting, except to urge the use of a swivel so as to preserve the normal twist in the line.

Mr. F. Gray Griswold, of New York City, is an angler of great experience and ripe judgment. He writes me that a line should never be dried in sun or wind for this induces rot. He never dries his salt water lines during a trip, but simply runs them off the reel after the day's fishing and reels them back again. He waits till he has finished fishing before rinsing and drying his lines, and he says they never break. At the Tuna Club the wet line is reeled off upon a wooden spool after the day's fishing and rereeled the next day.

The line must be kept away from all rusted metal. It is the habit of some anglers to secure the hook to the reel in such a way that the hook or the rusty leader may come in contact with the line when the rod is laid aside. This should never be done, for if the rusty hook or leader is allowed to touch the line the rust will corrode and destroy it. Many good lines unexpectedly fail for this reason. Hulit in his readable "Salt Water Angler" says that the fibre of the line is improved and protected by running the portion constantly in the water through a piece of beeswax before fishing.

Knots—Any knot, no matter how expertly tied, will weaken a line. So beware of knots! If you are using an eighteen-thread line fastened to the swivel on the leader by a poorly tied knot, it may have only the strength of a twelve-thread line properly secured. Few anglers appreciate this fact.

The guides use different kinds of knots to secure the line to the swivel or to close the loop in the double line and each will affirm that his methods are the only proper ones to employ.

A wet line is from 10 to 15 per cent stronger than when dry and it works better on the reel. Therefore, as suggested elsewhere, it is good practice to wet the line by paying it out for about a hundred and fifty feet behind the moving boat on your way to the fishing grounds and then staggering it on the reel

as you retrieve it. Then if a proper fastening is used you will enjoy nearly its full strength. The thumb pad should also be wetted.

Mr. H. Barron made an interesting contribution to the *Field & Stream*, of January 1931, on the weakening effect of knots in lines. He selected an 18 pound Wexford line, which had a breaking test of twenty pounds. The Scott testing machine showed the following results:

	STRENGTH OF KNOT	% OF LOSS OF STRENGTH
Bowline.....	13 lbs.	35%
Jam or slip knot.....	16½ “	17½%
Fisherman's bend.....	17½ “	12½%
Timber hitch.....	17½ “	12½%
Overhand or ordinary knot	16 “	20%
Double overhand with bight	13 “	35%

I requested Mr. W. E. Mather, M. E. of Cleveland, who is experienced in such matters to test an Ashaway Joe Jefferson No. 24-thread line on a line testing machine. A series of tests indicated that the strength of the line was somewhat uneven. A wet line guaranteed up to 72 pounds may test 76 pounds. It may break at slightly less than its guaranteed strength. I give the results in the following table:

Line (wet) tested.....	73 lbs.
Line (dry) “	64 “

	LINE FAILED AT
Leader secured to line by leather thong.....	73 lbs.
“ “ “ “ “ bait casters' knot....	72 “
“ “ “ “ “ bowline	59 “
“ “ “ “ “ anglers' knot (McCarthy)	55 “
“ “ “ “ “ anglers' knot (straight pull).....	50 “
Loop tied by rolling hitch.....	68 “

In another test a wet 24-thread line broke at 64 pounds and when dry at 58 pounds. The same line carrying an over-

hand knot broke at only 32 pounds. It parted at a bowline knot at 33 pounds.

The use of the leather thong did not weaken the line; nor did the bait casters' knot. In these cases the line did not break at the attachments. In the Mather tests the bowline weakened the line about 20% and the two anglers' knots still more. The use of the thong at the swivel is illustrated elsewhere and the bait casters' knot is easily tied, as follows:

Pass the line twice through the swivel ring and then coil the end or running part evenly over the standing part of the line about ten times; tuck the end under a few of the coils and finish off with a few half hitches. Any knot which is used should be retied on fresh line at frequent intervals as it gradually weakens where it is tied.

I call attention to the illustration of the rolling hitch to be employed if the line is doubled for a distance back from the leader. This hitch must be accurately applied to be effective. The end should be neatly served by a winding and the hitch will not slip. Tests indicate that the use of this method does not weaken the line to exceed 5 per cent.

I was advised by the Ashaway Line & Twine Company that

“Blood, fish slime, rust, dirt, weeds and grasses left on the line will ruin it quickly. An extra worthwhile caution is remembering to dry any line in the shade after fishing. This prevents mildew and rot.”

One year I was fishing with a new 24-thread line of approved manufacture. It broke four times during two weeks of service for reasons entirely unrelated to its strength or quality. Twice it chafed off under the keels of boats as the fish ran. Once it was cut by the rocks on the bottom, and once it parted at the knot tied to the swivel on the leader. It is apparent that luck plays a large part in the tackle's efficiency and service. I have had a jumping fish tie an ordinary overhand knot in a steel leader. If it had failed for this reason, it would have been charged with lack of quality.

I have known many tarpon anglers; but only a few of them make it a practice to take good care of their lines, or, for that matter, of any part of their tackle. Let me assume the role of a Polonius for a moment. You should start fishing with a new line. The best is none too good. When the day's fishing is over, detach your leader and place your rod in the shade, first running the wet portion off the reel and rewinding it. Be careful not to fracture the line. When you leave the boat, carry the rod and reel to your room. Never permit the leader or any metal substance to come in contact with your wet line for if you do, a spot of rust is apt to so weaken it that it will fail at the point of contact. When your fishing holiday is at an end, rinse the line in fresh water and dry it in the shade. When the line has been in service for a week or so, reverse it on the reel. You will then have the equivalent of a new line for the chances are the portion originally underneath has never been wet. Inspect your tackle, especially the hook, after each catch. The lighter lines call for more care than those of heavier caliber.

I am sorry I have not followed all this sound advice. I have lost many fish by not heeding these precepts.

Formerly lines tested about two pounds per thread but they are now made to test three pounds when wet. It is important to specify the kind of line used when the catch is authenticated.

I here insert cuts of the rolling hitch and the rawhide cushion.



ROLLING HITCH



THE RAWHIDE CUSHION

A good plan to follow in all heavy sea-fishing is to rig the line on the rod to be used and lift a dead weight from the floor.

It will interest one to perceive how little can be raised. The rod will bend to a dangerous degree in lifting a few pounds, although the 24-thread line will have a tensile strength of over forty-eight pounds. The line may be doubled back from the leader for a distance equal to the length of the leader, and the rolling hitch is the safest way to secure this loop according to the tests. A splice is sometimes used. It is better practice to dispense with the loop and to fasten the line to the swivel by the use of the rawhide as described. It is advisable to take at least two new lines for accident may befall one at any time. Six and nine thread lines should be purchased before the trip for the local dealers may not carry them. Indeed, it is wise to procure all tackle from reliable dealers prior to the trip for the assemblage of your outfit is a pleasant labor. The Ashaway Company has written so entertainingly of its method of fabricating its lines that I will here include it:

“Tramp, tramp, tramp. A walking delegate has nothing on the maker of an Ashaway hand-laid line. 725 feet down and 725 feet back. All day long he walks and every inch of the way his sensitive, trained fingers are testing the linen threads that go into the line that you, perhaps, will use on your vacation. Vacations don't come any too often,—you'll want the best lines that money can buy.

“Twisted linen salt-water lines are made in three parts, for instance four threads (of a 12-thread line) to a strand, three strands to a line.

“Starting at the near end of the walk, the line maker grasps the 12 ends of thread, divided into 3 groups that fall into separate guides. He hikes to the far end of the walk, the threads unreeling from separate spools as he goes. At the far end he attaches a small weight to these strands to give the right tension.

“On the return trip he inspects the threads for flaws of any kind. The instant his fingers, made alert by years of practice, feel an imperfection, he stops. If possible to take out the imperfection without harming the thread he

does so, for any roughness would injure the quality of the line. More than that, it would make the line uneven, causing it to wear at that spot when passing through the guides of your rod.

“If the imperfection is of such a nature that the thread is weakened, the line maker cuts out the weak spot and splices the ends together. If this were not done, your 12-thread line might test to a full 24-pound breaking strength at every inch of the line *except this one place*. Your line might be but a 22-pound test line, for the whole line is no stronger than its weakest point.

“Splicing these fine linen threads by hand is an art requiring the utmost experience and skill. When properly done, as only an expert can do it, tests show that the spliced section is actually stronger than the threads in their original condition. It is this extraordinary skill that enables our line makers to lay hand-made lines of any length—the 500-yard lines such as Zane Grey and others use to catch record fish.

“When he arrives at the starting end again, each of the three strands is cut and attached to a separate power-driven spindle, the power is turned on and they are allowed to twist until the ‘feel’ tells the line maker that they have the right twist to give greatest strength.

“When the three strands are lying side by side, twisted, the line maker fits each into a small wooden holder that he holds in the palm of his hand and again makes the trip. The three strands twist together behind him. Your line is made.

“The line is then put through a tempering or hardening process that welds the three strands of silky flax fibres into a perfect whole, ready for polishing, and a final inspection as it is wound on the spool.”

Leaders—In still fishing some anglers employ a rawhide or moosehide snood, a heavy braided line, or a cod line as a leader. Sharks are usually abundant in this mode of fishing

and as they can bite through such a leader, neither time nor line are lost before they regain their freedom. Then, too, most guides believe that a tarpon will reject the bait on attempting to gorge it, when it feels the metallic leader. The wire leader is generally used in other methods of fishing. It consists of a single strand of wire straightened and tinned.

Five or six feet of single wire made up in two equal sections connected by a swivel with a swivel at the line end would seem to be appropriate for tarpon fishing. The interior swivel serves to prevent the leader from kinking. The guides, however, frown upon the use of the middle swivel connecting the sections of the leader. They may be right. The tackle makers claim to treat the wire with a rust proof process which lengthens its life, but one generally loses or discards leaders before rust can affect their strength. I prefer leaders about five feet in length.

If one cares to make a test it will be apparent that a good leader will sustain many times the maximum weight it will ever be subjected to, provided it is free from kinks.

I once purchased from a well-known dealer some mounted leaders made from so-called special leader wire, and sent them to be tested at the laboratory of the American Steel & Wire Company, at Chicago. I submitted some leaders kinked as they sometimes become in fishing and one with an overhand knot. I also bruised one or two. I set forth the report.

“(1) The micrometer measurement of the wires shows that they average .029 in., corresponding to piano wire of No. 12 gauge. The wire, however, is much inferior to piano wire in tensile strength, and in ability to take bends and twists. We judge it to be rather low grade spring wire.

(2) The small soft wire links which are placed on the end of each wire were found to pull out straight whenever a tension of from 30 to 40 lbs. was put on the assembly.

(3) At tensions ranging from 65 to 110 lbs. the swivels failed.

(4) The eyes in the wire itself broke at tensions ranging from 100 to 110 lbs.

(5) Special attention was paid to the kinks of which you spoke, and it was found that the section of wire in which a kink was made broke at the kink at 10 lbs.

(6) The knotted section which was submitted broke at 98 lbs.

(7) One portion of the wire which had been hammered or flattened slightly broke at 60 lbs. We presume that the flattening was done deliberately, although this point was not mentioned in your letter.

The impression left upon the mind of Mr. Van Harlingen of our staff who conducted all these tests is that the main wire is of an inferior type, and that a No. 12 piano wire would be vastly superior. He also in his report to me expressed his surprise at the flimsy construction of the links and the swivels. With regard to the breaking point of the main wire, we found that whenever we tried to grip this with our machine, we damaged it sufficiently to cause it to fail before any respectable load was put upon it. A piano wire of No. 12 to No. 13 gauge will stand a slow steady pull of anywhere from 200 to 275 lbs."

The so-called links referred to in this report were the ordinary loops at the ends of the leaders.

No doubt these leaders were purchased by the dealer in entire good faith, but I submit it is unfair to anglers engaged in this expensive fishing to sell them untested and inferior goods at a high price. In late years leaders have improved in quality.

Sinkers—The weight and style of the sinker depend upon the waters where the fishing is done. They are usually of the "bank" type weighing about eight ounces. Sometimes a pound of lead is necessary to keep a heavy line down. One

may safely rely upon the guide for instructions on this point and upon the local market to furnish the kind to be used. Sinkers should be tied on with very easily broken twine so that they will be easily snapped off when the fish is struck or when it first jumps.

A few years ago, some inventive genius conceived the idea of boring a hole near the bottom of the bank sinker as well as at the top. As the sinker is now tied at both ends, it no longer snarls with the leader or line when it is lowered. It was a happy thought and is now universally practiced.

Hooks—We now approach the controversial subject of hooks. Good hooks sold by reputable dealers are strong enough to withstand far more severe strains than the tackle to which they are attached. It is the style and size which occasion the controversies. Most anglers prefer Nos. 8/0 to 11/0 hooks for general fishing and the Van Vleck, vom Hofe, Mills, Pflueger, and other tarpon hooks all have their adherents. The O'Shaughnessy type hooks are the favorites. Tarpon hooks are sometimes mounted on a link chain about four or five inches long so as to give the hook free play on the leader, but most anglers prefer to fasten the hook directly to the leader. The point should be frequently inspected and kept sharp by filing, for the mouth of the fish is hard and difficult to penetrate. The same size hooks should be used on light as on standard tackle.

H. P. Wells in his classic book, entitled *Fly Rods and Fly Tackle* gives a very clear description of the old method of making fish hooks, which may be described briefly as follows: A cutter snips off parts of the coil of round steel wire in uniform lengths. A length is placed on an iron block provided with a stop and a workman with a chisel mounted on a handle, hooked against a pin serving as a fulcrum, applies a cutter which buries a proper distance in the wire thus forming a portion of the barb. The wire is then annealed and under one blow of a hammer the portion of the wire below the in-

ipient barb is flattened and then filed away. We now have the barb on the end of the wire which is then bent around a form of the shape the hook is to assume. The hook is then brought to a cherry-red heat and thrown into oil from which it emerges hard and brittle. It is then placed in a kettle filled with sand heated to a proper temperature where it is stirred till the proper temper is reached. These last two steps determine the utility of the product, for if the hardening process proceeds to excess the hook will remain too brittle. If not sufficiently heated, it will be too soft. So, too, in the last process, the precise amount of tempering heat must be supplied. The hooks are then "tumbled" to remove all scale and then lacquered or tinned. Such was the old process simply stated.

The fishing hook center of the world is at Redditch, England, where the art has been practiced for scores of years. The Enterprise Mfg. Company, of Akron, unquestionably puts out very good tarpon hooks. This concern says that it aims to eliminate the human element as much as possible, although it is still necessary to resort to hand work in the finishing operations. It states that:

"Old methods of hardening and tempering have been superseded by more scientific processes where by the employment of oils and heat treatment the element of guess work, largely predominant in early days, has been eliminated."

The vom Hofe hooks are made abroad and are as reliable as those manufactured here so far as my experience goes. Frequently batches of hooks turn out to be defective for obviously the process is a difficult one to follow.

I received an interesting letter from Mr. L. C. Van Vleck, of Toledo, Ohio, a part of which I quote:

"Captain Mainge told me if I wanted to see tarpon, to go to Captiva. So we packed up and went. My rod,

reel and lines were not anything to brag about. But the hooks—none would hold—either bend or break, so back to Punta Rassa where I wired for some large cod hooks. As soon as these arrived, I took them to Fort Myers and found an old blacksmith shop where I forged out one dozen hooks. My brother came down to Punta Rassa and together we took a tent and camp outfit for Captiva and with these dozen hooks, killed seventy-two tarpon trolling. During the summer of 1894, I fashioned a hook and we sent it to Allcock of Redditch, England and had 500 made. In the Spring of '95, we had the best tackle that could be had at that time and had unusually good sport."

This hook here described has been a favorite ever since it was first devised by Mr. Van Vleck. No. 9 hooks have given me the best results.

Swivels—Barrel swivels are usually employed and the eyes should revolve freely. I have used Catalina swivels with success and thus avoided the knot, which so seriously weakens the line but the leather attachment is better. A swivel rarely fails.

Gaff—There is no restriction on the size of this part of the equipment. It should be strong and mounted on a long handle so as to make its use effective. A gaff rarely is used. The guide will carry a landing hook, which is a barbless hook on a stout looped line, which he attaches to his wrist. This hook is inserted in the mouth of the tarpon and the line hook is released. He then withdraws the landing hook and the fish swims away to be caught again some other day. I fear that the sharks capture many released tarpon if they are spent or roughly handled. The fish should not be permitted to come in contact with the side of the boat when it is released.

Miscellaneous Equipment—Metallic articles should be rolled up in a piece of oiled cloth to prevent rust. A cheap fiber suitcase, or, better still, a canvas bag such as plumbers

carry their tools in, answer the same purpose as the expensive pigskin tackle box, and may contain the following articles:

Extra lines, leaders, hooks, sinkers, swivels, spoons (Wilson), flat and cutting pliers, emery paper, bottle vaseline for rods, screw driver, knife (Boy Scout), oiler, flat file, alarm clock, extra guides, spool of silk, tapes (adhesive and measuring), drinking cup, corkscrew, can opener, mosquito dope; stout cotton gloves, woolen socks to draw on when mosquitoes are abroad, field glasses, sun goggles, matches, compass, camera and films or plates, local almanac, pipe, cigars, tobacco, note book and pencil, electric flashlight and spare bulbs and batteries, thermos bottle, net corks, harpoon head and line, shark hook and line, book, Government map of vicinity, thong of leather, first aid kit, spool of copper wire, carborundum stone, ball of wax, roll of mosquito netting, varnish.

You may desire to fish at any hour of the night so be sure to carry an alarm clock to wake you up at the appointed time. It will save both you and your guide much trouble and profanity at times when your tempers are apt to be somewhat uneven and every moment counts.

Clothing—It is not necessary for the angler to provide himself with any special outfit in the way of wearing apparel. A year spent in the open has convinced me that it is well not to be dogmatic on the question of what clothing someone else should wear. Canvas shoes are well nigh essential from the viewpoint of safety, but an old pair of black shoes with rubber heels are cooler. Wear an old suit for you are sure to get wet. A coat is a great convenience on account of the pockets. A good raincoat is essential. Medical men are unanimously of the opinion that tropic and semi-tropic conditions make it essential that a hat should be worn to protect the head from the fierce rays of the sun. An English made helmet is very comfortable and durable but it is ex-

pensive. Only a portion of the rays of the sun penetrate the water of the sea and 40% of them are reflected, which makes a hat of little protection against sunburn. Much of the discomfort comes from below. When the tide is running toward the sun or the angler is forced to gaze at a bobbing cork in the midst of a glistening sea, the strongest eye is inadequate to the task. So you should equip yourself with sun glasses of good grade, similar to those used by motorists. These are not only indispensable to your comfort when cork fishing but they add to your efficiency in striking the fish for not a moment is to be lost in responding when the cork disappears.

If one is subject to sunburn the hot sun reflected by the water will work havoc with the face and hands. Be careful to avoid the burn at the first exposure by wearing gloves and covering your face and neck with some emollient like mentholatum, and then applying talcum powder very plentifully. No-Burn and other remedies are used with success but I have found nothing so efficient as the Mentholatum. A few precautions at the outset will make your trip comfortable, but if you get well burned on the first day on the water you may suffer for a week.

Mosquitoes—In Florida fishing, especially during the late Spring and Summer, there is need for an efficient safe-guard against mosquitoes both in quarters and in the open. Mosquitoes rarely bother one on the fishing grounds after sunrise. On a still evening after the rains begin, protection is needed on the water as well as ashore. There is an insect powder known as the "Bee Brand" manufactured by McCormick & Co., Baltimore, Maryland. It is used as follows: First agitate the curtains and close the door and windows of the sleeping room. A spoonful of the powder is placed upon some metallic substance (the top of a tin can, for instance) and lighted. It gives off a thin smoke in burning which is efficient against flies and mosquitoes. If the windows and door

are properly screened one is assured of a good night's rest after burning this powder for but a few minutes. It is not objectionable. It is convenient to have a small roll of mosquito net in your kit for use in the event your room has not been properly screened, or you wish to take a nap in the boat.

I submit the following mosquito remedy:

Olive oil,.....	8 oz.
Carbolic acid,.....	½ oz.
Pennyroyal,.....	1 oz.
Sp. Camphor,.....	½ oz.
Acetic acid,.....	½ oz.
Oil of Cedar,.....	1 oz.
Carbolated vaseline to thicken.	

I have used this prescription for years.

It is excellent as a repellent against all insect pests and it is soothing for sunburn and insect bites.

For daily consumption, have your druggist provide a small rubber phial with a screw top, which can be carried easily in the pocket. If the mosquitoes are bad one will need a pair of light leggings, or heavy socks, gloves, an undershirt with sleeves and a handkerchief for the neck.

The Government has used the following in the tropics:

Oil of Citronella	1 oz.
Spirits of Camphor	1 oz.
Oil of Cedar	½ oz.
Carbolated vaseline to thicken.	

Here is the best tar dope:

Pine tar	1½ oz.
Oil of Pennyroyal	½ "
Oil of Citronella	½ "
Creosote.....	½ "
Camphor pulverized	½ "
Carbolated vaseline	2 tubes.

Heat the tar, add the other ingredients, and simmer well till mixed.

You will probably wish to fish the tides at night, for tarpon like the herring, frequently feed best at this time. It is then the mosquitoes are most active. An ordinary close fitting cloth head piece long enough to flow over the shoulders and be tucked under the outer garment is a convenience for the portion of your face exposed can be liberally covered with the remedy and immunity gained. With proper precautions and a little forethought the mosquitoes will not trouble you.

For many years a bitter controversy has waged between the light tackle enthusiasts and those preferring heavier tackle. Reams have been written on both sides of the dispute which shows no signs of abating. I shall not enter into this time-worn and acrimonious debate save to suggest that if you cut your tackle down too fine it is likely that your fish will run around until it attracts the attention of a shark. As most anglers now release the fish captured, it would seem that the quicker this is done the better. The spectacle of a fish dragging a light line for an hour or so in waters infested with sharks is not an edifying one. The tackle unquestionably should be fitted to the fish and a golden mean is better than either very heavy or very light tackle. The cult who clamor loudest for the employment of very light tackle usually lack much experience or are fireside anglers.

CHAPTER V

HINTS ON FISHING METHODS AND EXPEDIENTS

“Now for the Art of Catching Fish, that is to say, how to make a man that was none, to be an Angler by a book.”

ISAAC WALTON.

WHILE certain general principles which are applicable everywhere, govern the art of capturing a tarpon, methods vary according to local conditions, the kind of bait used and the nature of the water fished. The following suggestions are made for the benefit of the novice or the angler who has taken but few fish. They are based, in part, upon considerable personal experience, but in setting them forth I have relied upon observation of the methods employed by anglers of varied experience with whom I have fished for many years. Many anglers of experience never develop any particular aptitude for the sport precisely as a man fails to become a good shot or golf player, or a good horseman, no matter how much time he may devote to these sports. But tarpon fishing is a sociable sport and the boats usually are close together. It is easy to note the methods employed and the success which attends upon their practice. The guides with whom I have made it a practice to talk have given me much sound instruction and many hints which I am sure can be followed with success.

When the angler begins to fish the chances are that he has not had a rod in his hands for a year or more. He is unaccustomed to the boat, and being unused to the seaway, is clumsy in all his movements. The rod feels heavy and strange to the hand. One cannot get attuned to the surroundings and be able to do his best until he has enjoyed several days of fishing.

Lord Grey in his book on "Fly Fishing" describes the qualities which a man must possess to become a good angler :

"He must in the first place, have enough strength and aptitude of body to enable him to do a fairly hard day's work and manage both a rod and a fish cleverly, though he will not require the same exceeding quickness of limb, accuracy of eye and strength, which are necessary to the greatest success in the finest games. Quickness and delicacy of touch, and a certain power of managing a rod and line, akin to that individual cleverness or genius which men show in the use of tools or instruments with which they are experts, are necessary to success in angling."

Every word of this is applicable to tarpon fishing. One needs delicacy of touch to fish deep and yet keep off the bottom or to respond to a strike. One should be in fair physical condition to withstand the severe strain which a good day's fishing entails.

It will add to one's pleasure if a few minutes of daily setting-up exercises are taken for a month or so before beginning fishing. This is irksome work but it prevents lameness and backaches from the exertion incident to pumping the fish. Particular attention should be paid to the back, arm and hand muscles. These suggestions are for those who lead a sedentary life.

After these very general observations I should say a few words about the guide. He should be carefully selected and his instructions implicitly followed, for, in all probability, he is well versed in the best methods of fishing in local waters. His judgment has been educated by much personal experience and observation. So heed what he says and do not mistrust his ability because other boats happen to capture the most fish.

Many anglers desire to make their catch in the most sportsmanlike way. The guide wishes to run up a high score and to

catch the fish quickly so that he may run back to the school and capture another. I can appreciate the guide's point of view for the large majority of his patrons desire to catch as many tarpon as possible with but little regard to the way this is accomplished. It is numbers and not methods that appeal to them. But the angler has the right to insist upon his methods being followed even if they are faulty for, after all, the guide is working for him.

If good judgment has been displayed in his selection he will be an experienced waterman and will own a good safe boat, capacious and roomy, with a revolving seat in the stern, so that one can face the fish during the battle. This is well nigh essential, at least for the novice.

It is convenient to have two rods fully rigged for when accident befalls one fishing can be resumed with the other without delay.

Let us assume you have used care in the selection of your tackle and that it is in first class condition. Your line should first be wetted in fresh water, stretched and dried in the shade before use for this evens its strength by setting the lay of it and thereby prevents kinking. This should be done at home. Do not rely upon patent reel fastening devices unless you are certain they are effective but securely lash your reel to the rod, so that by no possibility it can come off in the heat of the struggle. In my opinion more fish are lost by the breaking of the leader than by the failure of any other part of the tackle, provided the line is of high quality, in first-class condition and properly secured. A leader four or five feet long is better than a longer one for it is less liable to kink.

It is permissible to double the line back for a distance of five or six feet. This is not necessary. The doubled line should not be used unless the knot closing the loop is properly tied. Before beginning to fish wet the reel pad and the line for a good distance. This increases its strength and serves to keep the pad moist. The line should be wound back evenly

and smoothly, so it will render easily and it should be staggered slightly on the reel which facilitates its prompt flow under severe strain. The careful and even winding of the line upon the reel is indispensable to success for if the line fails to render the fish usually breaks off. When a fish is on glance at it occasionally to see that the line is being properly reeled and use the left thumb to distribute it on the reel. I cannot over-estimate the importance of these suggestions.

If it is necessary to wear gloves to protect the hands from blistering or sunburn, select the lightest pair possible for delicacy of touch is essential. Sometimes the bottom is fished, that is to say, the sinker is let down till it reaches the bottom and then the line is reeled up three, four or five turns of the reel. The angler should measure the amount of line retrieved by one turn on his reel so he may know how far his bait is above the bottom. As the depth of water changes the line is given out or taken in accordingly. This requires promptness and alertness on the part of the angler. When the hook catches on the bottom as the boat drifts along, three or four *instant* short sharp jerks will usually disengage it and save not only the time and patience of the angler and his guide but also the possible loss of the tackle. It is difficult to act with the desired promptitude when thus entangled, or when the hook is struck by a fish unless the hands instantly telegraph the tidings to the brain and the muscular reaction is prompt. Heavy gloves are a handicap.

It is a great convenience to have a mark placed upon the line to indicate roughly the amount which should be paid out. The guide will know the depth of the water to be fished and he will tie a piece of yarn or string in the line to indicate approximately how much should be let down. This is well-nigh essential for the beginner, especially in night fishing. It is a great convenience at all times both to the angler and his guide. These marks are usually set at from 36 to 42 feet at Boca Grande Pass. Unless care is exercised in putting the

line overboard the hook or leader may become entangled with the sinker or the line. When the line is put down while the boat is at rest be sure to avoid entangling the leader by paying out the line slowly, bearing in mind that one might as well be on shore gathering shells as fishing with the tackle in a snarled condition. Therefore, before the boat is stopped and permitted to drift in the tideway the hook should be baited and the line slowly paid out so as to straighten out the leader.

Like care should be exercised when the bait is lowered so it may be free from grass or other obstructions. When grass is present, the angler should refrain from putting it overboard till the boat slows down so that the bait will not be dragged through the water at or near the surface; and he must be sure that it is not let down until the bait and leader are free from obstruction. Tarpon will not strike a bait which is fouled by weeds or grass. When the leader is entangled, it is apt to cut the line or break when the fish strikes. Probably many broken leaders and parted lines are due to the fact that the tackle is snarled when the fish strikes.

You will probably be fishing in close proximity to other boats. Watch the methods they employ and try to ascertain how deep they are fishing in the event they strike a fish as well as the bait used and the precise location of the fish when it took the bait.

Your guide will be quick to adopt your methods to those employed by successful anglers in your vicinity.

Anglers strive to conceal the methods which have brought them success and the guides promote this unsportsmanlike attitude. But that is nothing new. I quote from Walton's much loved "*Compleat Angler*":

“And now I shall tell you that which may be called a secret. I have been a-fishing with old Oliver Henly, now with God, a noted fisher for Trout and Salmon; and

have observed that he would usually take three or four worms out of his bag, and put them into a little box in his pocket, where he would usually let them continue half an hour or more before he would bait his hook with them. I have asked him for his reason and he has replied: 'He did but pick the best out to be in readiness against he baited his hook the next time' but he has been observed, both by others and myself, to catch more fish than I, or any other body that has ever gone a-fishing with him, could do, and especially Salmon, and I have been told lately, by one of his most intimate and secret friends that the box in which he put these worms was annointed with a drop, or two or three, of the oil of ivy berries, made by expression or infusion; and told that by the worms remaining in that box an hour, or a like time, they had incorporated a kind of smell that was irresistibly attractive enough to force any fish within smell of them to bite."

There are too many Oliver Henlys among the tarpon anglers and guides. If you find that the fish are striking at a certain depth, or at a particular bait, tell your fellow-anglers so that they too may share in your good fortune; for there is fish enough for all.

The drag on the reel should be set at a moderate tension and you must understand how to adjust it to meet the action of the fish.

The guide will adjust the drag until you have gained sufficient experience to do it yourself. I usually keep it regulated on a moderate brake and apply the desired greater resistance by the use of the thumb pad, although some fish are so powerful that the drag needs to be readjusted during the struggle. The application of the thumb pad when the drag is set is attended with danger for one is apt in times of excitement to press too strongly upon the pad, forgetting that the drag is functioning. The beginner should rely solely upon the drag.

Both the tide and the wind determine the speed at which your boat will drift. The angler should fish from such a position that the line will slope away from and not under the boat. You should examine your bait from time to time for trigger-fish sometimes abound and kill the crab. When this occurs, try fishing at a less depth.

If the sea is rough, manipulate the tip of the rod so as to keep the bait as still as possible. It is doubtful if a tarpon will strike a bait which is bobbing violently up and down.

We will now assume that the boat is drifting with the tide on the fishing grounds. The left hand lightly grasps the rod above the reel and the right hand holds the grip below it with the thumb gently pressing the pad which engages the line on the reel. It is advisable to keep the point of the rod *low* and at an angle to the rail of the boat. The rod, however, must be so held that a sharp strike will not break it over the rail of the boat or release it from the grasp. A little practice is essential before proper form in this respect is attained. While it is not necessary to hold the rod rigidly, alertness must be maintained, for when the strike does come the angler should be in position to make an adequate response. The tarpon is not bound by any fixed habit in taking the bait. It may strike gently, or it may take the bait with a snap which nearly unseats the angler. What response should the angler make? There is a wide divergence of opinion among anglers of great experience and observation as to whether or not the fish should be struck at the outset. Some favor striking back hard and often; others equally skilled argue that the fish by striking at the bait has hooked itself if it is to be hooked at all and that no amount of exertion on the angler's part will affect the desired result. Others favor feeling the weight of the fish as it starts away, before striking.

Mr. B. Kemp Littlepage, in a very interesting article in *Field and Stream* for March, 1920, made a strong argument

in support of the theory that a tarpon hooks itself when it seizes the crab. I submitted the question to Mr. B. W. Crowninshield for his opinion. Mr. Crowninshield has had great experience in sea-fishing and his opinion on any question relating to the tarpon is well nigh final. He thinks that many tarpon do hook themselves, especially when the crab is used for bait; but that when cut bait is used the fish usually take it easily and are liable to let go if not struck very quickly. I have tried to drive a hook into the jaw of a living tarpon by striking the fish with standard tackle, but I have never succeeded in doing so. After experimenting, I think the angler will conclude that the fish usually forces in the hook by the snap it makes when the bait is taken.

In cork fishing, the fish hooks itself without any aid from the angler. This fact is significant.

Most anglers think it cannot do harm to strike several times by pressing the thumb firmly upon the reel pad and swaying the rod upward with energy *and without giving line*. If the fish has hooked itself this method, they argue, cannot injure the chances of capture; on the other hand, if the fish should be struck this has been done. The next act will depend upon circumstances and the tarpon can be depended upon to waste no time in making the next move. It lays out a plan of defense at once and the next few moments are ones of great anxiety. Usually under such treatment, the fish will come directly to the surface to leap and to endeavor to shake out the hook. Sometimes this jump is at the conclusion of a short run. More rarely the tarpon seems to scorn to practice such a trick upon the angler and it may never jump. It is fairly safe to act upon the assumption that the fish will jump at once so every attempt should be made to reel in any slack which can be gained.

On many occasions I have tried a method which is a departure from that usually followed. I offer it for what it is worth. While awaiting a strike the reel drag is released with

the thumb gently pressing the reel pad. When the fish strikes, the thumb is promptly and firmly applied and the rod is raised to straighten out the line. The fish is permitted to run as far as possible against a slight resistance applied by pressure on the pad. When the line begins to rise, indicating that the fish is about to jump, the drag is put on and the usual preparation taken to meet it. Few fish handled in this fashion jump near the boat. They usually make moderate runs before appearing at the surface when one is prepared to meet the emergency by gaining a tight line.

The angler should be thoroughly accustomed to a correct manipulation of the reel and very quick with his hand in order to use this method with success, for slack line cannot be gained by working the handle of the reel till the drag is applied. It is not a method to which beginners should resort, nor is it one to follow when the fishing area is restricted by the presence of other boats. One thing is certain. The fish should be encouraged to run for this seems to fix the hook. When the tarpon is too strongly held at the outset, or is jerked, it is apt to jump at once close to the boat, which is not only a source of danger but also enables it to gain slack line and shake out the hook if it happens to be poorly embedded.

I suggest that a trial be given this method. Most women anglers fish with a light rod and a comparatively light drag on their reel. They unconsciously follow this method, whereas men work a fish too hard at the outset and lose more. If very light tackle is used, the angler will be surprised to find how easy it is to strike and play the fish without losing it in the initial stages of the combat.

If you will handle the fish at first firmly, yet with little force, you will find it will stay down for a time without running or jumping. The boat should be started slowly and the fish will shortly make a run. But the longer you can keep it under the stern, the better chance you have to hold it

during the jump. Don't look for trouble by jerking or yanking at the fish, whatever is done. You may have enough before you land it. I am naturally too tense and strike too quickly, sometimes pulling the bait away from the fish. I have cured myself of this habit by holding the rod loosely so that I must gather myself before I can respond to a strike. This seems to give me about the right amount of time to lift the rod with the most effectiveness. But this is a matter of personal temperament and nervous reaction. Everyone has to learn the lesson for himself.

When the tide is slack it is good practice to fish over the stern, so as to keep the line free from the boat whichever way the fish runs. The tarpon may jump close to the boat on either side, or it may make a short run toward either side and then jump, or it may not do either of these things but may make a long run in any direction. It is extremely difficult to give any categorical advice to cover one's action at this uncertain stage of the contest. The tarpon will make the next move without any delay and one can meet the attack only by trying to keep a reasonably taut line, so that when the first jump does come the fish will be held on a moderate strain. If the fish makes a run for some distance from the boat, the task is easier for the slanting line coming to the surface will indicate that the fish is coming up to leap. It is essential to get in all the slack line possible and to hold the fish on a fairly tight line while it is in the air. Many times it will be out of the question to do this. The operation is helped by reeling in any slack line which can be gained and pointing the rod toward the fish so that it may be swayed back when it appears. The fish may disappear and the line may feel dead and lifeless. Don't despair but reel hard for the fish may still be there. It may be running towards you. The angler will utilize the first opportunity that presents itself to insert the butt of the rod into the socket on the upper side of his seat. The use of this device helps enormously in the capture of the fish. In tarpon fishing

line cannot usually be gained by the mere reeling in of the fish but this must be done by the operation known as "pumping". The angler lifts the line till the rod is at an angle of say 75° or 80° and then lowers the tip evenly toward the water, quickly reeling meanwhile. Several feet of line are gained by each operation. This is repeated whenever opportunity offers for it is an axiom among anglers that the fish should be fought without respite till the issue of the battle. But the fish should not be hurried by too heavy or jerky pumping. There is no occasion to be alarmed over the temporary loss of a bit of line for the tarpon will not run far under a moderate strain. But be prompt to gain line when opportunity offers, bearing in mind that one should keep a constant but moderate strain on the fish till the end. *Always try to face the fish.* If the presence of a shark is perceived release the drag and give your fish all the line it needs and you may save it. The fish is usually lost by hurrying its capture. There is an almost irresistible impulse to reduce any fish to possession and in obeying it the angler pumps and pulls till something gives way or the hook pulls out. Many women are successful tarpon anglers because they handle the fish gently and have quick wit to forestall its actions. Then, too, some fish, when skillfully captured, are found to have the hook insecurely imbedded and clumsiness or haste would surely have lost them. Too heavy pulling causes the hook to make a large hole where it pierces the fish's jaw and it is apt to drop out when the fish jumps or gets a little slack line. A tarpon rarely temporizes. It is direct and forceful in all its actions, and like a prudent general, frequently changes its plan of attack. It fights every battle out to a finish and when you feel like resting, it, too, is snatching a few moments needed rest. So keep at it. When a strain is put on the line the fish is apt to jump and every jump draws heavily on its strength. But be careful to gain a moderate strain on the line when you see it coming to the surface; for that betokens

a jump and every jump is a crisis in the struggle, for when the tarpon is in the air it shakes itself convulsively and it is then that it most frequently breaks loose. It will sometimes jump ten or twelve times; but, on the other hand, it may not leave the water at all. If you can hold fast for three or four jumps very likely the fish is yours, unless it is lost at the boat or taken by a shark. If the fish draws too liberally upon your line the boat should follow and the line should be retrieved by pumping or reeling as soon as that is possible.

As my guide's boat sits rather low in the water, it is my practice, when the fish is taking line, to hold the tip of the rod as far down as possible so that when the fish jumps at the end of the run, it must overcome the resistance of the line in the water which tests show is considerable. This tends to keep a steady strain on the fish.

An attempt should be made to keep the fish reasonably near but not too close to the boat and it should not be worked up on a short line until it is weak and ready to give up the fight. It is awkward to have the fish run under the boat, especially when it is fresh and full of fight. When this occurs be quick to insert the point of the rod in the water aft the stern so that the line will not get entangled in the wheel. Then fish from the other side.

There are two critical phases of the struggle, one when the fish is struck and jumps, and the other just before it is released. But the latter phase need occasion no particular anxiety *if the angler will take the time to play the fish out before working it up to the boat*. If the fish is brought up prematurely it weaves, darts, and turns over. It may add to the angler's perplexities by running under the boat. Many a tarpon has been lost by these maneuvers. John Silver in *Treasure Island* ascribed all the pirates misfortunes to "Hurry, Hurry" and so it is in tarpon angling.

Let us assume that the angler has succeeded in bringing the fish up to the boat. It will probably attempt to stage a

final rally but that will be short-lived and only result in a short run. Permit it to run against a moderate strain and then pump it in. The boat is at rest and the fish is now on its side. If you can pull its mouth open and skid it along the surface, the tarpon will soon weaken and give up the fight. The guide is waiting at the rail with the barbless release hook cord wrapped around one of his wrists and a glove on his other hand. Some guides use a gaff with a short wooden handle. When the fish is brought within reach, the guide grasps the leader with his gloved hand and raising the fish's head inserts the release hook in its mouth, (usually the lower jaw), giving it a short strong jerk so it will engage. The fish is then held by both hooks. The guide releases the line hook, disengages his release hook and the fish swims free.

While all this is occurring the angler must be alert for if the fish darts away before the release hook is firmly inserted, the line must render freely and the angler must apply pressure to the thumb pad so the line will not over-run for the drag should be released when the guide grasps the leader. There is an element of danger incident to releasing a fish for if the hook should come out when the fish is held on too tight a line, it might find lodgment in the guide. So release your drag and use the thumb pad to brake the line. It will assist the guide if the angler stands up and moves a short distance toward the bow. This keeps the rod away from the guide's back for if the latter stands between the angler and the fish, the rod may whip over his back and be shattered. I have lost two tips in this way. Then, too, the angler should be in a position to see what is occurring and be ready for emergencies. The fish frequently breaks away from the best of guides.

When a tarpon is hooked in shallow water it leaps more frequently and is altogether livelier on the hook than when the water is deep. The males, while smaller as a rule, are more active. A female heavy with roe or a very large fish is more

apt to sulk and make fewer jumps. When the fish is hooked through the upper jaw the mouth is held open and this weakens it. A fish hooked through the lower jaw puts up a stouter resistance for it can then keep its jaws in their normal position. If you foul-hook the fish, you are in for a long fight.

I once observed a tarpon from the time it took the bait until it was released. The water was seven or eight feet deep. The bottom was white sand, the sun was bright and the water was clear. Every motion of the fish was perceptible. After it had jumped five or six times, it hugged the bottom and tried every manoeuvre it could devise to escape. As I watched it dart, twist and turn, it was easy to see how many fish wrench themselves loose when insecurely hooked or carelessly played. So when the line suddenly feels slack and the fish has departed, do not let the guide beguile you with the pleasant fiction that a shark seized the fish.

When a fish is struck the guide usually starts his engine at once and moves clear of the fish and other boats nearby. It is a good plan to apprise the guide that such action may be necessary by saying "strike" when the fish is felt. This is essential at night.

When two anglers are fishing from the same boat and one of them gets a strike the other immediately reels in, and, if in the stern seat vacates it at once for its occupation by the man with the fish. When a boat nearby has a fish it is the custom to move away as soon as possible unless it is clear there is no interference. Above all things, be cool and refrain from hurrying; be sportsmanlike and courteous to other anglers and insist that your guide be equally so; release the fish unharmed after the battle is over, save in exceptional cases. The tarpon, fortunately, has no commercial value. If the fish is evidently a very heavy one or is desired for mounting or it is one's first fish, there is no reason why it should not be killed. For no amount of rod fishing will ever appreciably diminish the uncounted millions of tarpon that roam the sea.

Finally, engage a good guide and if a novice follow his advice, remembering that he is an expert and has doubtless captured hundreds of fish to your one.

The most favored bait on the west coast of Florida in May and June is the blue crab. The crab does not live long if exposed to the direct rays of the sun. Therefore, when the boat is changing position it is well to have a bucket of water near the angler in which the crab may be placed while upon the hook. This will keep it in good condition for an indefinite period.

In this fishing one is apt to hook many other species of fish and channel bass, groupers, pompanos, sharks, rays and other species take the same bait the tarpon uses. Sometimes one strikes a turtle. The only safe rule to follow is to assume you are fast to a tarpon until this is clearly disproved.

The late Dr. Charles F. Holder was the dean of American anglers and he spent his life in the study and pursuit of fish of all description. I refer the reader to the chapter from his book "Big Game at Sea," entitled "The taking of big game fishes," which embodies his long experience and which gives many valuable hints.

I have not had sufficient experience in the use of very light tackle to lay down any hard-and-fast rules governing this fishing; but the following hints may be of some value to the novice.

The hook used with both light and 3-6 tackle should be the same size as that used in the heavy tackle fishing. One cannot expect to strike the fish hard enough with a light rod to drive the hook through the heavy jaw of the fish. But you will experience no trouble if you will raise your rod so as to put the hook in proper position for a fish to hook itself. The same leader should be used and the line should be attached to it by the leather and half hitches previously described. The line (and the reel pad) should be wetted and the line evenly reeled back so it will render freely when the fish runs. An ordinary multiplying reel large enough to hold about 900 feet of six

thread or nine thread line will give better service than the heavier and more complicated drag reel used with the heavy tackle. In my opinion it is best not to use any drag save the thumb pad, for the pressure of the thumb upon the line is better than a mechanical drag when fishing with light tackle.

Use as light a sinker as possible and tie it on with a piece of small twine so it will snap off on the first jump of the fish. The fish must be obliging enough to strike itself, for with light tackle there is little to be done save to accept the fortunes of war. When the fish is being played, the strain must be constant and it should be fought up to the limit of the strength of the tackle.

The angler should ascertain how much strain he can put upon his tackle by lifting weights with his rod and line, thereby ridding himself of the constant anxiety of breaking the tackle while the fish is being played. The tackle will stand a far heavier strain than one would think. The rod should be kept nearly at right angles to the line of resistance and when the strain on the rod approaches the danger point the line should be released by lessening the pressure of the thumb upon the reel pad.

A little practice gives confidence and soon one learns to put up a stout resistance to the fish. A rubber butt-pad is very convenient, for the butt must be pressed against the body. A butt rest, either on the upperside of the angler's chair-seat or strapped around the body is not essential. Patience and coolness will finally conquer any fish if he can be kept on but numerous accidents befall one and many are lost. It is not the kind of tackle to employ when fish are scarce or reluctant to come to hook. The angler will need plenty of sea room for he must follow the fish to keep his line. In crowded waters an angler using very light tackle is a first-class nuisance to his fellow anglers.

One word more. If the fish can be induced to make the fight over a sandy bottom the chances of its capture are much

better, for many are lost by the line being chafed off by rocks when the fish changes direction and pulls the line over the bottom. As a general rule, the shorter the line the fish is played on the better the chances of its capture. A quiet sea simplifies the task.

As I write these lines I am reminded of a remark made by that veteran angler, Lord Grey, in his classic book on Fly-Fishing:

“There is only one theory about angling in which I have perfect confidence, and that is that the two words, least appropriate to any statement about it, are the words ‘Always’ and ‘Never.’ Theories, rules, creeds and hypotheses are constantly forming in the angler’s mind. Trout seem to make it their object to suggest these only to upset and destroy them.”

This is equally true of the tarpon.

The same general principles apply in still fishing. The boat is anchored near a likely spot. Twenty or thirty feet of line is unreel and neatly coiled after the bait, usually a fillet of a mullet, is cast into the chosen water. If good fortune attends upon you the line will likely run out two or three feet, stop a few seconds and then run out again. It may go with a rush. You take up your rod, being careful not to interfere with the coiled line. When this is all rendered strike several times to set the hook in the throat for the fish has gorged the bait. The guide will up anchor and man the oars or the engine, so as to keep the stern toward the fish or to follow it. When the fish is hooked it is played as has been described. Tarpon are also caught by trolling with a Wilson spoon, mullet or other lure. This fishing requires no particular comment.

In still fishing crabs are very apt to wound the line so it must be frequently examined, and sharks and other vermin give you much trouble.

It is unprofitable to dwell upon the disasters which may befall the angler during the struggle. The rod or reel may fail;

the line may get entangled on the reel, or elsewhere, and snap off; the line may part; the leader may fail by breaking off through kinking; the fish may throw out the hook, or the hook may break or spread so it will not hold; a shark may take your fish away, in whole or in part; and finally, you may lose your fish at the gaff. A bad run of luck may persist till the guide views the angler with profound disgust and disapprobation, a feeling which is warmly reciprocated by the angler. A fish is counted as struck only when it jumps or is seen, and as hooked when it is fast for two or more jumps. I have known skilled fishermen to lose eleven or twelve successive fish after striking them. So the novice should not despair over the loss of a few fish. Every precaution should be taken with the tackle and the angler must be alert to foresee what manœuvre the fish is attempting. The tarpon is so rapid in his movements that slack line is unavoidable at times; but the number of such crises should be held to the minimum. You may catch four or five in succession and then lose the next six or eight.

I have had excellent sport at Captiva Pass, usually during an ebbing tide. The fishing there is done by suspending the bait, usually a fillet of mullet, a blue crab, or a live fish, about seven feet below an ordinary net cork, and letting the cork drift in the tideway sixty feet or so away from the drifting boat. When the cork disappears, one must be quick to gain all the slack and get a strain on the fish. Many are lost. The water is so shallow that the fish leap repeatedly and it is very fine sport. It is a charming spot with much to interest and delight the angler. But the Pass is so narrow and shallow that only a few boats can fish it for the capture of a few fish and the noise of the boats changing position alarm the fish.

The effect of motor boats upon fishing has not been investigated thoroughly, although the Government has issued a paper containing a careful study made by G. H. Parker, S. D., Professor of Zoology at Harvard. (Bureau of Fisheries Doc. 752:1911.) The tarpon can feel through the skin, the organs along the lateral lines, and the ears. The author says:

“The sounds produced by motor boats are extremely faint under water and have little influence on the movements and feeding of fishes. Such influence as they do have is temporary and very much restricted in local extent. * * * From these observations, it seems quite clear that single loud noises generated in the air enter the water to a small extent but in sufficient volume to disturb momentarily fishes that are in the immediate vicinity. But even this limited disturbance does not seem to be produced by the ordinary motor boat which purely because of the gradual increase and decrease of the sound in intensity as the boat approaches and recedes is relatively inert so far as many fish are concerned.”

It is common practice around the Muskoka Lakes in Canada for the boys to await the arrival of a boat at a dock and to drop a line alongside the boat as soon as she is berthed. The fish may be alarmed by the boat but it is momentary for they seem to be attracted by the agitation of the water and noise and soon come back to feed. Indians sometimes agitate a pool with brush and scare away all the fish knowing they will soon return and strike the bait.

Sometimes forty or fifty boats of all degrees of speed and noisiness fish in a compact group at Boca Grande Pass without having any marked effect upon the fishing. The water here is from 40-90 feet deep but at Captiva, where it is shallow, motor boats certainly alarm the fish at least temporarily. Mr. H. Wendell Endicott in his interesting and instructive book, entitled *Adventures with Rod and Harpoon along the Florida Keys* (Stokes & Co., N. Y., 1925) thus summarizes his conclusions:

“It is my belief that the tarpon is very sensitive to noise in the water and that the churn of the propeller and the throb and pound of the engine, have ruined many a good evening’s sport especially in shoal waters. I have found

that the boat itself or the quiet movement of the oars has but little effect on the fish.”

In a personal letter Mr. Endicott says:

“I almost concur with you as regards the effect of motor boats on tarpon in deep water:—for instance, probably the largest and most popular fishing ground on the East coast is in Bahia Honda, where the water ranges from fifteen to thirty feet deep. You almost always fish with motor boats here, but that is the deepest of all the grounds that I know of on the East coast, and while I have fished Bahia Honda in row boats, and with what I believe to be somewhat greater success than with motor boats, I feel that the effect of the motor boat in this deeper water is less noticeable. In all the other places that I fish, there isn’t a question of a doubt in my mind as to the serious effects of the motor boat.”

It is unquestionably true that if motor boats would seek shallow water while changing position and thus give the area that the fish are using a wide berth, the fishing would be better even in deep Passes like Boca Grande.

My best fishing has occurred in June after Useppa has closed and only a few boats were fishing. One July, many years ago, the Pass was deserted save by two boats and one could catch tarpon at almost any time. The later fishing may be better because of the scarcity of boats. This subject is worth more careful study.

Mr. Fred A. Bishop has taken tarpon on a plug and has written of his methods in the July, 1919, *American Angler*. He states that Mr. T. N. Burket of Lincoln, Nebraska, took a 112-pounder at Chrystal River, Florida, on a light bamboo rod, a 15-thread linen line, and a No. 2 Heddon minnow. Mr. Burket states in a letter there published, dated February 23, 1919, that he used a No. 2/0 vom Hofe reel, 400 feet of Kingfisher No. 33 silk line and a plug known as a white Tango with a red head, and extra heavy No. 2/0 Pflueger hooks.

Dimock, in his book entitled "*The Book of the Tarpon*" Outing Publication Co., N. Y., relates how he caught many tarpon on a fly rod with flies.

I call attention to the article written by Mr. G. D. B. Bonbright, which is listed in the bibliography for an excellent description of this type of fishing.

The fishing at the Panama Canal Zone must be delightful. Col. Harold E. Cloke, U. S. A., has described it very succinctly in a personal letter from which I quote:

"Tarpon fishing here is intensely interesting. We have our greatest sport with the smaller class of tarpon. These abound in the waters of the lower Chagres River just below the apron of the spillway. The water constantly running through the hydro-electric plant carries many fish with it such as small perch, needle fish, shiners, and shrimp. The tarpon lie in wait for them just below the falls. I use a very light outfit and many times a fly. They rise to the fly very much as do large trout or salmon and when they strike, they are exceedingly 'sporty.' They leap from the water more and cavort about more than do the large tarpon.

"This size tarpon is also quite a palatable table fish. The Spanish people here boil it, pick away the bones and then make a potpie of it, interlaying the meat with pimentos, peppers, cheese, etc. It is very good when prepared this way. There are literally millions of them in the river at all times so no qualms exist in using a few of them for food for the native population.

"Toward the mouth of the Chagres River near old Fort Lorenzo, we get the big tarpon. I did not weigh my largest one. It measured 6 ft. 5 in. 33" girth. I have taken out some quite celebrated personages in quest of the big fellows. General Pershing, for example, caught the largest one I know about down here. It weighed according to the formula $132\frac{1}{2}$ lbs. You know the formula, of course. I

have little faith in it. The fish was 6 ft. 6½ in. long. I know that much for I measured it myself. Its girth I have forgotten. It was great sport.”

I am told that the best method to employ in catching very small tarpon in creeks and rivers is by fishing with a live minnow on a small hook suspended a foot or so below a cork. If the angler is exceedingly quick he may catch one but many are lost for they are very lively and difficult to hook. They also strike at a trolling spoon or a fly.

Mr. Joseph W. Stray of Brooklyn has described the method he employs to harpoon these fish. He uses the smallest size harpoon, equipped with one fluke, attached to a 3-foot bronze wire leader with a spliced-in eye swivel at the far end. The reel line is attached to this and the rod is placed where it may be readily grasped after the harpoon is fast to the fish. About 25 feet of reel line is coiled in the boat. The harpoon which has a handle 6 feet long and ½-inch in diameter is thrown as a javelin. Every fish so harpooned, is, in fact, foul hooked and fights its best because it is not partially drowned in the struggle and impelled by the strain on the line to swim toward the boat. This method of capture must require great skill and a quick eye.

In the event the angler is fortunate enough to capture a heavy fish and wishes to authenticate the catch he should take the length and greatest girth together with the exact weight. In order to measure the fish it should be laid on a level surface and the mouth firmly closed. The length for record is the distance from the end of the snout to a point midway between the tips of the caudal fin. The measurement is taken over the body of the fish. If one tip of the caudal fin is longer than the other, which sometimes happens, the angler is entitled to record the longer tip in the measurement. A naturalist records the length of fish by taking the distance from the end of the snout to the last caudal vertebra excluding the caudal fin from the reckoning; but the sportsman has a different system. The girth mea-

surement is taken where it is greatest. The weight should be duly witnessed, and if possible, a photograph should be taken showing the fish on the scales and the angler with his guide and the tackle used. The reader is referred to the form of affidavit in the appendix which sets forth the essential facts necessary to authenticate a catch.

When the fish is normal in form and is not heavy with roe the following formula will give the approximate weight.

$$\frac{\text{Girth}^2 \text{ (inches)} \times \text{length (inches)}}{800} = \text{weight.}$$

If you will take the length in inches, add one-fourth (in inches) to the length so taken; multiply the total by the square of the greatest girth and divide by 100, you will reach the same result given by the above formula.

I have weighed and measured several fish with care.

The following table shows a comparison of the actual weight of the fish with that given by the formula:

	WEIGHT BY SCALE	WEIGHT BY FORMULA
(1)	142 pounds	137 pounds
(2)	120 “	116 “
(3)	92 “	91 “
(4)	76 “	79 “
(5)	72 “	72 “
(6)	120 “	114 “
(7)	125 “	123 “

This table shows the ordinary working of the formula as applied to moderate sized fish, but I have found cases where there was over ten pounds difference in the result, due, no doubt, to the presence of roe in the fish, or abnormal development. The formula does not seem to work out with even approximate accuracy in the cases of some very heavy fish. There is either something the matter with the scales or the measurements of record fish, or the formula, as the reader will note from the records of such fish set forth elsewhere in this book.

When a fish is caught one day and weighed the next, the loss of weight through evaporation, is a mooted point among anglers and guides. Sometimes one hears extravagant claims made in this regard. I have conducted a series of tests to ascertain the amount of this loss. The result seems to be that during the hot sunshiny weather, common on the West Coast of Florida in June, a fish caught about noon and weighed and then re-weighed the next morning will suffer a shrinkage in weight of approximately 3% to 5%. I am of the opinion that this is the limit of the shrinkage during the first twelve hours after capture.

The average estimated weight of two hundred and three tarpon recorded at Useppa, for 1928, was 68.482 pounds. But guides are quite liberal in estimating fish and sixty pounds probably would be fair to assume as the average weight of the fish caught in April and May at Boca Grande and Captiva Passes. The fish actually weighed in at the annual Sarasota Tournaments average about 64 pounds. The males seem to arrive before the females; at least that is my observation based on the examination of many fish. Later in the year the weight of the average fish captured will increase a little for then more heavy females are taken.

The run of fish varies from year to year. For instance, in 1928, all the anglers fishing from Useppa, many of them veterans at the game, caught just under two hundred fish. The next year one of them, Dr. John A. Gaines, caught 165 fish in twenty-six fishing days!

My catches during five successive trips to Boca Grande, Florida, were as follows:

FISHING PERIOD	NO. CAUGHT	MISSED ON	
		JUMPS	TACKLE FAILED
1932 May 15-June 1	33	20	5
1933 June 23-July 12	39	20	6
1934 May 24-June 10	32	31	0
1935 May 16-June 6	31	16	3
1936 May 30-June 15	21	11	3
	—	—	—
	156	98	17

The days of my arrival and departure are included in the above periods.

In 1936 I had less than seven full days of fishing. The number of fish lost each year was attributable in part to the fact that I fish a great deal on the beaches where it is difficult to hook the fish. I lost four or five leaders. The lines usually failed because they were cut off by boats or the rocks. Several parted at the knot where the double line was tied or because of an injury received while out of the water by reason of carelessness. I missed many tarpon strikes where the fish did not jump. The above record was taken from the entries in my diaries made each day at the conclusion of the fishing.

I usually spend about eighteen days at Boca Grande but on one of these years I stayed three full weeks. One should count out about six days during such a period on account of bad weather when the fishing is poor or impossible. I never fish hard and three or four fish a day contents me even on days when more could be caught.

I print this record so that anglers unfamiliar with the place may know what to expect. A keen and fairly competent angler who fishes hard can count on doing better.

Since 1924 probably over 25,000 tarpon have been caught at Captiva and Boca Grande Passes. During the four years prior to 1936 carefully kept records show that 10,331 tarpon were taken at these places. In 1935, 2941 were caught and of this total 1225 were captured in May and 1294 in June. I am in-

formed that the largest tarpon taken in this vicinity since 1924 was caught by Mr. Charles J. Iven, of Rochester, N. Y., at Boca Grande Pass on May 15, 1925. It weighed 190 pounds. It was 7' long and had a girth of 42".

I have taken over five hundred and my heaviest fish scaled 158 pounds six hours after capture.

It would seem to follow from these facts that the chances are quite remote that any given angler will catch a very heavy fish. But as Pope remarked, "Hope springs eternal in the human breast", and there is solace in the baseball maxim that "It only takes one to hit it." May the Piscator's prayer be fulfilled unto you!

"Grant me, oh Lord, a grand 'écai,
So great and grand that even I
May have no need
To lie."

LA TRINITE VERSION.

Unless it is the first fish one has caught there is no excuse for killing it merely to get its picture. Only those of exceptional size should be killed; all others should be released after their length has been estimated and their weight thus roughly determined.

The tides at Boca Grande Pass are so erratic that they would try the patience of a Job. High water and low water normally follow each other at intervals of six hours and twelve minutes, giving two highs and two lows in a tidal day. That is the rule; but the tides here are so profoundly modified by the geographical features that the general rule is subject to so many exceptions that it is well nigh worthless. A certain learned man once came to Useppa and listened with ill-concealed amusement to anglers speculating about the time of high and low water. He promised to prepare a tide table which would relieve them from further worry about so simple a matter. After working for two weeks, he tore up his notes and

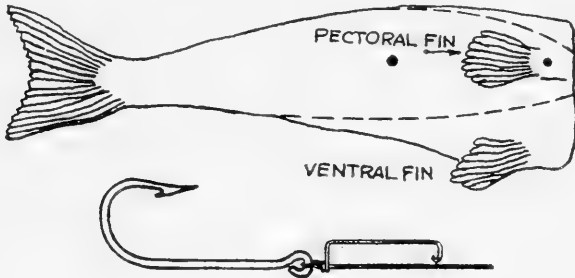
disappeared. When tides are erratic owing to storms they may run in or out all day long. But unless the tides are running strong, when the fish are feeding they will bite at almost any stage. Some prefer high or low water slack, or just before or after, but it is my observation that the man who catches the most fish is the one who fishes the most hours. The maxim that one cannot catch many tarpon on the hotel veranda embodies a profound truth.

The tarpon, like the herring, is a night feeder and as a rule the fishing between sunset and dawn is better than in the daylight. Plankton are on the surface at night and the smaller fry come up to feed on them. This attracts the fish upon which the tarpon feed. I assume this is the main reason why they are more abundant at night. But in the proper season, day fishing is usually good enough to satisfy any reasonable angler. The daylight sport is much better and, incidentally, much safer. One-half the pleasure of this angling is lost if you cannot observe the jumps and manoeuvres of the fish. If you wish to follow the most comfortable method, I suggest you fish from a couple of hours before sunset until it is dark and from about four-thirty until eight or nine in the morning. Not only will the beauty of the sunsets and dawns linger in your memory but you will have enough strikes in the proper season to satisfy any reasonable person. If your vacation is a short one, this plan may not be so productive of results. I have followed it for many years with fair success and much pleasure.

It is believed by most guides and anglers that tarpon fishing is better during the full moon periods. I have kept a record of the fishing at Boca Grande for many years. My diaries indicate that it is no better then than at other times. More anglers are present for the full moon fishing and it is natural that more fish would be caught. It is more pleasant to fish at night when there is a full moon. But I am satisfied that the catch per rod is no greater then than at other times during

the month. The long record kept at Useppa will, I think, corroborate these statements.

I have confined my statements to the methods commonly employed on the West Coast of Florida for I have never fished



elsewhere. Conditions on the East Coast are somewhat different but after the fish is hooked the principles here outlined would seem to be applicable. When cut bait is used, Mr. Endicott advocates cutting and securing it to the hook as here illustrated. The angler who contemplates fishing on the East Coast should read the books of Endicott and Heilner specified in the bibliography for both of these men are veteran anglers of great experience as well as charming writers. Much has been written about the Panama, Mexican and Texas fishing, some of which will also be found in the bibliography.

There is no outdoor sport which rewards diligence and patience to a greater extent than tarpon angling. The fish may bite vigorously and almost continuously for a half hour or so, and then refrain from striking for twenty-four hours. Time or tide sometimes fail to affect their actions in this regard. So it behooves the angler to remain on the fishing ground rather than on shore if he wishes to catch the maximum number and not suffer the jibes of his fellow anglers who were fortunate enough to be among those present when fortune smiled.

CHAPTER VI.

ANGLING ALONG THE BEACHES

A wise man once said: "There are two periods when the fishing is at its best; just before you arrive and immediately after you depart."

PASS fishing for tarpon, especially at night, is the most productive in results and I have passed many happy hours in its pursuit. But as time passes another method makes a stronger appeal. Captiva, Cayo Costa and Gasparilla Islands have an aggregate coast line on the Gulf of Mexico of upwards of twenty miles and, generally speaking, the water is shallow for a considerable distance from the shores. The tarpon migrate along the coast in a northerly direction, apparently sojourning in the Passes which connect the waters of the Gulf with those of Charlotte Harbor. The principal Passes are Captiva and Boca Grande, where the fish linger for indeterminate periods to feed and rest. They also resort to these Passes from the interior waters. As they proceed up the coast they use water that is comparatively shallow, that is to say, from six or eight to twenty feet in depth. Usually their course is less than a mile from the shore. The schools vary in numbers. Some are small; but those containing several hundred fish are common. When not disturbed they proceed at the average rate of from five to six miles an hour with occasional pauses. It is a beautiful sight to watch a migrating school proceeding leisurely through a sunlit sea for they roll on the surface, displaying the blue, green and silver of their lithe bodies. Occasionally one will leap and throw up the water. This habit enables a practiced eye to observe a school from a long distance. Rough water, white caps and unfavorable light conditions all cut down the visibility of the schools but a sharp-eyed guide usually spots the fish a mile or so away.

One day while fishing along the beach the water was clear and shallow. I climbed up on the bow and watched a large school of fish swim under and around the boat. There were several hundred. The larger ones swam deep and the smaller played along the surface, manifesting no alarm when close to the drifting boat. The speed of the fish was about four miles an hour. They were closely packed from the bottom to the surface. It was a sight which would gladden the heart of any angler and it will be long remembered. When viewing such a school from a distance, the comparatively few fish that show gives no adequate conception of the number it contains. Most of the fish are invisible unless you are very close.

If the boat is carefully managed it is not difficult to get close to a school and to run parallel with it only a hundred feet or so away. But if alarmed or run through the school will accelerate its pace to ten or fifteen miles an hour or possibly seek deep water. But my observation which has been long continued and close indicates that the proximity of a carefully managed and quiet boat creates little nervousness in the school and one may follow it closely for miles.

In years past it was generally believed that traveling fish would not take the bait; but this is not the case during the months of May, June and July on the West Coast of Florida. They usually take the bait eagerly but are difficult to capture for many release themselves by jumping to which they quickly resort owing to the shallow water.

Two methods of fishing are suggested. In these months the fish may take crabs or a fillet of mullet secured to the hook as suggested elsewhere. Small catfish and pinfish are excellent baits. The hook used in Pass fishing (Nos. 8 or 9) answers very well and a resilient rod not too light seems most effective. The line pays out better if coated with beeswax or some other substance serving the same purpose. A float, usually a common net cork, is secured about six or seven feet above the hook. The boat is quietly brought alongside the school, using

the utmost care not to disturb it. Fifty to seventy-five yards, or so, is not too close if the fish show no signs of alarm. When the course of the school is estimated the speed of the boat is slightly accelerated so as to pass diagonally in front of it and a generous amount of the line is then let out so that, if possible, the school will approach to and pass by on each side of the suspended bait. When the boat has placed the hook in a likely spot it is stopped or slowed down until the school swims by the bait. The fish leading the school are most likely to strike. Care should be taken to pay out plenty of line for if the school either changes direction towards the boat or too much line is allowed it can be reeled in to the desired position as the fish approach. Too short a line cannot be lengthened. The position of the fish can usually be determined by their showing on the surface or by the black spot the mass makes in the water.

While waiting the butt of the rod should be placed in the rod socket and your right hand should grasp the reel handle, for all line possible should be retrieved when the cork disappears. The line will not run out straight but the winds, currents and the course of the boat when it is laid all contribute to its slackness; and a bow in the line is frequently unavoidable. The cork usually will disappear before the fish is felt so keep a keen eye on it and start reeling as soon as it disappears.

The fish will frequently run against the line and pull the cork under. When this occurs, you will strike without reaping any reward and probably you will have to set the bait again.

But let us assume you get a strike and make every effort to respond. Owing to the shallowness of the water the fish will begin to jump repeatedly almost at once. Sometimes it tries to keep with the school. It may run a short distance but it is certain that you will see a series of acrobatics which will delight your heart and severely test your skill.

Some anglers advocate feeding line to the fish after it strikes so it may have time to gorge the bait. Others delay getting a strain on the line as long as possible without paying any out.

I have tried various methods without conspicuous success so I leave it to the reader.

The tarpon do not appear to take the bait with much vigor and are apt to let it go or to shake it loose. I have had a fish bite off the tail of a fillet of mullet and jump several times after it had cast it. This year (1936) a tarpon took a pin fish off my hook and then rebaited it by forcing the hook through the body in a different place. Occasionally you will foul-hook a tarpon and then your work is cut out for you. After the fish has been struck it is played the same as in other types of fishing although it should be handled with great care at first. A tip weighing about 10 ounces will catch the most fish and a long rod is better than a short one. A bait casting rod gives excellent sport; but you will not catch many fish.

There is another method which can be employed which produces even better results; and that is by casting the bait into a school instead of laying it in advance of the approaching fish. Many anglers are now using long natural bamboo rods which they fit with windings, guides and a reel seat. They are both practical and durable. A skillful and strong angler can cast the bait accurately for a long distance. The resiliency of the rod prevents the fish gaining slack and better results are obtained than with the ordinary rod.

A rather heavy bait casting rod can also be employed but the natural bamboo answers every purpose and is much cheaper. It may slowly supplant every other type of rod used on the West Coast of Florida. This year (1936) three anglers fishing from the same boat with these rods jumped fifty-five fish in a single day; but they captured only five. These men were experienced in tarpon fishing. Many fish are lost whatever method is followed.

In May, 1935, the serenity of the veteran guides and anglers at Boca Grande was disturbed by the advent of a high speed boat holding a couple of lads from St. Petersburg, Florida, who were equipped with long one-piece bamboo rods with

which they cast pin fish hooked through the back into schools of tarpon. They were most dexterous and accurate in their casting, landing the bait in the very thick of the school. When a tarpon was struck it was played standing, with the boat at rest, and double-headers were frequent. These boys caught fifteen or twenty fish during a single day although the experienced guides and anglers were not boating a third as many. The incident made it evident that the orthodox methods of fishing which have long obtained are not infallible. New ones may prove to be more effective than the old.

The capture of a fish out of a school does not seem to alarm its companions and it is usually possible to catch several if due care is used. In one case eight fish were so taken. The school appears to regard the jumps of one of their number as a normal manœuvre for sometimes a free fish will leap high above the school while it is traveling.

Occasionally a shark will chase a school or run under it. The speed of the tarpon is then displayed at its best; but the school will not run far. It soon settles down to its regular pace and fishing can be resumed. It is a fine sight to see a hundred or more tarpon attempt to leap at the same instant and then dash away at top speed.

This method of fishing is most fascinating. After the bait is in proper position and the school of the great fish slowly proceeds toward it, a strike frequently is inevitable. It is a stoical angler, indeed, who can repress a thrill during the moments of suspense. The proximity of a large school and the certainty of a strike make this the most exciting fishing which one can experience.

You will lose several times as many fish as in Pass fishing, so do not despair when one gains its freedom. You may catch several in succession and then lose ten straight.

These methods are slightly different from the cork fishing described elsewhere. Here you hunt up a school instead of awaiting a fortuitous strike. You experience the thrill of

hunting and fitting your methods to the movements of the fish instead of waiting for them to locate your bait. It interests the guide for it makes demands on his skill as well as on that of the angler. It is practiced amid pleasant surroundings and in the daytime. While it is not as productive of results as Pass fishing it is more interesting and more sportsmanlike. This method, however, has one objection. Only a very few anglers can practice it at the same time for the schools are not numerous and are soon dispersed by over-fishing.

One day in June, 1934, I jumped many fish and caught only five, for the fish seemed to strike at the bait in a playful mood. If one wishes to run up his score, fish at night in the Passes. But personally, I prefer to lose fish by the practice of this method rather than to fare better in the Passes. With a skillful guide and fairly light tackle, you will enjoy a day's sport unexcelled in any other form of angling.

CONCLUSION.

When captured upon reasonably light tackle the tarpon is the peer of any fish that swims. It can always be found in its chosen haunts at its proper season and in this respect far excels the tuna or sail fish as a game fish, for the latter are uncertain in their whereabouts. It is a sturdy fighter and the words of Job find full application:

“When he raiseth himself up the mighty are afraid. He maketh the deep to boil like a pot.”

One may go to any good place like Boca Grande in May, June or July and be sure of plenty of fish. The sport has its ever-to-be-remembered incidental enjoyments. The changing colors of the sea and sky and the movement of the water; the presence and actions of myriads of birds; the marine life and the serene aspects of nature—all these gladden the heart of the fisherman and make an impression as deep as the capture of the fish.

As you journey northward your thoughts will revert to the incredulous friends who await your return, and you must con-

sider the form of report you will render when you are asked the question put to Job thousands of years ago:

“Canst thou draw out leviathan with an hook?”

The angler is cautioned that this question will be put by friends whose ideas of a large fish go back to a certain three-pound bass they captured over a decade before. So if they wag their heads sagely when you tell them of your exploits don't be crestfallen. True genius is rarely appreciated in this world. The art of telling a plausible story to your friends at home is sometimes harder than it is to lay its foundation by the capture of the fish. When your simple and truthful tale is derided as a clumsy and ill-constructed story false upon its face, you may find solace in reading these eloquent words of a famous angler and great man—Grover Cleveland:

“It is sometimes said that there is such close relationship between mendacity and fishing that in matters connected with their craft all fishermen are untruthful. It must, of course, be admitted that large stories of fishing adventure are sometimes told by fishermen—and why should this not be so? Beyond all question, there is no sphere of human activity so full of strange and wonderful incidents as theirs. Fish are constantly doing the most mysterious and startling things; and no one has yet been wise enough to explain their ways or account for their conduct. The best fishermen do not attempt it; they move and strive in an atmosphere of mystery and uncertainty, constantly aiming to reach results without a clue and through the cultivation of faculties non-existent or inoperative in the common mind. In these circumstances fishermen necessarily see and do wonderful things. If those not members of the brotherhood are unable to assimilate the recital of these wonders, it is because their believing apparatus has not been properly regulated and stimulated. Such disability falls very far short of justifying doubt as to the truth of the narration.”

A PARTIAL BIBLIOGRAPHY OF THE TARPON

- Aflalo, F. G.: "Sunshine and Sport in Florida and the West Indies;" G. W. Jacob & Co., Philadelphia, 1907.
- American Big Game Fishing, Derrydale Press, N. Y. 1936,
See Art. on Tarpon.
- Babcock, L. L. art. on "Tarpon", in Vol. 17 Lonsdale Library,
entitled "Sea Fishing," Seeley Service Co., London.
- Bailey, E. A.: "Tarpon Fishing in Texas;" Blackwoods, 158;
281.
- Beebe, William: "Galápagos: World's End" (Sharks).
- Beebe, William: "Beneath Tropic Seas," Putnam's Sons,
N. Y., 1928.
- Beebe, William: "Arcturus Adventure," (Sharks) Putnam's
(1926).
- Bishop, Fred: "Plugging for Tarpon," *American Angler*,
July, 1919.
- Bonbright, George D. B.: "Taking Tarpon with a Fly," *The
Sportsman*, Sept. 1929 (Excellent article).
- Breder, Jr. Charles M.: "Field Book of Marine Fishes of the
Atlantic Coast," Putnam's Sons, N. Y., 1929.
- Breder, Jr. C. M.: "Locomotion of Fishes," *Zoologica*, Vol.
4, No. 5, p. 247.
- Breder, Jr. C. M. art. "Young Tarpon on Andros Island",
N. Y. Zoological Soc. Mag. June, 1933. (An excellent art-
icle).
- Caine, L. S. "Game Fish of the South", Houghton, Mifflin &
Co., N. Y. 1935. (A useful book.)
- Cloke, Col. H. E., U. S. A.: "Flipping the Fly in Panama,"
Field and Stream.
- Country Life Library of Sport, *Fishing*, Vol. II, art., "Tar-
pon." Chas. Scribner's Sons, N. Y.
- Churchill, E. G. S.: "Tarpon Fishing in Mexico and Florida;"
Harrison & Sons, London.
- Dampier, William: See "Second Voyage to Bay of Campeche"
in Masefield's Edition of his Works.

- Dimock, A. W.: "The Book of the Tarpon;" Outing Publishing Company, N. Y., 1915.
- Dimock, A. W.: "Florida Enchantments;" Peekamouse, N. Y., 1915.
- Dimock, Julian A.: Outdoor Photography, *vide* Chap. X. Outing Publishing Co., N. Y.
- Ellsworth, Fred Bradford: "Light Tackle Sport in Florida," *American Angler*, April, 1919.
- Earl of Suffolk, Aflalo and others: "Encyclopaedia of Sport," "Art. Tarpon," Vol. II, p. 437.
- Endicott, Wendell: "Adventures with Rod and Harpoon along the Florida Keys," Stokes & Co., N. Y., 1925. (Excellent.)
- Felton, Thomas C.: "Tarpon Fishing in the Gulf of Mexico," Vol. XI, *Outing*, Jan., 1888.
- Fish and Fishing in Louisiana, Bulletin No. 23, Dept. of Conservation, La. 1933. (Excellent on all the Gulf fishes.)
- Fox, John, Jr.: "Tarpon Fishing in Boca Grande;" *Scribner's Magazine*, 59: 213, Feb., 1916.
- Frazer, Perry D.: "The Angler's Workshop;" *Forest and Stream Pub. Co., N. Y.*, 1908.
- Gill, Theodore: "The Tarpon, The Lady Fish and their Relatives;" Smithsonian Institution, Misc. Collections, Vol. 48. Quar. Issue, Vol. 3.
- Gleason, A. H.: "Best Tackle for Tarpon;" *Country Life in America*, 7:300. January, 1905.
- "Tarpon Fishing;" *Country Life in America*, 7:247.
- "Thrilling Sport of Tarpon Fishing;" *Country Life in America*, 7:247-54. January, 1905.
- Goode, George Brown: "American Fishes" D. Estes & Co., Boston, 1903.
- Graham, N. D. S.: "Tarpon Fishing at Aransas Pass;" *Outing* 35:473. February, 1900.
- Grant, Robert: "Tarpon Fishing." Out of Door Library. Scribner, 1897, Vol. Fishing.

- Grey, Zane: "Tales of Fishes;" Harper & Brothers, 1919.
- Gregg & Gardiner: "Where, When and How to Catch Fish on the East Coast of Florida." Matthews-Northrup Works, Buffalo, N. Y., 1902.
- Grenfell, W. H.: "Tarpon Fishing;" National 34:258.
- Griswold, Frank Gray: "Sport on Land and Water," 5 vols. 1913-1920 (privately printed).
- "Some Fish and Some Fishing," John Lane, Co., N. Y., 1921.
- "Fish, Facts and Fancies." Privately printed, 1923.
- Hallock, Chas.: "Camp Life in Florida;" *Forest and Stream*, Pub. Co. N. Y., 1876.
- Hay, O. P.: "Tarpon Fishing in Florida;" Outing, 31:378.
- Hedges, F. A. Mitchell: "Battles with Giant Fish." Small, Maynard & Co., 1924.
- Heilner, Van Campen: "Adventures in Angling." Stewart Kidd & Co., Cincinnati, 1922.
- Heilner, Van Campen: "The Leaping Tarpon," Vol. 28, *Natural History*, pp. 539-45., Sept.-Oct., 1928.
- Henshall, Jas. A., M. D.: "Camping and Cruising in Florida;" Robert Clarke & Co., Cin., 1884.
- Hobbs, W. B.: "Graining the Tarpon;" Outing, 23:491.
- Holder, Dr. C. F.: "The Big Game Fishes of the United States;" The Macmillan Co., 1903.
- "The Game Fishes of the World;" Hodder & Stoughton, London, New York and Toronto.
- "The Log of a Sea Angler;" Houghton, Mifflin & Co., 1906.
- "Big Game at Sea;" Outing Publishing Co., N. Y., 1918.
- "Salt Water Game Fishing;" Outing Publishing Co., 1914.
- Hudson, E. H.: "The Giant of the Mexican Gulf;" Outing, 45:721, March, 1905.
- Hulit, Leonard: "The Salt Water Angler," D. Appleton & Co., N. Y., 1924.
- International Encyclopaedia, 2d Ed.: Art. "Tarpon;" Vol. 21, p. 856.
- Jordan & Gilbert: "Synopsis of the Fishes of North America;" Smith. Institute, U. S. Nat. Mus. No. 16, p. 261.

- Jordan & Evermann: "American Food and Game Fishes;" Doubleday, Page & Co., 1902.
- "The Fishes of North and Middle America;" Smith. Institute, U. S. Nat. Mus. Bulletin 47. See: Family *LVI. Elopidae.*
- Jordan, D. S.: "Guide to the Study of Fishes;" Henry Holt & Co., 1905.
- Lewis, Capt. A. W.: "Tarpon Fishing on the Panuco River," *Outdoor Life*, Sept., 1924.
- Littlepage, Kemp B.: "Tarpon on a Fly-rod," *Field and Stream*, March, 1920.
- Marcgravius, Georgius: "Historiae Rerum Naturalium Braziliae," Amsterdam and Leydon, 1648.
- Meek, Alexander: "Migrations of Fish;" Edward Arnold, London, 1916.
- Mielatz, C. F. W.: "Anglers Battle Royal;" *Outing* 41:560-7; February, 1903.
- "Bagley's Crab Eating Tarpon;" *Outing* 38:2-7, April, 1901.
- "Tarpon Fishing;" *Outing* 41:560.
- Miller, I. W.: "Fresh Water Tarpon," *Field and Stream*, May, 1936.
- Miller, Stewart: "Fly Fishing Florida Salt Waters", *Field and Stream*.
- Miller, Stewart: "Florida Fishing", G. Howard Watt, N. Y., 1931.
- Pinckney, Frank S.: "The Silver King"; Anglers Pub. Co. N. Y. 1888.
- Rinehart, M. R.: "Gold Button Fish", *Good Housekeeping*, 95; pp. 38-41, August, 1932.
- Ward, Rowland: "The English Angler in Florida"; London, 1898.
- Wardlow, C. W.: "Grand 'Ecai", *Blackwood's* 239:239-52. Feby. 1936.

NOTE.—The student will find scores of articles in the pages of *Forest and Stream*, *Field and Stream*, *American Angler* and other sporting magazines.

SUGGESTED RULES TO GOVERN THE CAPTURE OF TARPON

Most of these rules have been taken from those of the Tuna Club of Avalon, Cal. The specifications of the Long Key Fishing Club provided for the use in tarpon fishing of an 18-thread line and a rod not over 6' 9", the tip weighing not over 12 oz. For the light tackle class a 12-thread line and a 6 oz. tip were specified.

SUGGESTED RULES

First—An angler must bring the unmutilated fish to gaff, unaided, by the use of the rod and reel only. A broken rod disqualifies the catch. The guide must not touch any part of the tackle save the leader. The fish is not regarded as captured until it is actually released or is gaffed and secured.

Second—An angler must fish with but one rod at a time.

Third—All catches for record must be weighed.

Fourth—Tackle must be exhibited with the fish at the time of weighing all fish.

Fifth—Leaders must not be longer than six feet.

Sixth—Double line not exceeding the length of the leader will be permitted. No substitute for double line.

Seventh—Handlining the double line or the use of a boatman's handline snapped on, or in any way attached to the leader, disqualifies the catch.

Eighth—Leaders may be of any material.

Ninth—Notice to the angler: Do not permit anyone to touch your tackle or assist you when you have a fish on, except as above provided.

Tenth—No tarpon shall be eligible for record in any class unless captured on a wood rod not heavier or shorter than those specified below under the respective classes, viz.:

Heavy Tackle.

- (a) Consisting of butt and tip and to be not shorter than 6' 9" over all. Tip to be not less than 5' in length and to weigh not more than 16 ounces; or

Light Tackle.

- (b) Consisting of butt and tip and to be not shorter than 6' over all. Butt not to exceed 14" in length. Tip to be not less than 5' in length and to weigh not more than 6 ounces; or

3-6 Tackle.

- (c) Consisting of a butt and tip and to be not shorter than six feet over all. Weight of entire rod not to exceed 6 ounces.

NOTE.—By tip is meant that portion of the rod from outer end thereof to point where same is assembled at butt with tip fully seated.

Eleventh—Lines used in any class to be manufactured from the grade of linen yarn known to the trade as No. 50. To establish a record for the capture of a tarpon in any class the largest size line that may be used is as follows:

For Heavy Tackle—24-thread line having a breaking strain of not to exceed 72 pounds when wet.

For Light Tackle—9-thread line having a breaking strain of not to exceed 30 pounds when wet.

For 3-6 Tackle—6-thread line having a breaking strain of not to exceed 20 pounds when wet.

NOTE.—Lighter lines than those above specified may be used in any class.

FORM OF AFFIDAVIT TO PROVE CAPTURE

STATE OF..... }
 COUNTY OF..... } ss.:

I,..... residing in the.....
 of....., State of....., being duly
 sworn, do depose and say:

That on the..... day of....., 193.....,
 at..... in the State of.....,
 I caught a tarpon actually weighing..... pounds, being.....
 feet..... inches in length and having a girth of..... inches,
 upon the following described tackle: (a) A wood rod..... feet
 in length, weighing..... ounces, consisting of a butt.....
 inches long, and a tip..... feet in length, the latter weigh-
 ing..... ounces, known as a..... rod; (b) A No.
 reel known as a.....; (c) A.....
 line having..... threads; (d) A leader of.....
 feet in length; and (e)..... (Bait or lure).....

That said capture was witnessed by the following disinter-
 ested persons:

..... of.....
 of.....

That said fish was weighed upon certain scales situate at
 in the presence of the following named
 persons:

Name

Address

.....
.....

I verily believe that said scales were accurate and that said capture was in all respects fair and sportsmanlike.

The name and address of my guide at the time of said capture was as follows:

.....of.....

I do further depose and say that I was unassisted by any person in the capture of said fish save that my said guide without touching any part of the tackle save the leader gaffed the same.

(Sign here)

Sworn to before me, this....

day of.....193.....

.....

Notary Public,

in and for.....

We, the undersigned, do hereby certify that we caused the above described tarpon mentioned in the above affidavit to be duly weighed and measured as therein set forth and certify that the above affidavit is true as to the weight and measurements of said tarpon and the tackle used in the capture thereof.

Dated at.....this.....day of.....
193.....

SHARK FISHING AT BOCA GRANDE PASS.

“Third Fisherman. Master, I marvel how the fishes live in the sea.

First Fisherman. Why, as men do a-land; the great ones eat up the little ones.”

PERICLES

When fishing is at its height and anglers are releasing many spent tarpon and miscellaneous fish, the sharks haunt the scene and become bold and voracious. There are about one hundred and fifty species of sharks, but on this portion of the West Coast the hammerhead, the gulf, the mackerel and the sand shark are most numerous, and it is the hammerhead which chiefly preys upon the tarpon when it is struggling to free itself from the hook of the angler. Sharks rarely attempt the capture of a vigorous fish which is free to defend itself by its speed, but Dr. Beebe has established by his submarine work that when a fish is struggling upon the hook and a wandering shark perceives that it is hampered, it is instantly attacked and devoured.

In 1928, at Boca Grande Pass, that veteran and accomplished angler, Hon. W. R. Turner, observed a shark seize a free tarpon which was rolling with others close to his boat. But such instances are rare. I have heard of only a few others.

After the angler has had one or more tarpon taken off his line by a predatory shark, he meditates reprisals and a few suggestions may not be amiss.

The necessary equipment for this fishing is neither costly nor elaborate. You will need a shark hook of moderate size. The hook should be equipped with a bronze cable to which a telegraph wire about ten feet long should be attached. The rope is then out of reach of the shark's jaws. The loop of the wire to which the line is attached should be wrapped with cloth to protect the line from cutting. Any strong rope will do as a

line which should be two hundred or more feet long. The hook is baited with a piece of tarpon or other good-sized fish and placed in a likely spot in the tideway. The line is fastened, preferably, high enough to be in view of the angler, so that he may pull it in when it is perceived to be whipping from the struggles of the shark. Sometimes the hook is baited and lowered about fifteen feet below the bow of the angler's boat and the angler proceeds with his fishing till the vibration of the boat indicates that a shark has seized the bait. The angler should equip himself with a heavy pair of gloves to protect his hands while playing the shark. Heavy cloth gloves answer the purpose admirably and can be purchased at any five and ten-cent store.

But it frequently happens that sharks will come close enough to the boat to be harpooned, especially when they scent a tarpon or a string of fish hanging at the bow.

For such an emergency the angler should equip himself with a harpoon of some kind mounted on a shaft from six to eight feet long, having a projecting rod at its lower end which loosely fits into a recess in the shank of the harpoon. The harpoon line, preferably a window sash cord of good quality, two hundred feet long, is fastened to the swivel of the bronze wire or chain attached to the harpoon and so rigged on the handle that a vigorous pull after the harpoon is attached to the fish will release the handle which held to the line by a loop floats on the surface and is picked up by your guide. You are now ready to get upon the bow of your boat and play the shark. The line should be dragged behind the boat till it is free from kinks and then coiled in a box, preferably a cheese box, so that it will render freely when the shark makes a run. The angler must take every precaution to keep clear of the line when the shark is running for if a loop of it should catch on his person or his clothes, he might be dragged overboard. It is well to play the shark carefully at first for the harpoon may pull out. It is

advisable to carry two harpoons and to try to get a second one into the fish as soon as possible for then the shark can be vigorously played with the comfortable feeling that if one harpoon pulls out you have another in reserve.

When the shark is brought up to the boat, it is still full of fight and oftentimes the angler tries to kill it with a revolver or rifle. It is far better and safer to employ a lance for a few jabs from it will soon kill the largest shark.

The harpoon usually has a long handle and it requires much practice and considerable strength and experience to throw it accurately. If the shark can be induced to come close enough to the boat, jab it with the harpoon instead of trying to make a cast.

The equipment described will cost about forty dollars and the expenditure is worth while for its use enlivens the day when fishing is poor or the tides are not propitious for tarpon.

As the season advances at Boca Grande, sharks increase in number and in size. In July during one of my early trips to this Pass we baited a line and laid it off the light-house pier, soon catching a shark which measured sixteen feet and four inches. Its stomach contained the generous piece of tarpon with which the hook was baited, another piece of tarpon, a cormorant, three horseshoe crab shells and at least one-half bushel of partly digested matter. Sharks are extremely voracious and will continue to grab at a string of fish tied on the boat even after they are mortally wounded. Hammerhead sharks, twelve feet long, are taken in these waters.

Sometimes sharks will take the tarpon bait and then the angler has his work cut out for him. The best thing to do is to run up as close as possible and cut the line. If it falls to the angler's lot to hook a mackerel shark, he will swear he has a tarpon till his eyes undeceive him, for the distant jumps of that specie sometimes mislead even the veteran angler. With

suitable equipment many happy hours will be passed in the pursuit of this enemy common to both angler and the tarpon.

You may wish to capture a shark with a rod and reel. I have taken some quite large on heavy tarpon tackle (24-thread line), but it is a tedious and unprofitable task. How hard does a shark pull?

Colonel Hugh D. Wise, of the Army, has made some interesting tests with a spring balance to determine this. (*Field & Stream*, Feb. 1936.) He found that a sand shark, 108 inches in length and weighing 245 pounds, could pull 99 pounds in surges and when fresh. When the fish tired, it could only pull 20 pounds. The average pull was 40 pounds. He concluded that there was no reason why a 1000-pound shark could not be taken from a moving boat with rod and reel, using a thirty-six-thread line with the drag set at 80 pounds.

It is a matter of common belief that when one shark is captured, the others will vanish. My observation bears this out; but it is hard to believe it to be true or to assign any adequate reason for it. I bring it to the attention of anglers for verification. I have referred to Dr. Beebe's experience with sharks while he was diving. In a conversation with him, I suggested that sharks doubtless would have attacked him if he had had the misfortune to wound himself and the shark had picked up the scent of blood. He replied that he frequently cut his feet on coral so that they bled freely and that sharks in close proximity paid no attention to him. When a tarpon is hooked it is a common sight to see a shark follow it up as a hound follows a deer and in such cases they will come right up to the boat in their lust for capture.

Dr. Beebe's researches have thrown a strong light upon the habits of fish for he has investigated them in their habitat and become a part of their own world. His description of sharks is fascinating. In his *Arcturus Adventure* he describes how he donned a diving helmet and baited up various fishes including many sharks. When a fish was impaled upon a hook its strug-

gles soon attracted sharks to the scene and the advent of the nearest shark caused others more distant to concentrate from which he concludes that sharks keep watch of others precisely as do vultures. While a fish was swimming freely the sharks seemed to pay it no attention.

From these experiments it is evident that the moment it perceives that a hooked tarpon is acting in an abnormal manner the shark not only undertakes its capture but others from afar join in the pursuit actuated by some sense, which he makes no attempt to explain. Fishes have a keen sense of smell, but have poor eyesight. They are near-sighted. Like a dog they perceive a body in motion much better than one at rest. Dr. Beebe observed that the struggles of fish, so attached to the line that they did not bleed, attracted the sharks. He concluded that it was the abnormal movements of the bait and not the sense of smell that led the shark to make the attack.

Tarpon anglers have an excellent opportunity to verify these conclusions.

I have read that fishermen of the South Sea Islands call up sharks by emptying cans of salmon into the tideway and that it is very effective. Holder baited them by pouring blood into the water.

I have used the blood method and this is the way I went about it. I procured beef blood in Buffalo and had it treated with a preservative so its smell would not drive us out of the boat. The boat was anchored at a spot where the bar shelved down sharply into deep water. A fish was suspended on a shark hook under the boat and a harpoon made ready to throw when the shark appeared. The blood was then poured into the tideway in a small stream. On two occasions sharks caught the scent and following it up, came to the bait, where they were harpooned before they seized it. One was a hammerhead and the other a gulf shark. They were played from the bow. A heavy window sash cord was used as a harpoon line and it answered very well. They were lanced and killed after quite a

struggle. The gulf shark measured 13' 11" but it tired after it had pulled the heavy power boat for thirty or forty minutes. I got nothing the next trip; but I am satisfied this method will attract a shark provided one is close enough to pick up the scent of the blood. It is easily struck because the fish suspended under the boat causes it to come up very close. It is exciting work and fine sport.

When a shark attacks a tarpon, the latter seems to run towards the tail of the shark. A shark is a fast swimmer but it is slow to stop or turn, which probably accounts for the tarpon's tactics. The hammerhead is very fast and quicker to turn than the others because it has a bow rudder on its head. Moreover, it has a very keen sense of smell.

The angler who devotes some of his spare time to the capture of sharks is a public benefactor and deserves well of his fellow men.

THE CAPTURE OF THE TARPON BY ROD AND REEL*

My experience has been limited to fishing at Boca Grande, Florida, using small crabs for bait. The method employed is for your motor boat to run up the tide either on the flood or ebb, and to drift with it.

In May and June the tarpon feed on the blue crabs which come out on the tide from their feeding grounds farther up Charlotte Harbor.

THE TACKLE

Some anglers still use "heavy tackle," consisting of a 16 oz. tip and a 24-thread linen line. A greater number now are using lighter tackle, consisting of a tip weighing about 12 oz. or less, and an 18-thread line. A few anglers use the regulation 6-9 tackle, but this has not become popular for the angler has very little control of the fish and must allow it to tire itself down in trying to rid itself of the hook. The time required, the extreme skill that is necessary, and the many lines broken, render this method impractical for the angler of ordinary skill or one who wishes to put some force into his work. We may gain some important lessons from these light tackle experts. I shall not discuss this method for it is simply one of individual choice. I will describe the outfit which I have found suited to my individual needs and taste. I think no rod equals a high-grade split bamboo tip, 5½ feet long, weighing about 12 oz. and made of very flexible cane joined to the regulation length butt composed of any material. A reel with ordinary adjustments for deep sea angling (No. 4/0 in size) and an 18-thread linen line 200 to 300 yards in length should be employed. The regulations of all first-class tarpon clubs allow a

* The following article was prepared for the third edition by Dr. John A. Gaines, of Tampa, Florida. He has consented to its reproduction. Dr. Gaines is a tarpon angler of great experience, having caught 355 tarpon. (1936.) His suggestions are worthy of careful study.

double line 6 feet up from its attachment to the wire leader. The leader should not be more than 6 feet long. Some method of fastening the end of the double line should be used that will avoid a knot in the line at this point, for a knot will reduce its breaking strength from 30% to 40%. This can very readily be done, and your guide or some angler will gladly show how it is accomplished. The line may have markers set at variable distances from the hook, depending upon your idea of the depth to fish.

THE HOOK

This is, to my mind, a very important part of the tackle. My preference is for a hook of rather large size 10/0 or 11/0. The larger is ordinarily my preference, for the following reasons: The mouth of the tarpon is large and can take this size of hook readily. It is also about nine-tenths composed of bony formation and the remainder is very hard and tough. By actual trial with a freshly caught tarpon, strong men have been unable to stand off thirty or forty feet and with heavy rod and line jerk with sufficient force to drive the hook so the barb will pass through the jaw. I do not believe the hook can be set even by repeated jerks, but it is driven in by the fish closing its jaws, probably in an attempt to crush and dislodge the offending and painful object. I like the large hook because its size allows the jaw to strike it in the most favorable position to drive it through the bones of the upper jaw. This is favored by the method of fishing done at this season at Boca Grande. A lead of $\frac{1}{2}$ to 1 lb. is fastened to the wire leader at the swivel. The weight of the sinker depends upon wind and tide. The sinker should hold the line almost straight under the boat, and when the tarpon takes the bait a quick jerk pulls the line and leader in a direct line from the tip of the rod to the fish's mouth, thereby pulling the shank of the hook straight up. This brings the point of the hook against the roof of the fish's mouth, with the bend of the hook in position to be struck

by the lower jaw when the fish's mouth is closed. I am convinced that this alone results in setting the hook. I believe also that unless this is done before the fish jumps, it is never done, for the fish usually throws the hook on his first jump. I have landed tarpon and found the point of a 11/0 hook bent at a ninety degree angle in being driven through the bones of the mouth. One can judge how futile it is to attempt to set a hook through striking by trying to lift a 5 lb. weight off the floor at right angles to his rod. A jerk will set the point of the hook in the jaw and a steady pull will hold it there until the fish drives it home with the lower jaw. I believe the large size hooks lend themselves to this better than too small a hook. I am also of the opinion that the wire of a hook larger than 11/0 is so thick that the hook is easily seen by the fish. I like a hook with the smallest shank that is strong enough to stand the strain, and one in which the point of the hook stands out from the shank about $\frac{1}{4}$ inch farther than does the regulation "Captiva" hook.

DEPTH OF FISHING

The channel at these fishing grounds averages about 45 feet but it has many deep holes. At some places the bottom drops to 90 feet in average conditions of the tide. The average depth at which you can fish without getting the hook caught on the bottom is about 40 feet, and the guide usually places a marker on the line at this depth, which gives the best results for one unfamiliar with the conformation of the bottom. Some anglers fish the bottom at all times; and by this is meant that every little distance, (say about each 100 or 200 feet) the line is dropped down until the lead weight strikes bottom, when it is quickly reeled up for about three turns of the reel so as to allow the hook to clear the bottom. This is consistently done in deep or shallow water. The theory of this is that the tarpon is a "bottom feeder", or a fish that looks for its food on or near the bottom, regardless of the depth of the water. Others be-

lieve that the fish feeds more often near the surface, or near the 36 foot depth. I am convinced that the angler who fishes at the shallower depths will, over a long period get many more strikes than the one who fishes bottom. Yet, there are conditions of weather and water, when the deeper levels are more productive for the tarpon will feed where the food it is taking is most plentiful. This governs the depth at which the fish are found, and varies quite considerably with the swiftness of the tide and the conformation of the bottom. As to the fish themselves, I can hardly regard them as bottom feeders when the protruding lower jaw is studied. Nature is not given to making mistakes in her children, and all fish that take their food from the bottom either possess the sucker or drum form of mouth, with the lower jaw rather receding, while the tarpon's mouth is peculiarly adapted to feeding from below.

The greater part of the time I fish at the 35 to 40 feet depths, but occasionally better results are obtained at lower levels. For a portion of the time I have had better success by fishing the bottom but this quite rarely occurs. Under some conditions, 20 to 25 feet will get a greater number of strikes.

It is much more difficult to set a hook at the shallower levels, as the fish jumps immediately on feeling the strike. It is quite possible for the fish to drive the hook well in the first time the mouth is closed, but the longer it struggles under water before the first jump, the greater will be the chance that it will become well hooked.

STRIKING THE FISH

This brings me to a consideration of the strike. Many anglers strike again and again, with all the force the rod will stand until the fish becomes frightened and jumps. One following this plan hooks more fish by fishing at the greatest possible depth as the fish will not come up for the jump so quickly as it will from the shallower depths. However, fewer fish are hung at the shallower depths by this method, and at very shallow

depths most of them jump immediately and throw the hook, except when the hook happens to be set by the early closing of the jaws. In cork fishing, the cork allows them to go down and holds a taut line, with a steady pull. This method gives better results in the shallower waters.

I am convinced that the best results follow one quick moderate jerk succeeded by a steady pull so as to keep the hook in position. This is also proved by the fact that those using a 6 oz. tip rarely fail to securely hang a tarpon because it is not possible with the light tackle to do more than merely hold a taut line. With this tackle it is often several minutes before the fish will jump. This, to my mind, shows the advantage of light handling with any tackle.

In fishing for so elusive a fish as the tarpon, which is so susceptible to changes of weather, and is so hard to learn anything definite about, it requires the taking of a great many fish in varying weather to enable one to prove or disprove anything that one may think occurs. The deep sea existence and migratory habits of the tarpon make them difficult to study and to gain an accurate idea of the best thing to do under given conditions. Tarpon anglers are, as a rule, very reticent when asked by a beginner for instructions. This is not "pure cussedness" on the part of the angler, but is due to the fact that while he has very definite opinions he so often fails to take fish himself that he fears his disciple may feel that he has been wilfully misled or, at least, if he had done some other way his luck might have been better. I, therefore, beg of you, my reader, to consider I am only telling you frankly the methods that have improved my own record and proved much more productive for the three years I have used them than when I only fished the bottom and jerked as hard and as often as I could until the fish had jumped and thrown my hook. I have yet much to learn and so I vary my depth of fishing, dependent upon conditions of the tide. With no intention of being dogmatic, my only hope is that I may be of some help to

the man with an open mind who has not, so far, been lucky at tarpon fishing.

PLAYING THE FISH

As soon as a strike occurs, the angler notifies the guide, who is ever on the alert. He will start his engine and move as quickly as possible to avoid the danger of the fish falling into the boat as it returns to the water after the leap. When sufficient distance is gained to avoid this mishap, he stops the boat. After several leaps or jumps, sometimes 10 or 12 feet above the water, the fish will sound near the bottom. It should then be held steadily. The boat is then started very slowly and the fish can be led from the school of fish and out of the way of other anglers drifting through the same school. The fish will probably make a run of from one hundred to three hundred feet, and on pumping it in near the boat it will often repeat the run. At such times a very moderate drag on the reel should be maintained for the friction of the line in the water gives a surprising drag or weight on the swiftly moving fish without aid from the drag on the reel. When the fish stops it is pumped in. A word about this pumping is not amiss based on my observation of anglers and from my own experience. When the tip of the rod is slowly raised drawing the fish closer, the slack made by lowering the tip is taken in by turning the handle of the reel. If the tip is lowered too fast or an effort is made to retrieve too much line on the reel, there will be a jerk when the line comes taut again. When this occurs the fish will resist and will usually take out part or all of the line retrieved. If, on the other hand, the line is held taut at the end of the lift of rod, which is evenly lowered and one or, at most, two turns of the reel handle is made, carefully avoiding any sudden change of tension on the line, the fish may be rapidly brought in. At times the tarpon will make such a long run that the boat must follow to prevent taking too much line from the reel. This is especially true if the fish should see a shark

soon after being hung. From time to time you should notify your boatman of the amount of line you have out.

LANDING THE FISH

When the fish is sufficiently played down for the boatman to handle it, it is pumped in so he may reach the leader. The rules of the fishing clubs disqualify your fish if the guide touches the line above the leader. He then draws the fish in by the leader until he can insert a short barbless gaff or releasing hook in the fish's mouth. The hook can then be taken out and the fish released uninjured. The method of releasing the fish without pulling their heads up against the rail of the boat was developed by my guide, Rupert Guthrie, after I had protested against the usual method of releasing fish. He released his fish in the water and refrained from pulling their heads up against the boat. Usually the fish is pulled up against the side or end of the boat and held firmly until it ceases to struggle, when the hook is removed and the fish released. This is done in the firm belief that the angler is saving the fish by thus releasing it. As a matter of fact the fish struggles and beats its head against the boat until it is utterly exhausted and subdued, and bleeding gills result from the pounding. Those fish rarely escape becoming food for the sharks for even a small shark can kill and eat a large tarpon when found in this condition. When a fish is bleeding a shark will run it down when it tastes or smells blood in the water. By the method suggested, the fish is uninjured and still has sufficient life to escape a shark, unless it is struck immediately on being released and before it realizes its freedom.

There are good hotels at Boca Grande, about two miles from the Pass. There is a most excellent hotel, with beautiful surroundings and a fine cuisine at Useppa Inn, Useppa Island, about six miles from the Pass, where there are usually a number of delightful anglers during the fishing season.

While both places have good boatmen or guides, as they are called here, Useppa has the advantage in being about equidistant between Boca Grande and Captiva Passes, each Pass requiring about a forty-minute trip.

This chapter is not written for the angler who knows all about tarpon fishing, but for those who, like myself, are seeking a better way both to enjoy the sport and to conserve the released fish.

THE EYE OF THE TARPON*

The eyes of the deep sea fishes are of two quite different types; those with very large and well-protected eyes and those in which the eyes are small, imperfectly developed or rudimentary. The first go down to depths of one or two hundred fathoms. The habitat of the second is in the abysmal deeps. In the former the pupils are widely dilated, the lens is spherical and every structural arrangement is adapted to gather in as many as possible of the light rays. Visible light is absorbed by the water and it grows dimmer rapidly as it leaves the surface until in the profounder depths, absolute darkness prevails. Here many of the fishes are blind, others have electric or phosphorescent organs which give some luminosity. Below two hundred fathoms or thereabouts, the deep sea fishes that also come to the surface cannot go, as the pressure of the water becomes enormous, being over a ton to the square inch for each 1,000 fathoms of depth. To sustain this pressure the entire structure of the creature including that of the eyes has great power of resistance. Below two hundred fathoms no animal adapted to life in the upper levels could exist.

The abysmal fishes are predacious. They do not resist the great pressure in the profounder depths but are sponge-like in form, the water passing through them. In their struggles with other fishes, they are sometimes brought to the surface when the gases expanding, tear the tissues to pieces. The eyes of the pelagic fishes that swim in the deep waters have every structural arrangement to adapt themselves to changing pressure, soft fatty tissues in the orbit against which the eyes may rest without being crushed and internal structures which allow the passage of fluids from front to back. The eyeball is completely enveloped in the orbital tissues with the exception of the cornea which is flat and clear.

*Dr. F. Park Lewis, of Buffalo, an eminent authority on the eye, has made a scientific research into the eye of the tarpon, which I believe is the pioneer study on this subject. I here set it forth with my thanks to the Doctor for his kindness.

In the light of the early morning and evening as the tarpon jumps from the water in its terrific struggles the eye is said to have a baleful glare that strikes terror to the heart of a timid observer but which is wholly out of proportion to his actual menace because the sight of the great creature in its native element is poor and totally useless in our atmosphere. The reason of this is a quality of fluorescence which the huge lens possesses. The ultra violet rays which are almost if not completely invisible to our eyes, are still quite abundant in the twilight and striking the lens through the large round pupil, they cause it to shine with a luminescent glow. The eyeball is flattened both on the corneal and the posterior side. The choroid gland between the retina and the sclera is covered with flat plates of a highly reflecting substance called "guarin." This catches the remaining rays of daylight which are shot back in scintillating gleams. The reflection of the shining cornea and of the glittering silvery surface of the iris together with the excitement of a struggle from a small boat on the ocean in the dimness of early morning, gives to the eye of the creature a malevolence it is difficult to realize.

The tarpon is a prototype of the prehistoric forms of which fossil remains are still in existence. These date back to the carboniferous era and in the tarpon the characteristics of these earlier forms are found.

The eye of the tarpon has never as far as the writer can learn been intensively studied and only an outline of its gross anatomic features can be presented here.

The eye of the tarpon is protected by veritable armor plates in the large, heavy enamelled scales closely fitting around the orbit. These are detached only with great difficulty. The structure of the eye itself is dense and firm and calculated to resist the great pressure of the deeper water. The integument of the head forms a margin around the globe. While the skin over the body of the fish is silvery white, a black streak extends along the back and surrounds the eyes. The eyes are large and striking from which it gets the name "Megalops." They are

situated in the extreme upper and anterior part of the head, and are slightly smaller than are those of the horse. The eye is so encased in the orbit that its size is not apparent until it has been removed.

The orbit is an oval bony cavity opening forward and outward. The long diameter is from the front back pointing slightly upward and inward from the median line of the head. The top of the eye is almost level with the slanting ridge of the snout. The optic nerve joins at the chiasm and the position of the eyes in the head would indicate the presence of binocular fixation. The measurements of the eyeball are laterally fifty millimeters in the widest part and forty millimeters in height.

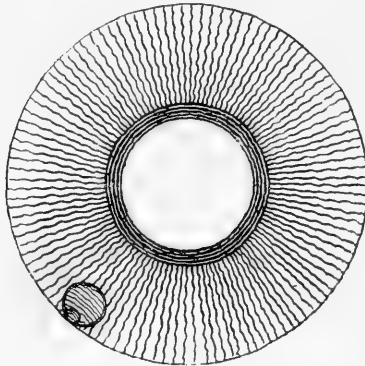
The anterior part of the eyeball is of bone and cartilage and is bluish black. The cornea is almost flat, having normally a slightly curved surface. At the equator the color disappears, the black suddenly merging into an ivory or yellowish white. The back of the ball is covered by a flat and soft, but dense membrane through which the optic nerve passes. A space of more than an inch between the ball and the back of the orbit is filled with heavy muscles, vessels and fat. On the outer side of the optic nerve entrance to the eyeball is a white body about the size of the optic nerve and entering the cranial cavity.

The cornea is oval in its horizontal diameter having a width of 50 m.m. and a height of 40 m.m. The central part is circular and has a diameter equal to that of the pupil (20 m.m.). The transparency extends from the pupillary margin to the periphery where its junction with the sclera is marked by a black band 1 m.m. wide. From the center of the cornea which is 1 m. m. in thickness to a point midway between this and the margin the thickness increases to 3 m.m. after which it again decreases at the circumferential border to 1 m.m. where it joins the sclera in which true bone is incorporated with the sclera fibres.



The tarpon's cornea is thinner in the center, grows thicker at the pupillary margin, and thins again as it joins the sclerotic coat.

Between this thickened point and the margin the iris is closely applied to the cornea except at the pupillary margin where it is free. The bony tissue continues for 20 m.m. back when the sclera becomes a thick firm membrane. It changes also in color from shiny black to ivory yellow. The globe would be spheroidal were it not for an added hemisphere occupying the inner side, the diameter of the greater sphere being 40 m.m., that of the smaller, 20 m.m.



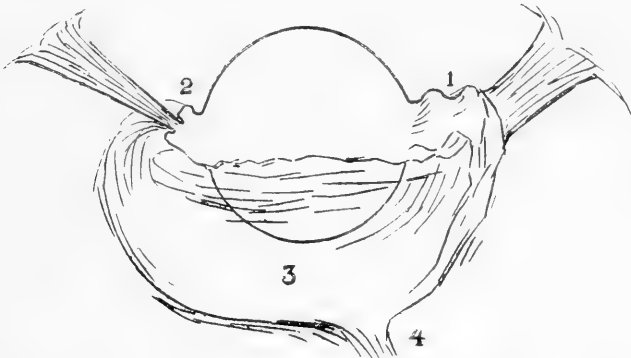
The iris of the tarpon with the pupil normal size. In the lower inner portion will be seen a small circular opening in which the outer membrane is lacking. At its margin a valve-like opening is found.

The iris is of a golden yellow hue and is closely applied to the thickened margin of the cornea including a space 3 m.m. in extent on the attached side, 1 m.m. on the pupillary margin side being free. The broad iris surrounding the pupil has a silvery sheen.

The pupil is 17 m.m. in diameter. The margin of the iris is hidden under an opaque border extending for 8 m.m. into the clear cornea. When this is scraped away a most interesting and unusual feature is discovered. In the lower and inner part of the iris at the inner margin is a circular space about 3 m.m. in diameter in which the outer layer is absent. At the lower portion of this is a line passage through which a probe cannot be passed nor fluid forced but which is probably a valve opening from the posterior chamber.

At the iris margin behind the iris is an attached membrane constituting the outer and anterior portion of the vitreous humor. Immediately above this is the pigmented band of fibrous tissue to which the inner pole of the lens is attached.

The lens is most distinctive. It is globular like that of most fishes, having a diameter of 14 m.m. At each of its lateral poles is an extension of lens substance to which is attached a broad, smooth, fibrous membrane (the *processus falciformis*). This projecting substance is about 4 m.m. in extent and is set in a position opposite to that of the equatorial diameter to which the vitreous is lightly attached.



Sketch of the crystalline and vitreous. The projections (1 and 2) from the poles of the crystalline lens differ in appearance, that on the nasal side, No. 1, is broader and its termination is continuous with the vitreous; No. 3. That on the tem-

poral side, No. 2, is also continuous with the vitreous. Both sides are also attached by broad pigmented fibrous bands which are firmly attached on the one end to the lens projection and on the other to the juncture of the iris margin and choroid allowing a certain amount of rotation and lateral motion to the lens but still holding it in its position behind the pupil.

These lenticular enlargements which are firmly attached to the juncture of the iris and choroid, differ in form. That on the nasal side being fan-shaped and continuous with the vitreous of which it forms a part; and that on the temporal side has an opening in its center into which is attached the pigmented band. It is also on its under side continuous with the vitreous. The lens is swung in a hammock-like membrane of smooth fibres which envelopes its posterior half by which it is moved.

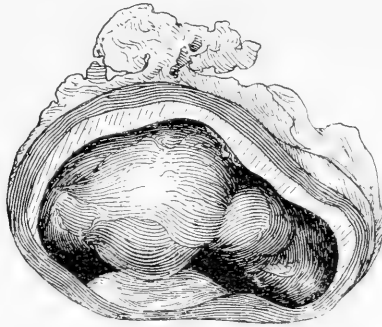
The vitreous is also somewhat loosely attached to it along its whole equatorial extent between the poles. The vitreous is also attached firmly around the optic nerve entrance. Within the vitreous are rounded portions of greater density which may change their position by pressure behind the crystalline lens so as to give added focal values in different directions. This movement of the vitreous is provided for by the cup-like addition to the globe in which there must be a less dense fluid which flows from side to side as the motion of the vitreous and the lens takes place. The attachments to these projections on the lens are such that its motion is also accompanied by a rotation of the lens. The extension of the vitreous from the inner lens projection reaches to the posterior portion of the valve-like opening in the iris, and is probably tubular allowing for the equalization of pressure by the passage of the less dense fluid probably of the nature of the aqueous, from the posterior to the anterior chamber.

This peculiar connection between the iris and the posterior chamber is also found in the swordfish, in the octopus and possibly in other of the deep sea fishes.

A thick oily choroid gland $2\frac{1}{4}$ to 3 m.m. in thickness is found at the posterior pole and thinning gradually until it ceases at the ora seratta. The optic nerve somewhat flattened bends sharply on leaving the eyeball crossing to reach the brain.

The sclerotic in its posterior portion becomes membranous. The optic nerve is hidden in a mass of white oily tissue with the immense extra ocular muscles exerting pressure as they move the flattened eyeball.

The muscles of the eyeball are exceedingly heavy and strong, the one passing under the eyeball having at its insertion a diameter of 10 m.m. and a thickness of 5 m.m. The change of focus is accomplished by a change of position of the crystalline lens and vitreous, doubtless through the pressure of the extra ocular muscles.



Section through the eyeball showing the relative position of the cornea and lens with the cup-shaped additional cavity for the regulation of pressure on motion of the lens and vitreous.

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