

**Article XXIV.—NOTES UPON NEW YORK FISHES
RECEIVED AT THE NEW YORK AQUARIUM,
1895-1897.**

By TARLETON H. BEAN.

Since May 1, 1895, the Aquarium has received 165 species of the fishes of New York, of which 124 species are marine or anadromous, and the rest fresh-water forms. The marine fishes have been collected chiefly in Gravesend Bay, Long Island, in the traps and other fishing apparatus belonging to John B. De Nyse, a veteran fisherman, whose knowledge of the migrations of coast fishes and of the history of the fishery in that bay is extensive and accurate. Many rare species that would escape the notice of the average observer are recognized and sent to the Aquarium, usually alive, by Mr. De Nyse and his sons.

The writer has made occasional excursions to Shinnecock and Peconic Bays, Sandy Hook and the ocean beach at Southampton, Long Island, the Bronx River, and to several lakes in Central Park and Prospect Park, Brooklyn. The New York Commission of Fisheries, Game and Forest, has contributed many species, both living and dead, for exhibition or identification, and additional materials have come from the South Side Sportsmen's Club of Long Island, and from James Annin, Jr., of Caledonia, N. Y.

It is well known that systematic seining along the shores in the vicinity of New York City would add many species to this list, but the present exhibit will serve to indicate the wealth of the marine fish fauna at least, and, at the same time, introduce a number of species of rare occurrence or new to the region. The Short-nosed Sturgeon (*Acipenser brevirostris*) has been living in one of the pools since May, 1896, and has taken hard clams (*Venus mercenaria*) regularly for food.

A species of *Harengula* was caught at Gravesend Bay in 1895. No species of the genus has been known to occur north of the Gulf of Mexico before. Hoy's Whitefish (*Argyrosomus hoyi*) has been taken only in Lake Michigan until Mr. Annin found it in

Canandaigua Lake, N. Y., where it is abundant. The Fresh-water Silverside (*Menidia beryllina*), previously known and rather rare in the Potomac River, is common in a little stream at Water Mill, Long Island. The Thread-fin (*Polydactylus octonemus*), which has not been observed in our waters for thirty years, was secured in Gravesend Bay, Sept. 24, 1896. Three examples were obtained. The Surmullet (*Mullus auratus*), an occasional visitor from southern waters, ranging north to Cape Cod, was reported abundant at Sandy Hook in September and October, 1897, by fishermen. Three individuals were seined for the Aquarium Oct. 8, and, at the time of writing, one of them is alive.

A large Amber-fish (*Seriola* sp.) was captured in August, 1896, at Gravesend Bay, Long Island, and brought in for identification; its measurements are given in the proper place. The Runner (*Elagatis bipinnulatus*), belonging to the West Indian fauna, was once before recorded from Long Island; a single example was taken in Gravesend Bay, in August, 1895. The Banded Larimus (*Larimus fasciatus*), which is not a common species, has been reported from Chesapeake Bay to the Gulf of Mexico. Two individuals were brought alive from Gravesend Bay in August, 1895, and lived in the Aquarium until December, when they succumbed to the cold water at a temperature of 43° Fahr. They fed freely upon shrimp. The Parche (*Chætodon ocellatus*), a West Indian species, occasionally found in summer in Rhode Island and New Jersey waters, was obtained in Gravesend Bay.

A young Surgeon-fish (*Teuthis hepatus*) was captured in Gravesend Bay, Oct. 20, 1897; this occurs in the West Indies and Gulf of Mexico; it was previously known as far north as Charleston. Young Trunk-fish (*Lactophrys trigonus*), belonging to the West Indian fauna, are carried occasionally by the Gulf Stream northward as far as Massachusetts. An example was found in Gravesend Bay, Aug. 28, 1897; it could not be kept alive long in a balanced jar, but it fed regularly for about ten days on minced clam. The Spotted Codling (*Phycis regius*) is not an uncommon fish in Gravesend Bay in October; several individuals were obtained this year. The species often lies upon its side very much like the Tautog and many Flounders.

Pterophryne histrio was found floating in New York Bay in August, 1897; it occurs occasionally in summer as far north as Cape Cod, but belongs to the tropical parts of the Atlantic.

In this paper the species are arranged in the order in which they are given in 'A Check-list of the Fishes and Fish-like Vertebrates of North and Middle America,' by David Starr Jordan and Barton Warren Evermann. The names, almost without exception, are written as they stand in that work. The notes were made from time to time during the entire period mentioned in the title whenever suitable dead fishes became available for observation; and additional data were secured by a study of living individuals. I am under obligations to Mr. L. B. Spencer and Mr. W. I. De Nyse for many important notes upon the feeding habits. Most of the species here recorded have been presented to the American Museum of Natural History.

1. ***Petromyzon marinus* (Linnaeus).** SEA LAMPREY; LAMPREY EEL.—The Lamprey has been obtained in Gravesend Bay in March, April and June in small numbers. It has never been kept alive long in the Aquarium because of the impracticability of furnishing it with proper food.

2. ***Mustelus canis* (Mitchill).** SMOOTH DOGFISH.—The species has been brought alive from Gravesend Bay in August, September and October. In the Aquarium it is restless and delicate, often coming to the surface and struggling as if trying to escape from the pool.

3. ***Sphyrna zygaena* (Linnaeus).** HAMMER-HEADED SHARK.—Not common in Gravesend Bay; occasionally taken in August and September, but never brought alive to the Aquarium because of its great liability to injuries of the eyes.

4. ***Carcharias littoralis* (Mitchill).** SAND SHARK.—A young male received from Gravesend Bay, Long Island, on June 26, 1895, died in the Aquarium Dec. 19, 1895, when the temperature of the water in the pool containing it was 53° Fahr. The following notes were made upon the specimen in the fresh condition:

Color, bronze gray with light brown blotches, the largest about as long as the eye. Belly and other lower parts white. Eye yellowish. Tips of pectorals,

ventrals, dorsals, anal and caudal above and below with a narrow black streak. Numerous minute dark specks on the under surface of snout and suborbital region, extending back to angle of mouth.

Two rows of teeth in function above and three below. Length of longest tooth in lower jaw, $\frac{1}{2}$ inch; in upper jaw, $\frac{3}{8}$ inch.

MEASUREMENTS.

| | |
|--|---|
| Length..... | 3 ft. 6 in. |
| Depth of body..... | $6\frac{1}{2}$ in. |
| Least depth of caudal peduncle..... | $1\frac{1}{8}$ in. |
| Tip of snout to perpendicular through last gill-opening..... | 10 in. |
| From first to last gill-opening..... | $2\frac{1}{2}$ in. |
| Depth of gill-openings..... | 2 in. |
| Snout..... | $2\frac{1}{2}$ in. |
| Eye to spiracle..... | $1\frac{1}{2}$ in. |
| Eye..... | $\frac{1}{2}$ in. long, $\frac{3}{8}$ in. deep. |
| Snout to nostril..... | $1\frac{1}{4}$ in. |
| Width of nostril..... | $\frac{5}{8}$ in. |
| Distance between nostrils..... | $1\frac{1}{4}$ in. |
| Nostril to front of mouth..... | $\frac{1}{2}$ in. |
| Length of mouth opening..... | $2\frac{3}{8}$ in. |
| Width of mouth, including labial folds..... | 4 in. |
| Length of labial fold..... | 1 in. |
| Labial fold to first gill-opening..... | $3\frac{3}{4}$ in. |
| Snout to first dorsal..... | 16 in. |
| First dorsal base..... | $3\frac{1}{2}$ in. |
| Middle of dorsal base to top of fin..... | 3 in. |
| Length of posterior margin of dorsal..... | $1\frac{1}{4}$ in. |
| From first to second dorsal..... | 5 in. |
| Length of second dorsal base..... | $2\frac{3}{4}$ in. |
| Middle of second dorsal base to top of fin..... | $2\frac{1}{2}$ in. |
| Posterior margin of second dorsal..... | $1\frac{1}{2}$ in. |
| Second dorsal to caudal pit..... | 3 in. |
| Caudal from pit..... | 12 in. |
| Lower caudal lobe..... | $9\frac{3}{8}$ in. |
| Terminal caudal lobe..... | 3 in. |
| Snout to pectoral, obliquely..... | $10\frac{1}{2}$ in. |
| Length of pectoral..... | 5 in. |
| Lower margin of pectoral..... | $2\frac{1}{4}$ in. |
| Extended pectoral not quite reaching to perpendicular through front of dorsal. | |
| Ventral origin slightly behind end of first dorsal base. | |
| Length of ventral..... | $3\frac{1}{8}$ in. |
| Inner margin of ventral..... | $1\frac{1}{4}$ in. |
| Vent to tip of clasper..... | $1\frac{1}{2}$ in. |
| End of ventral base to origin of anal..... | $3\frac{3}{4}$ in. |
| Anal base..... | 3 in. |
| Hind margin of anal..... | 1 in. |
| Depth of anal..... | .2 in. |
| Anal base to origin of lower caudal lobe..... | $1\frac{1}{4}$ in. |

5. *Squalus acanthias* *Linnaeus*. HORNED DOGFISH.—The Spined Dogfish has been brought from Gravesend Bay in October only; it is common on the fishing banks off the New Jersey coast. The species is not hardy in captivity.

6. *Squatina squatina* (Linnaeus). SHARK RAY; MONKFISH.—The Shark Ray has not been received alive, and is to be found only in the bays adjacent to the Atlantic. It appears occasionally in Gravesend Bay in summer.

7. *Raia erinacea* Mitchill. COMMON SKATE.—The Prickly Skate was received from Gravesend Bay in November, 1897, and the eggs came from there in March, 1896. The species has deposited eggs in the Aquarium in winter. It will not live in the tanks in summer, but endures the spring, fall, and part of the winter.

8. *Raia lævis* Mitchill. BARNDOR SKATE.—This Skate has come to the Aquarium from Gravesend Bay in October, 1896 and 1897. It is short lived in captivity because of the want of sand and mud, and the difficulty of providing suitable food. Individuals have been kept alive three or four months.

9. *Dasyatis centrura* (Mitchill). STING RAY.—The Sting Ray is rare now in Gravesend Bay, where hundreds were formerly taken every year. It will live in the Aquarium several months in the spring and summer.

10. *Pteroplatea maclura* (Le Sueur). BUTTERFLY RAY.—A very rare species in Gravesend Bay, and does not endure a captive life.

11. *Rhinoptera bonasus* (Mitchill). COW-NOSE RAY.—Rarely seen now in Gravesend Bay.

12. *Acipenser sturio* Linnaeus. STURGEON.—A female eight feet long was brought from the mouth of the Delaware River and placed alive in a pool on May 20, 1897. At this time (Dec. 7) it is still apparently in good condition. Rock crabs, soft clams and opened hard clams have been used for its food, but it seems to have eaten little or nothing until December first, when it began to feed freely upon opened hard clams. The species appears every spring in Gravesend Bay, and sometimes in the fall. It is hardy in the Aquarium.

13. *Acipenser brevirostris* (Le Sueur). SHORT-NOSED STURGEON.—The species was obtained in Gravesend Bay May 14, 1894, and a single example was brought alive to the Aquarium on May 13, 1896. It has taken food regularly, and is now living (Dec. 7, 1897). It came in company with five young individuals of *A. sturio*. The species has proved to be well adapted to aquarium life. It is rarely seen in Gravesend Bay.

14. *Ameiurus nebulosus* (Le Sueur). BULLHEAD.—The young were seined in the Bronx in August, 1897. Larger examples were forwarded by the New York Commission of Fisheries, Game and Forest, from Canandaigua Lake in November, 1896, and November, 1897; also from Saranac Lake in November, 1897. The fish feed freely upon hard clams and earth-worms; liver is given to them occasionally. Several albinos were obtained from Hackensack Meadows, N. J., in August, 1897. They are now (Dec. 7) six inches long, and have grown to that length from three inches in three months.

15. *Catostomus commersonii* (Lacépède). SUCKER.—This Sucker was obtained from Canandaigua Lake in November, 1896, and November, 1897; from the Bronx young individuals were received in August, 1897; from Saranac Lake the New York Commission forwarded the small mountain form, distinguished by its size and red color, in November, 1897. The Canandaigua Lake Suckers thrived in the Aquarium until July, 1897, when they were all killed by warm water. The food is chiefly hard clams, with earth-worms occasionally.

16. *Erimyzon sucetta* (Lacépède). CHUB SUCKER.—The Chub Sucker was seined in the Bronx in August, 1897, and Prof. Ulric Dahlgren sent one example from near Princeton, N. J., in September, 1897. The latter, when it arrived, had the broad, longitudinal, median band well developed and the vertical bands obsolete; but soon after it was placed in the Aquarium it obscured the longitudinal band entirely and developed the vertical bands.

17. *Cyprinus carpio* Linnaeus. CARP.—In November, 1896, a number of Carp, none of them above two pounds in weight, were presented by the U. S. Fish Commission. During the last summer two female Leather Carp died as a result of retention of the eggs. In October, 1897, several large examples were seined in the lake at Prospect Park, Brooklyn. The food of this species is hard clam, earth-worms, wheat, corn, lettuce and cabbage. Their growth is remarkable. A Leather Carp has fully doubled its weight in one year.

18. *Carassius auratus* (Linnaeus). GOLDFISH.—Goldfish have been obtained from lakes in Central and Prospect Parks, and from fountains in Gramercy Park and Bryant Park. A specimen was kept in a fountain at the Old Reservoir (42d Street and 5th Avenue, New York) by Patrick Walsh nine years, and was then presented to the Aquarium. The triple-tail variety was a gift from Mr. E. G. Blackford. From the Cold Spring Harbor hatchery of the New York Fish Commission a number of remarkably large goldfish were obtained. One was a typical fan-tail; another resembling this in color had the form of the regular goldfish; still another was so deep-bodied that he could scarcely swim in equilibrium—all of these were from the same lot of eggs. This fish has never been troubled by fungus or parasites.

19. *Semotilus atromaculatus* (Mitchill). CHUB; FALL-FISH; DACE.—A number of large Chub were sent by Mr. Annin from the Fish Commission station at Canandaigua Lake in November, 1896, and again, in the same month, in 1897. Some of the first lot were 14 inches long in July, 1897. All of the first shipment died in July, 1897, from the effects of warm water. They fed freely on hard clam and earth-worms and, occasionally, live killifish.

20. *Abramis crysoleucas* (Mitchill). ROACH; GOLDEN SHINER.—Abundant in the lakes of Central Park and in the Bronx; not found in the large lake of Prospect Park, Brooklyn, in seven hauls with a large seine. They feed freely upon chopped hard clam, and do not like earth-worms. The species spawned in their tank in May, 1897, and their young are now 1½ inches long.

21. *Abramis crysoleucas*, variety. IRISH ROACH.—About the end of June, 1896, two females and one male were found to be ready to spawn. The females cast their eggs, but they were immediately eaten by the fish. The fish is always extremely shy. It takes hard clam readily, and does not care for earth-worms. This variety is distinguished by its short and deep body, uniform size of scales and permanent vermilion color of the pectorals, ventrals and anal. The example studied has D. i, 7; A. i, 12; V. i, 8; scales 10-48-4; teeth 5-5, hooked, crenate, and with grinding surface. It is found in Central Park.

22. *Anguilla chrysypa* Rafinesque. EEL.—The Eel is particularly liable to attacks of fungus, which do not always yield to the treatment with salt or brackish water. By placing the Eel in a poorly-lighted tank the parasite can be more safely and surely overcome.

23. *Leptocephalus conger* (Linnaeus). CONGER EEL.—This species has never thrived in the Aquarium, but the individuals received were generally caught with hooks and badly injured. The fish suffers greatly from fungus attacks which cannot be relieved by changing to fresh water. It is sometimes caught in summer in Gravesend Bay.

24. *Elops saurus* (Linnaeus). BIG-EYED HERRING.—An adult example was caught in Gravesend Bay Oct. 5, 1896. It is known to the fishermen as the 'seering' and 'sisco.'

25. *Etrumeus sadina* (Mitchill). ROUND HERRING.—Young individuals were taken in Gravesend Bay July 30, 1896, varying in total length from $4\frac{1}{2}$ to $4\frac{3}{4}$ inches. They were associated with young Mackerel of slightly larger size in bunches and schools. John B. De Nyse saw some schools that he estimated to contain 25,000 fish.

26. *Clupea harengus* (Linnaeus). SEA HERRING.—On April 30, 1896, Mr. John B. De Nyse brought to the Aquarium from Gravesend Bay some small Clupeids known as 'shad bait,' which

are believed to be Sea Herring. The following notes were made from fresh specimens :

Many young transparent fish of the genus *Clupea*, a little under two inches long, are seen in the shad fykes and pounds, and are known as 'shad bait,' because they are said to be taken frequently from shad stomachs.

D. 18 ; A. 17. Muscular impressions along side of body about 60. The ventral very slightly in advance of the origin of dorsal. Intestinal tract full of minute orange-colored substances resembling Entomostraca. A row of black dots on sides, low down, from pectoral to anal. Iris silvery ; top of eye very dark.

Large Sea Herring, according to Mr. W. I. De Nyse, occur rarely in Gravesend Bay. Only about one hundred or two hundred are obtained during fall and winter. On Nov. 23, 1897, an individual $13\frac{1}{2}$ inches long, and $2\frac{3}{4}$ inches deep, and a number of young from $4\frac{3}{4}$ to 6 inches long were secured.

27. *Pomolobus mediocris* (Mitchill). HICKORY SHAD.—The Hickory Shad is caught in Gravesend Bay during September, October and November, but not in such numbers as were found some years ago.

The Hickory Shad arriving in Fulton Market Oct. 30, 1896, each contained in the stomach from 15 to 20 Sand Launce, from $3\frac{1}{2}$ to 5 inches long. The Shad are large, weighing from $\frac{1}{2}$ pound to $2\frac{1}{2}$ pounds. They were shipped from nearby waters.

28. *Pomolobus pseudoharengus* (Wilson). BRANCH HERRING.—This Alewife is the first to make its appearance in Gravesend Bay. It comes with the Shad. No attempt has yet been made to keep it in captivity here, but there is no reason to doubt that it would do as well as the Shad, Menhaden and Herring now (Dec. 7, 1897) living in the central pool. On Nov. 30, 1897, examples above 7 inches long were brought from Gravesend Bay.

29. *Pomolobus æstivalis* (Mitchill). GLUT HERRING.—On Nov. 23, 1897, Mr. De Nyse sent from Gravesend Bay a Glut Herring $6\frac{3}{4}$ inches long and $1\frac{3}{8}$ inches deep, evidently the young of the year. It is known in the Bay as Shad Herring. On Nov. 30 two individuals, evidently fish of the year, measuring about 7 inches, were brought in from the same bay.

30. *Alosa sapidissima* (Wilson). SHAD.—Mr. W. I. De Nyse says it is a common thing in the fall of the year to take large quantities of young Shad in nets set off shore in Gravesend Bay—sometimes a ton and a half in a haul; that is during the migration seaward. They are usually about 6 to 8 inches long. In John B. De Nyse's pound sixty or seventy were caught Oct. 17, 1895. A male 11 inches long and $2\frac{3}{4}$ inches deep, and a female 12 inches long and 3 inches deep were brought to the Aquarium. None were taken after Oct. 31 in 1895; but on that date a male 13 inches long and $3\frac{1}{2}$ inches deep, and a female $13\frac{1}{2}$ inches long and $3\frac{1}{8}$ inches deep, were secured. The male had two lernæan parasites on its back just below the dorsal fin. Mr. W. I. De Nyse states that this parasite is always found along the backbone.

On Oct. 8, 1896, a Shad about $4\frac{1}{2}$ inches long and one about 9 inches were taken in Gravesend Bay. Apparently the Shad do not all remain at sea after their first migration until they are sexually mature.

Mr. John B. De Nyse informs me that in the first spring run of small Shad, fully ninety per cent. are males.

31. *Harengula* sp.—An individual about 9 inches long was brought in dead from Gravesend Bay in 1895. This was the only one observed in that locality, and it is the only record known of the occurrence of this genus north of Florida. The specimen is not now available for study.

32. *Opisthonema oglinum* (Le Sueur). THREAD HERRING.—Known as 'Sprat Herring' in Gravesend Bay. Appears there in July and August, and is sometimes so abundant as to fill the nets. The great run lasts two weeks, beginning towards the end of July.

33. *Brevoortia tyrannus* (Latrobe). MENHADEN.—The species comes into Gravesend Bay in May and through the summer; occasional individuals are seen in the fall as late as November. At the end of November, 1897, some examples are alive and feeding well in the great pool of the Aquarium.

34. *Stolephorus mitchilli* (Cuv. & Val.). ANCHOVY ; WHITE BAIT.—This Anchovy appears in Gravesend Bay in May and remains until October. It is frequently shipped to the market as 'White Bait.' The fish is too frail for a captive life.

35. *Stolephorus argyrophanus* (Cuv. & Val.). ANCHOVY. —This species is uncommon in Gravesend Bay, but occurs more frequently in bays communicating directly with the Atlantic.

36. *Coregonus quadrilateralis* Richardson. FROST-FISH ; ROUND WHITEFISH.—This small Whitefish is one of the characteristic species of the Adirondack lakes. Mr. James Annin, Jr., sent specimens for identification from Hoel Pond and Big Clear Lake, in Franklin County, N. Y., and from the third lake of the Fulton Chain. He states that the fish spawns in the little inlets or upon the sand beaches. It never appears until about the time the water begins to chill and freeze about the edges. On the Fulton Chain of lakes the spawning season of 1895 was practically closed about Nov. 20.

The Frost-fish, according to Mr. Annin, is "a delicious morsel."

The following notes were made upon fresh examples received from the third lake of the Fulton Chain, Nov. 26, 1895 :

A male $11\frac{3}{4}$ inches long to end of caudal fin had the middle caudal rays, from end of scales, $\frac{5}{8}$ inches long ; upper caudal lobe, measured horizontally, $1\frac{7}{8}$ inches ; head, $1\frac{1}{8}$ inches ; maxilla, $\frac{3}{8}$ inch ; eye, $\frac{3}{8}$ inch ; gill-rakers, 5 plus 10, the longest $\frac{1}{4}$ as long as the eye ; scales, 8-84-8. A female $11\frac{1}{8}$ inches to tip of caudal has upper caudal lobe 2 inches, measured horizontally ; middle caudal rays from end of scales, $\frac{9}{8}$ inch ; depth of body, $2\frac{1}{4}$ inches ; head, $1\frac{7}{8}$ inches ; maxilla and eye, each $\frac{3}{8}$ inch ; gill-rakers, 5 plus 10, the longest $\frac{1}{4}$ as long as the eye ; scales, 8-79-8.

Three males received Dec. 11, 1895, showed the following colors :

In the male, $13\frac{3}{8}$ inches long, from Hoel Pond, the back and sides were dark steel gray ; the belly white ; pectoral, ventral and anal orange ; dorsal and caudal chiefly yellow. A male 12 inches long, from Big Clear Lake, had the back and sides silvery gray, darker between the lines of scales ; the lower fins

[December, 1897.]

orange; the dorsal and caudal with traces of yellow. A male $11\frac{1}{8}$ inches long, from Big Clear Lake, showed the same colors as the last. The following measurements in inches and notes were taken :

| | Hoel Pond. | Big Clear Lake. | Big Clear Lake. |
|-------------------------------------|-----------------|-----------------|-----------------|
| | ♂ | ♂ | ♂ |
| Length..... | $13\frac{3}{8}$ | 12 | $11\frac{1}{8}$ |
| Caudal lobe, horizontally..... | $2\frac{3}{8}$ | $1\frac{7}{8}$ | $1\frac{7}{8}$ |
| Middle caudal rays..... | $\frac{3}{4}$ | $\frac{9}{8}$ | $\frac{9}{8}$ |
| Depth of body | $2\frac{1}{2}$ | $2\frac{3}{8}$ | $2\frac{1}{8}$ |
| Least depth of caudal peduncle..... | $\frac{7}{8}$ | $\frac{3}{4}$ | $\frac{1}{2}$ |
| Head | 2 | $1\frac{3}{4}$ | $1\frac{1}{8}$ |
| Snout..... | $\frac{1}{2}$ | .. | .. |
| Eye | $\frac{7}{16}$ | $\frac{7}{16}$ | $\frac{3}{8}$ |
| Maxilla | $\frac{7}{16}$ | $\frac{9}{8}$ | $\frac{3}{8}$ |

In all, the gill-rakers are minute, and number : 5 plus 10, 5 plus 10, and 5 plus 9. The scales are : 10-86-9, 10-76-9, and 9-86-8.

An example sent by the New York Commission of Fisheries, Game and Forest, from Saranac Lake, Nov. 23, 1897, showed the following characters :

MEASUREMENTS.

| | |
|--|---------------------|
| Length, including caudal..... | 13 in. |
| Length to end of scales..... | $11\frac{1}{2}$ in. |
| Length of middle caudal rays (from end of scales)..... | $\frac{7}{8}$ in. |
| Length of upper caudal lobe (obliquely)..... | $2\frac{1}{8}$ in. |
| Depth of body at dorsal..... | $2\frac{3}{8}$ in. |
| Least depth of caudal peduncle..... | $\frac{1}{8}$ in. |
| Length of head..... | $2\frac{1}{8}$ in. |
| Diameter of eye..... | $\frac{9}{16}$ in. |
| Length of maxilla (does not reach orbit)..... | $\frac{9}{16}$ in. |
| Length of mandible | $\frac{3}{4}$ in. |
| Distance from snout to dorsal origin..... | $5\frac{1}{8}$ in. |
| Length of dorsal base..... | $1\frac{1}{8}$ in. |
| Length of longest dorsal ray..... | $1\frac{5}{8}$ in. |
| Length of last dorsal ray..... | $\frac{1}{8}$ in. |
| Distance from snout to ventral origin..... | $5\frac{3}{8}$ in. |
| Length of ventral..... | $1\frac{9}{16}$ in. |
| Length of ventral appendage..... | $\frac{1}{2}$ in. |
| Distance from snout to anal origin..... | $8\frac{3}{4}$ in. |
| Length of anal base | $1\frac{3}{8}$ in. |
| Length of longest anal ray..... | $1\frac{7}{8}$ in. |
| Length of last anal ray..... | $\frac{1}{2}$ in. |
| Length of pectoral | 2 in. |
| Distance from snout to adipose fin | $9\frac{1}{4}$ in. |
| Length of base of adipose fin..... | $\frac{7}{8}$ in. |
| Width of adipose fin..... | $\frac{3}{8}$ in. |
| Length of adipose fin | $\frac{3}{8}$ in. |
| Length of longest gill-raker | $\frac{1}{8}$ in. |

D. 11; A. 11; V. i, 10; P. i, 14. Scales, 10-84-8. Gill-rakers, 6 + 10, the longest $\frac{1}{8}$ inch.

Purplish gray ; lower parts whitish. Pectorals, ventrals and anal vermilion. Eye pale golden. Head, especially behind the eyes, iridescent gold and purple tints. Caudal was chiefly vermilion in life.

The fish is a male with ripe milt. There are numerous small tubercles on the scales of the sides above and below the lateral line.

37. *Coregonus clupeiformis* (Mitchill). WHITEFISH.—A single young individual, caught in a gill-net at Wilson, Niagara Co., N. Y., in Lake Ontario, was forwarded by Mr. James Annin, Jr., for identification.

38. *Coregonus labradoricus* Richardson. LABRADOR WHITEFISH.—This species is frequently confused with the common Whitefish of the Great Lakes (*C. clupeiformis*), especially in waters into which fry of the latter fish have been introduced. It is also mistaken sometimes for the Blackfin Whitefish (*Argyrosomus nigripinnis*); but a glance at the jaws should correct that error speedily. From the common Whitefish it may readily be distinguished by the lingual teeth (unfortunately not always present) and its compressed back, as well as its small size.

A male and a female were received through Mr. Jas. Annin, Jr., from Upper Saranac Lake on Nov. 16, 1895. Both fish were nearly spent. They were supposed to be the common Whitefish. A male from Chazy Lake arrived through the same source on Nov. 22, 1895. It was doubtfully called 'Blackfin Whitefish.' At that time the fish had left the spawning beds and were in deep water. On June 17, 1896, a female 19 $\frac{5}{8}$ inches long was shipped by Mr. Annin from Canandaigua Lake. Its stomach is pear-shaped with walls more than $\frac{1}{4}$ inch thick ; it contained numerous small shells of several genera, not yet identified.

The species is reported by fishermen to be very abundant in that lake, and to be destructive of eggs of other fish. They say it comes in great numbers into shallow water near the shore in early summer when the water is roily, and can be caught on set lines. Mr. Annin saw men baiting their set lines with small Minnows on Canandaigua Lake, and when they were taken up in the morning the Labrador Whitefish was found on the hooks. It is claimed that one of them so taken weighed 6 pounds. Superintendent O. H. Daniels, of the New Hampshire Fish Commis-

sion forwarded a specimen from Lake Winnesquam, at Laconia, 19 $\frac{7}{8}$ inches long, weighing 46 ounces, and he wrote that individuals weighing 7 $\frac{1}{2}$ pounds had recently been taken. The species was called 'Blue-fin' and 'Whitefish.'

The fish-eating habit of the Labrador Whitefish was fully verified in the Aquarium upon examples obtained in Canandaigua Lake in November, 1896, by Mr. Annin. Knowing that the species usually subsists upon small mollusks and crustaceans, efforts were made to provide the fish with *Physa* and *Gammarus*; but this became difficult in winter, and an experiment was made with small Killifish (*Fundulus heteroclitus* and *majalis*), which proved satisfactory during the cold months. In summer, however, it was found necessary to return to the use of *Gammarus*. The Whitefish at first took the Killifish without any eagerness, but they soon learned to chase their prey and take it much as trout do.

A female received from Canandaigua Lake on June 17, 1896, in a fresh state, showed the following colors: Membrane of pectoral fins dusky; that of the pectorals tinged with lemon yellow; ventrals dusky at the tip; anal pale; caudal pale except a narrow dusky portion of the middle rays; eyes pearly with golden iridescence. The maxilla reaches about to front of eye. The adipose dorsal extends straight backward, and its base is covered with a sheath of small scales $\frac{3}{8}$ of an inch wide. The gill-rakers are 9 plus 17, the longest $\frac{3}{8}$ of an inch. Very small teeth are present on the tongue. The eggs are minute.

In a male example, 17 $\frac{1}{4}$ inches long, received Nov. 16, 1895, from upper Saranac Lake and nearly spent, no tubercles could be seen upon the scales; but several of the males from Canandaigua Lake had them well developed. There is a great difference in the development of the lingual teeth, some of our individuals showing only a trace of them, and it seems as if there may be some relation between their condition and the sexual maturity of the fish. For example, in a male 14 inches long, sent from the fourth lake of the Fulton Chain, Nov. 9, 1897, the lingual teeth were present in a large patch; in three males, only a little smaller but sexually immature, from Saranac Lake, Nov. 11, 1897, the teeth on the tongue could be perceived by the touch only. The

following measurements, in inches, and additional notes, were made from the fresh fish :

| | Canandaigua Lake, June 17, 1896. ♀ | Upper Saranac Lake, L., Nov. 16, 1895. ♂ | Chazy Lake, Nov. 22, 1895. ♂ |
|--|---|--|------------------------------------|
| Length, including caudal..... | 19 $\frac{5}{8}$ | 17 $\frac{1}{4}$ | 15 $\frac{1}{2}$ |
| Length of middle caudal rays (from end of scales)..... | 1 | 1 $\frac{1}{8}$ | $\frac{7}{8}$ |
| Length of upper caudal lobe (horizontally)..... | 3 | 3 $\frac{1}{2}$ | .. |
| Length of longest caudal ray..... | 3 $\frac{1}{4}$ | .. | .. |
| Depth of body at dorsal..... | 4 $\frac{3}{4}$ | 3 $\frac{1}{2}$ | .. |
| Least depth of caudal peduncle..... | 1 $\frac{1}{2}$ | .. | 1 $\frac{1}{8}$ |
| Length of head..... | 3 $\frac{7}{8}$ | 2 $\frac{3}{4}$ | 2 $\frac{1}{2}$ |
| Diameter of eye..... | $\frac{5}{8}$ | $\frac{5}{8}$ | $\frac{1}{2}$ |
| Length of maxilla..... | 1 | $\frac{3}{4}$ | $\frac{5}{8}$ |
| Distance from snout to dorsal origin..... | 8 | .. | .. |
| Length of dorsal base..... | 2 $\frac{1}{8}$ | .. | .. |
| Length of longest dorsal ray..... | 2 $\frac{1}{2}$ | .. | .. |
| Length of last " "..... | $\frac{3}{4}$ | .. | .. |
| Distance from snout to ventral origin..... | 9 | .. | .. |
| Length of ventral..... | 2 $\frac{3}{4}$ | .. | .. |
| Length of ventral appendage..... | $\frac{7}{8}$ | .. | .. |
| Distance from snout to anal origin..... | 13 | .. | .. |
| Length of anal base..... | 2 | .. | .. |
| Length of longest anal ray..... | 1 $\frac{3}{4}$ | .. | .. |
| Length of last anal ray..... | $\frac{5}{8}$ | .. | .. |
| Length of pectoral..... | 3 | .. | .. |
| Distance from snout to adipose fin..... | 14 | .. | .. |
| Length of base of adipose fin..... | 1 | .. | .. |
| Length of adipose fin..... | $\frac{3}{4}$ | .. | .. |
| Width of base of adipose fin..... | $\frac{1}{2}$ | .. | .. |
| Length of longest gill-raker..... | $\frac{3}{8}$ | $\frac{3}{8}$ | $\frac{5}{16}$ |

Taking the fish in the order above given, the gill-rakers are : 9 plus 17, 10 plus 16, and 9 plus 17. The scales are : 10-76-8, 10-87-9, and 11-81-10. The branchiostegals in various specimens examined are 9 to 10; divided dorsal rays, 10 to 11; anal rays, 10 to 11.

39. *Argyrosomus artedi* (Le Sueur). CISCO; LAKE HERING.—A male was received from Mr. Annin Nov. 22, 1895, and a female on Nov. 25 of the same year. The male had spermaries moderately developed. The female agrees very well with the variety *cisco*. Both are from Three-mile Bay, Lake Ontario. The following measurements, in inches, and notes, were made upon the fresh examples :

| | 3-mile Bay. ♂ | 3-mile Bay. ♀ |
|-------------------------------------|------------------|------------------|
| Length, including caudal..... | 13 $\frac{1}{2}$ | 13 |
| Length of middle caudal rays..... | $\frac{3}{4}$ | .. |
| Least depth of caudal peduncle..... | 1 | .. |
| Depth of body at dorsal..... | 3 | 2 $\frac{1}{2}$ |
| Length of head..... | 2 $\frac{1}{4}$ | 2 $\frac{1}{4}$ |
| Length of maxilla..... | $\frac{3}{4}$ | $\frac{7}{8}$ |
| Diameter of eye..... | $\frac{1}{2}$ | $\frac{1}{2}$ |
| Length of longest gill-raker..... | $\frac{5}{8}$ | .. |
| Number of gill-rakers..... | 17 + 31 | 47 |
| Scales..... | 8-74-8 | 76 |

In the female above mentioned, the maxilla reaches to the front of pupil; the lower jaw projects a little; the dorsal and anal each have ten divided rays; the dorsal has a black tip; the pectoral is dusky above; the ventral and anal are pale; the caudal is dusky towards the margin. According to Mr. Annin it lives in deep waters and spawns in brooks in December.

40. *Argyrosomus hoyi* Gill. LAKE SHINER; MOON-EYE CISCO.—This species is recorded with certainty from Lake Michigan only. It is taken in gill-nets in deep water and, notwithstanding its small size, has become commercially important. It is here for the first time announced as a member of the New York fauna, and the description following below leaves no doubt of the correctness of the identification. The fish examined, a female with ripe eggs, was taken in Canandaigua Lake, Dec. 19, 1896, by Mr. Annin's men. It was the only one caught, and was captured by becoming gilled in the funnel of the net. Mr. Annin is satisfied that this is the Lake Shiner of the fishermen, which they sometimes see in immense schools at the surface, and kill for trolling bait by shooting them.

Description.—Head, 4; depth, $4\frac{1}{2}$; eye, 5 (nearly); snout, $3\frac{1}{2}$; maxillary, nearly 3 in head, reaching to vertical through front of pupil. D. 10; A. 11; scales, 8–70–9. Gill-rakers, 14 + 28, left side, 40 on right side, longest about $\frac{1}{4}$ inch, about 2 in eye. Branchiostegals, 8. Body rather elongate, compressed, the back little elevated. Mouth rather large, terminal, the lower jaw slightly longer than upper when the mouth is closed; tip of muzzle conical as in *A. artedi*; mandible nearly reaching vertical through posterior edge of eye, nearly 2 in head. Head rather long and slender, with pointed snout; interorbital width equal to eye. Supraorbital and preorbital long and narrow. Distance from tip of snout to occiput, 2 in distance from occiput to origin of dorsal fin; dorsal rays much longer anteriorly than posteriorly, the longest ray nearly equal to distance from front of pupil to end of head, the last ray only $\frac{1}{3}$ as long; longest anal ray $2\frac{1}{2}$ in head, last anal ray $\frac{2}{3}$ as long as the longest Pseudo-branchiæ well developed; tongue with evident teeth.

Color in spirits silvery, with purplish iridescence on back; scales without punctulations; belly whitish; dorsal and caudal fins dark on terminal half, pale at base; other fins all pale.

Length, without caudal, 8 inches; total length, $9\frac{1}{2}$ inches; depth, $1\frac{3}{4}$ inches; head, $2\frac{1}{8}$ inches; eye, $\frac{7}{16}$ inch; maxilla, $\frac{1}{16}$ inch; interorbital width equal to diameter of eye.

Mr. Annin wrote me that the people at Canandaigua Lake told him that there were large quantities of small Lake Shiners, as

they are called, in the lake. A fisherman said that they are seen in immense schools at the top of the water occasionally, and by firing a gun loaded with shot into them they can stun them so that they can pick up quite a number. They are eagerly sought after for trolling bait for the salmon trout found in that lake.

41. *Argyrosomus tullibee* Richardson. TULLIBEE.—The Tullibee occurs in Onondaga Lake. A female was sent from there by Mr. Annin Nov. 18, 1895, and another of the same sex Nov. 25, 1896. Mr. Annin wrote that the fish commenced running onto the shoals about Nov. 15, and were spawning in the lake Nov. 25. They come up to the banks or gravelly shoals and deposit their eggs in from three feet to seven feet of water. The species has never been caught with the hook in that lake, although almost every kind of bait, the finest and smallest hooks, baited with *Gammarus* and other natural foods, were tried.

The following notes relate to the female obtained Nov. 18, 1895 :

| | |
|-------------------------------------|----------------------|
| Length to end of caudal | 18 $\frac{1}{2}$ in. |
| Length of upper caudal lobe..... | 2 $\frac{5}{8}$ in. |
| Length of middle caudal rays..... | 1 in. |
| Least depth of caudal peduncle..... | 1 $\frac{3}{8}$ in. |
| Depth of body at dorsal origin..... | 4 $\frac{3}{8}$ in. |
| Length of head..... | 3 $\frac{1}{4}$ in. |
| Length of maxilla | $\frac{7}{8}$ in. |
| Diameter of eye..... | $\frac{5}{8}$ in. |
| Length of longest gill-raker | 1 $\frac{9}{16}$ in. |

The mandible projects slightly. B. 8 ; D. 11 ; A. 11 ; V. 11 ; scales, 8-75-8 ; gill-rakers, 17 + 27.

The female received Nov. 25, 1896, is 15 inches long.

New York is well supplied with Coregonidæ, having eight of the sixteen North American species. *C. quadrilateralis* is the Frost-fish of the Adirondacks and the Great Lakes. *C. clupeiformis*, the common Whitefish, inhabits the Great Lakes and Lake Champlain. *C. labradoricus*, the Labrador Whitefish, is very abundant in the Adirondacks, and is found also in the Great Lakes. *Argyrosomus osmeriformis* is a shapely little Herring of Seneca and Skaneateles Lakes. *A. artedi* is the common Lake Herring or Cisco of the Great Lakes and Lake Champlain. *A. hoyi*, the Lake Shiner, or Hoy's Whitefish, is above recorded from Canandaigua Lake. *A. prognathus*, the Long-jaw, the only summer spawning Whitefish so far as known, lives in Lake Ontario, and, finally, *A. tullibee*, is the fine Whitefish of Onondaga Lake.

42. *Salmo salar* Linnaeus. ATLANTIC SALMON.—Although this is again a New York fish, it is represented in the Aquarium by the young hatched here from eggs taken from the Restigouche River, Canada. Eggs just on the point of hatching were received about May 1, 1897, from Mr. Percy Baker, and in a few days several hundred healthy fry were set free. These were reared almost without loss until June 18, when the temperature of the water had reached 76 degrees Fahrenheit. The refrigerating plant was not completed until July 7, and then only three of the young survived. One of these was subsequently lost by the displacement of a strainer. The larger of the two is now (Nov. 27) $3\frac{3}{8}$ inches long. Liver has been the principal food of these Salmon.

43. *Salmo salar sebago* Girard. LAND-LOCKED SALMON.—This Salmon has been introduced into our waters from Maine, and appears to have become established in several localities. A very fine example was obtained from the South Side Sportsmen's Club of Long Island, but it was injured in transportation and never recovered. In April, 1896, several individuals from Maine were presented by Mr. Eugene G. Blackford. One of these lived in a tank on the salt-water side for nineteen months, and was then frightened by visitors when the water was drawn low for cleaning, and injured itself so badly that it died after a few hours of struggling. The following measurements were obtained from the fresh fish :

| | |
|--|---------------------|
| Length..... | 24 in. |
| Middle caudal rays from end of scales..... | $1\frac{1}{8}$ in. |
| Depth..... | $\frac{1}{4}$ in. |
| Least depth of caudal peduncle..... | $1\frac{5}{8}$ in. |
| Head..... | $4\frac{3}{4}$ in. |
| Snout..... | $1\frac{1}{4}$ in. |
| Eye..... | $\frac{1}{4}$ in. |
| Orbit..... | $\frac{3}{4}$ in. |
| Snout to dorsal..... | $9\frac{1}{2}$ in. |
| Dorsal base..... | $2\frac{3}{4}$ in. |
| Longest dorsal ray..... | $2\frac{3}{8}$ in. |
| Last dorsal ray..... | $1\frac{1}{4}$ in. |
| Snout to ventral..... | $11\frac{1}{4}$ in. |
| Length of ventral..... | $2\frac{1}{4}$ in. |
| Snout to anal..... | $16\frac{3}{8}$ in. |
| Anal base..... | $1\frac{1}{8}$ in. |
| Longest anal ray..... | $1\frac{1}{8}$ in. |
| Last anal ray..... | $1\frac{1}{8}$ in. |
| Snout to adipose dorsal..... | $17\frac{3}{8}$ in. |
| Width of adipose dorsal..... | $\frac{1}{2}$ in. |
| Length of adipose dorsal..... | $\frac{3}{4}$ in. |
| Length of pectoral..... | $3\frac{1}{4}$ in. |
| Upper jaw..... | $2\frac{1}{4}$ in. |
| Maxilla..... | 2 in. |

The head has about 28 dark spots, the largest on the gill-cover, oblong, $\frac{5}{8}$ inch long. Body with many large and small black spots, a few with a pale ring around them, and some as large as the largest on the gill-cover; one on the caudal peduncle of one side distinctly X-shaped. General color dark bluish gray; belly and lower parts iridescent silvery. Fins all dusky: the dorsal with many black spots. Eye pale lemon, the upper part dusky.

Gill-rakers, 9 + 11, the longest $\frac{5}{8}$ inch. B. 11; D. 10; Scales, 21-123-20.

44. *Salmo mykiss* Walbaum. BLACK-SPOTTED TROUT; RED-THROAT TROUT.—The Lake Tahoe, California, Trout, form *S. mykiss henshawi* (Gill & Jordan), was obtained by Mr. James Annin, Jr., and reared at his establishment. Young individuals were sent by him in November, 1896, and thrived in the Aquarium until the latter part of June, 1897, when they were overcome by the warm water. They would not endure the transfer to salt water.

45. *Salmo gairdneri* Richardson. STEELHEAD TROUT.—From information furnished by Mr. Annin it appears evident that some of the eggs of trout received at Caledonia, N. Y., many years ago from the McLeod River, California, as Rainbows, really included both Rainbows and Steelheads. He finds certain females producing deep salmon-colored eggs, while in the same pond and receiving the same food as other females which furnished very light-colored, almost white, eggs. Some of the females also differ in going to the spawning beds nearly two months in advance of others. It is now known also that the McLeod contains a small-scaled form of the Rainbow, known to the Indians as the No-Shee, and this also may easily have been sent to the East under the name of Rainbow. Striking differences in the appearance and habits of so-called Rainbows introduced into the various States, lend color to this supposition.

The Steelheads now in the Aquarium were obtained in November, 1896, from the U. S. Fish Commission. They were hatched from eggs shipped from Fort Gaston to the Craig Brook station in Maine. The length of the Trout ranged from four to four and one-half inches; they are now ten inches long on the average, and weigh many times as much as they did a year ago. None of them have at any time yet shown a red lateral band such as is

present in the Rainbow, and they are further distinguished by the presence of white tips on the ventral and anal fins; the dorsal also has a small white tip. They have been kept almost from their arrival in salt water, and could not have been kept in the warm Croton water in June. The salt water never rose above $71\frac{1}{2}$ degrees Fahrenheit, and continued at this high temperature only ten days.

46. *Salmo irideus* Gibbons. RAINBOW TROUT.—Trout of this species have been received from the South Side Sportsmen's Club at Oakdale, Long Island, the New York Hatchery at Cold Spring Harbor, Long Island, and the Caledonia station of the New York Fish Commission. The large fish never stand transportation well when ice is used to cool the water. They frequently injure their eyes so that they become blind soon after the end of the trip. They are inveterate fighters, and the strongest invariably rules the rest. Contrary to what has been stated heretofore, they will not endure high temperatures as well as brook trout.

47. *Salmo fario* Linnaeus. BROWN TROUT.—This is one of the earliest species of trout to be placed in the Aquarium, and has shown remarkable hardiness in captivity. A large female was received from Mr. E. G. Blackford in April, 1896, and placed in a salt water tank where it remains now (Nov. 27, 1897), and gives every indication of perfect health. During most of the time the fish has been in salt water, but at certain intervals fresh water is substituted for a short time, especially when symptoms of fungus make their appearance. Liver and live Killifish have been used for her food. Last November she excavated a shallow depression in the gravel bottom and deposited a lot of eggs. The species is extremely shy, and never seems to lose its fear of the attendants.

48. *Salmo* (HYBRID = *fario* + *fontinalis*). HYBRID TROUT.—In a paper published seven years ago the writer stated, as a result of his studies, that when a large-scaled trout is crossed with a small-scaled one, the hybrid will be large-scaled whichever way the cross be made. The hybrid between the Brown Trout and the Brook is a large-scaled form, and it is sterile as

far as reported. The Aquarium has had this hybrid from the South Side Sportsmen's Club, and from the New York Hatcheries at Cold Spring Harbor, Long Island, and Caledonia. It is always a strikingly handsome fish, and grows to a large size; but it is far less hardy than either of its parents. The cross has always been artificially made, and never occurs naturally. Two specimens studied gave the following measurements in inches:

| | Caledonia, N.Y. June 10, 1896. Jas. Annin, Jr. | Oakdale, N.Y. Mar. 23, 1897. Geo. P. Slade. |
|--|--|---|
| Extreme length..... | 9 $\frac{1}{4}$ | 14 $\frac{1}{4}$ |
| Length of middle caudal rays from end of scales..... | 3 $\frac{3}{4}$ | .. |
| Depth of body..... | 1 $\frac{7}{8}$ | 3 $\frac{1}{8}$ |
| Least depth of caudal peduncle..... | 7 $\frac{7}{8}$ | .. |
| Length of head..... | 2 | 3 $\frac{1}{4}$ |
| Length of snout..... | 1 $\frac{1}{2}$ | 1 $\frac{1}{8}$ |
| Length of upper jaw..... | 1 $\frac{1}{4}$ | .. |
| Length of lower jaw..... | 1 $\frac{3}{8}$ | .. |
| Diameter of eye..... | 1 $\frac{5}{8}$ | 1 $\frac{7}{8}$ |
| Distance from snout to dorsal origin..... | 3 $\frac{3}{4}$ | .. |
| Length of dorsal base..... | 1 $\frac{5}{8}$ | .. |
| Length of longest dorsal ray..... | 1 $\frac{5}{8}$ | .. |
| Length of last dorsal ray..... | 1 $\frac{3}{4}$ | .. |
| Distance from snout to ventral origin..... | 4 $\frac{1}{2}$ | .. |
| Length of ventral..... | 1 $\frac{1}{8}$ | .. |
| Distance from snout to anal origin..... | 6 | .. |
| Length of anal base..... | 7 $\frac{7}{8}$ | .. |
| Length of longest anal ray..... | 1 $\frac{1}{4}$ | .. |
| Length of last anal ray..... | 1 $\frac{1}{2}$ | .. |

The Caledonian specimen has no hyoid teeth; the vomerines are in a very small patch on the head of the bone only. The gill-rakers are 4 plus 10, the longest about one-half diameter of the eye. It has about 124 tubes in the lateral line. Branchiostegals, 10. The following color-notes were taken from the fresh fish:

Dorsal fin with numerous dark blotches resembling those of young Rainbow. Adipose long and slender, amber color with two obscure dusky blotches, one of these very indistinct. Lower half of sides pink; ventral, anal and caudal pink; ventral and anal with a milk-white front margin, that in the anal limited behind by a dark line as in Brook Trout. Sides reticulated with large meshes of lemon yellow interspersed with darker purplish or olive. Dorsal blotches are mingled with pale lemon. Pectoral pale vermillion. Eye silvery white with yellowish reflections.

The specimen from Oakdale, Long Island, weighed 20 ounces. It has a triangular patch of vomerine teeth, as found in *fontinalis*, but continued behind by several teeth in a single row, the entire length of the vomerine series being seven-sixteenths of an inch.

49. Cristivomer namaycush (*Walbaum*). LAKE TROUT ; SALMON TROUT.—The only New York examples of Lake Trout were received from Mr. James Annin, Jr., Caledonia, in the fall of 1896. They lived and grew rapidly until the warm water killed them in June, 1897. They could not endure transfer to salt water of a lower temperature, as so many other Trout will do, and nothing else could be utilized to tide them over until the completion of the refrigerating plant.

Owing to the extensive individual and race variation among Trout referred to this species, it seems desirable here to give some notes and measurements made from individuals obtained from New Hampshire and Vermont. Two Lake Trout weighing about $4\frac{3}{4}$ pounds each were shipped in a can, only a few inches longer than the fish, from Roxbury, Vermont, on Nov. 17, and after an express journey of 20 hours without an attendant one of them survives in good condition, while the other was nearly dead upon arrival and died within one hour. The latter was a female, and appears to have injured itself severely by jumping in the can ; it was not in good condition when it left Vermont. Twelve large Brook Trout shipped with the Lake Trout in two cans arrived without injury ; these and the Lake Trout were presented by Mr. John W. Titcomb, Fish and Game Commissioner.

Commissioner N. Wentworth, of Hudson Center, N. H., forwarded the New Hampshire Lake Trout, one from Newfound Lake, the other from Lake Winnepesaukee. They were sent to determine whether the trout of the two lakes, which the fishermen claim are different species, really are distinct. The Commissioner wrote that "The Newfound Trout has darker flesh, more like the Sea Salmon. This is not caused by their food, as both lakes are alive with Smelt. The Winnepesaukee Lake Trout are better biters ; tons of them are caught through the ice every winter. The Newfound Trout are hardly ever caught through the ice. A few were caught last winter for the first time to my knowledge. I am sure there is but one variety of Lake Trout in Newfound Lake. We had one in our tanks this fall that would weigh 25 pounds." The only differences to be found upon examination were such as relate to the depths at which the two races habitually live ; one is the slim, dark-colored *tuladi*, and the other the common Lake Trout of the Great Lakes region.

It is necessary, however, to call attention to the Lake Trout from Northern Vermont which furnished one of the series of measurements given below. The gill-rakers in that example are few in number and unusually short, four or five on each side being reduced to mere spiny tubercles.

MEASUREMENTS IN INCHES.

| | Newfound Lake. | Winnepesau- kee Lake. | Roxbury, Vt. |
|--|-------------------|--------------------------|------------------|
| | ♂ | ♂ | ♀ |
| Length, including caudal..... | 24 $\frac{1}{2}$ | 27 $\frac{1}{8}$ | 22 |
| Length to base of middle caudal rays.. | 21 | 23 $\frac{3}{8}$ | 19 $\frac{1}{2}$ |
| Least depth of caudal peduncle..... | 1 $\frac{5}{8}$ | 1 $\frac{7}{8}$ | .. |
| Greatest depth of body..... | 4 $\frac{5}{8}$ | 6 $\frac{3}{8}$ | 4 $\frac{1}{2}$ |
| Thickness of body..... | 2 $\frac{3}{4}$ | 2 $\frac{5}{8}$ | 2 $\frac{3}{4}$ |
| Length of head..... | 5 $\frac{3}{8}$ | 6 $\frac{1}{2}$ | 4 $\frac{1}{4}$ |
| Length of snout..... | 1 $\frac{1}{4}$ | 1 $\frac{3}{4}$ | 1 $\frac{1}{8}$ |
| Length of postorbital part of head.... | 3 $\frac{1}{4}$ | 3 $\frac{1}{2}$ | 2 $\frac{1}{2}$ |
| Length of upper jaw..... | 2 $\frac{3}{4}$ | 3 $\frac{7}{8}$ | 2 $\frac{3}{8}$ |
| Length of maxilla..... | 2 $\frac{1}{4}$ | 3 | 2 |
| Diameter of eye..... | 3 $\frac{3}{4}$ | 3 $\frac{1}{4}$ | 5 $\frac{5}{8}$ |
| Interorbital width..... | 1 $\frac{5}{8}$ | 2 $\frac{3}{8}$ | 1 $\frac{1}{8}$ |
| Distance from snout to dorsal..... | 10 $\frac{3}{4}$ | 12 $\frac{5}{8}$ | 10 |
| Length of dorsal base..... | 2 $\frac{5}{8}$ | 2 $\frac{1}{2}$ | 2 $\frac{1}{8}$ |
| Length of longest dorsal ray..... | 3 | 2 $\frac{1}{2}$ | 2 $\frac{3}{8}$ |
| Length of last dorsal ray..... | 1 $\frac{1}{2}$ | 1 $\frac{3}{8}$ | 1 $\frac{1}{8}$ |
| From end of dorsal to adipose fin.... | 4 $\frac{1}{2}$ | 5 | 4 $\frac{1}{4}$ |
| Length of adipose fin..... | 3 $\frac{3}{4}$ | 1 | 3 $\frac{3}{4}$ |
| Width of base of adipose fin..... | 3 $\frac{3}{8}$ | 1 $\frac{9}{16}$ | 3 $\frac{3}{8}$ |
| Distance from snout to ventral..... | 12 $\frac{1}{4}$ | 14 $\frac{3}{8}$ | 11 $\frac{5}{8}$ |
| Length of longest ventral ray..... | 2 $\frac{5}{8}$ | 2 $\frac{7}{8}$ | 2 $\frac{3}{8}$ |
| Length of last ventral ray..... | 1 $\frac{3}{8}$ | 1 $\frac{1}{2}$ | .. |
| Length of ventral appendage..... | 3 $\frac{3}{4}$ | 3 $\frac{3}{8}$ | 5 $\frac{5}{8}$ |
| Distance from snout to anal..... | 16 | 18 $\frac{5}{8}$ | 15 $\frac{1}{2}$ |
| Length of anal base..... | 2 | 2 $\frac{1}{8}$ | 1 $\frac{7}{8}$ |
| Length of longest anal ray..... | 2 $\frac{3}{4}$ | 2 $\frac{1}{2}$ | 2 $\frac{1}{2}$ |
| Length of last anal ray..... | 1 | 1 | 3 $\frac{1}{4}$ |
| Length of pectoral..... | 3 $\frac{1}{2}$ | 3 $\frac{1}{2}$ | 3 $\frac{1}{4}$ |
| Length of upper caudal lobe..... | 3 $\frac{3}{4}$ | 3 $\frac{3}{4}$ | .. |
| Length of lower caudal lobe..... | 3 $\frac{1}{2}$ | 3 $\frac{1}{8}$ | .. |
| Length of longest gill-raker..... | 1 $\frac{1}{8}$ | 1 $\frac{1}{8}$ | 1 $\frac{5}{8}$ |

In the Newfound Lake fish we have :

B. 11; D. 11; A. 10 (counting divided rays only); V. i, 8; P. i, 12; scales, 26-195-34 (about 150 tubes); gill-rakers, 9 + 13, the longest a little more than one-half length of eye, the one in the angle club-shaped at the tip. It is a male with spermaries moderately small but soft. The body is gray, darker on the back. The outer edge of the pectoral and ventral and the front margin of the anal are white as in *fontinalis*. A white tip to the lower caudal lobe and a

very small one at the top of the dorsal. Otherwise the coloration is like that of ordinary lake trout which have the pectoral, ventral and anal chiefly vermilion in the breeding season.

The male from Winnepesaukee Lake has :

B. 12 to 13 ; D. 10 ; A. 10 ; V. i, 8 ; P. 12 ; gill-rakers 8 + 12, the longest about one-half as long as the eye. The ground color is a little lighter than in the Newfound Lake trout, and the vermilion of the pectorals, ventrals and anal is less intense. The spermaries are larger than in the specimen from Newfound, and in about the same stage of development ; the body is considerably stouter.

The female from Roxbury, Vermont, shows the following additional characters :

B. 12 ; D. 10 ; A. 10 ; V. i, 8 ; gill-rakers, 8 + 12, the longest exactly one-half as long as the eye. The eggs and ovaries are small as in young females. The pectorals, ventrals and anal are chiefly vermilion as in the male from Newfound Lake. The body is silvery gray with numerous small, whitish spots, these present also upon the dorsal.

50. *Salvelinus fontinalis* (Mitchill). BROOK TROUT ; SPECKLED TROUT.—Brook Trout have been received from New York Fish Commission stations at Caledonia and Cold Spring Harbor, from the private establishment of Jas. Annin, Jr., the preserve at Oakdale, Long Island, of the South Side Sportsmen's Club, the Maine Fish Commission, from Mr. John W. Titcomb, President, Vermont Fish and Game Commission, Mr. E. G. Blackford, New York, and Mr. A. N. Cheney, State Fish Culturist of New York. The only Brook Trout that endured the high temperature (76°) of the Croton water in June, 1897, was one young individual from Caledonia. The Vermont Trout were saved by sending them to Cold Spring Harbor in May.

The food of the Trout in the Aquarium consists almost entirely of chopped hard clams and liver for the young, and hard clams, live killifish, and occasionally earth worms for the larger ones. Their increase in weight has been remarkable ; an individual from Caledonia, for example, received in November, 1896, as a fingerling not above $3\frac{1}{2}$ inches long, is now (Dec. 10, 1897) $12\frac{1}{4}$ inches long, and $3\frac{1}{2}$ inches deep. This species will live indifferently in

the fresh and salt water of the Aquarium. When attacked by fungus in fresh water the parasite is easily killed by keeping the fish in salt water, and the Trout is not at all injured or inconvenienced by this treatment if the transfer be made gradually, that is, from fresh to brackish, and finally salt water of the salinity here found (about 1.017). A Trout so treated and cured has practical immunity from fungus attacks thereafter. The Brook Trout is well adapted to domestication in tanks; it soon overcomes its fear of moving objects, takes its food regularly, and is always attractive because of its beauty and its grace of movement.

51. *Osmerus mordax* (Mitchill). SMELT.—The Smelt is found in Gravesend Bay in winter, beginning to run in December, and remaining during cold weather. In the spring it ascends rivers to spawn. The eggs are small and adhesive. The fry are hardy in transportation. In the Aquarium the adults live until about the end of June, when the water becomes too warm and they die. Their food consists mainly of shrimps and other small crustaceans.

52. *Umbra limi* (Kirtland). MUD MINNOW.—A number of Mud Minnows were shipped in wet moss from Caledonia, N. Y., April 10, 1896, by James Annin, Jr., and nearly all were alive at the end of the twelve hours' journey. The species has not proved hardy, either in balanced tanks or in running water, notwithstanding its reputation as a fish that can endure alternate freezing and thawing without permanent injury.

53. *Lucius americanus* (Gmelin). BANDED PICKEREL.—On Dec. 30, 1895, Mr. James Annin, Jr., sent from Rockland, N. Y., a small Pickerel which had attracted his attention on account of its colors and markings. It was taken in a small spring brook, tributary to the Beaverkill, which, about ten or fifteen miles below, unites with the Delaware. Subsequently two examples were forwarded alive from the same place, and one of them is still living in the Aquarium. The following notes and measure-

ments, in inches, relate to the first individual of undetermined sex, the organs being undeveloped :

| | |
|---|---------------------|
| Length, including caudal fin..... | $7\frac{3}{4}$ in. |
| External caudal lobe (horizontally)..... | $1\frac{1}{8}$ in. |
| Middle caudal rays (from end of scales)..... | $\frac{1}{2}$ in. |
| Length of head..... | $1\frac{3}{4}$ in. |
| Greatest depth of body..... | $1\frac{1}{8}$ in. |
| Least depth of caudal peduncle..... | $\frac{1}{2}$ in. |
| Length of snout..... | $\frac{5}{8}$ in. |
| Length of maxilla..... | $1\frac{1}{4}$ in. |
| Length of mandible..... | $1\frac{3}{16}$ in. |
| Diameter of eye..... | $\frac{1}{16}$ in. |
| Distance from snout to dorsal..... | $5\frac{3}{8}$ in. |
| Length of dorsal base..... | $7\frac{1}{8}$ in. |
| Length of longest dorsal ray..... | $3\frac{1}{4}$ in. |
| From end of dorsal to caudal origin..... | $\frac{7}{8}$ in. |
| Distance from snout to pectoral..... | $1\frac{5}{8}$ in. |
| Length of pectoral..... | $1\frac{1}{16}$ in. |
| Distance from snout to ventral..... | $3\frac{3}{8}$ in. |
| Length of ventral..... | $\frac{3}{4}$ in. |
| Distance from snout to anal..... | $5\frac{1}{4}$ in. |
| Length of anal base..... | $\frac{3}{4}$ in. |
| Length of longest anal ray..... | $1\frac{1}{16}$ in. |
| From end of anal base to origin of lower caudal lobe..... | $\frac{3}{4}$ in. |

B. 12 ; D. 12 ; A. 11 ; V. 9 ; scales, 24-110.

The maxilla reaches to below the middle of the pupil. The mandible projects $\frac{1}{16}$ of an inch when the mouth is closed. The diameter of the eye is contained $5\frac{3}{8}$ times in length of head. The stomach was empty, but insect remains were voided from the vent.

Colors.—About 20 oblique, interrupted, dark bands on the body. A narrow oblique dark band under the eye and four rather large dark blotches on the cheek and opercle. Pectorals, ventrals and anal orange. A tinge of orange on the dorsal and caudal. General color olivaceous gray, with golden reflections; lower parts creamy white. Iris lemon mingled with pale brown. Peritoneum silvery.

All the Pickerels are liable to fungus attacks without apparent cause, but, as a rule, they can be cured by the salt water treatment. Their food consists of small live killifish, which they approach slowly and deliberately until within five or six inches, when they rush, seize, and stop as abruptly as if stopped by an obstruction.

54. *Lucius reticulatus* (*Le Sueur*). CHAIN PICKEREL.—Living Pickerel were sent from Canandaigua Lake by Mr. James Annin, Jr., and small examples were seined in the Bronx. Others were given to the Aquarium by Charles A. Shriner, Chief Game and Fish Protector of New Jersey, and Prof. Ulric Dahlgren of

Princeton University. The Chain Pickerel is always hard to keep in good condition in captivity, but the losses here have been very small owing to the success of the salt water treatment for fungus. The fish spawned in their tank in June, 1897, and young were hatched naturally, but they died when about $\frac{3}{4}$ inch long because they could not be induced to feed. The feeding habits of this Pickerel are the same as stated concerning *L. americanus*.

55. *Lucius lucius* (Linnaeus). PIKE.—About July 1, 1896, a fresh specimen was sent for identification by Mr. Annin from Silver Lake, Wyoming Co., N. Y. He says the Pike is not found in Canandaigua Lake. Curiously enough, the Aquarium has never yet had a living example.

56. *Lucius lucius immaculatus* (Garrard). UNSPOTTED MASCALONGE.—The examples of Unspotted Mascalonge received at the Aquarium were from Chautauqua Lake, N. Y., which belongs to the Ohio River drainage system. It appears that the typical spotted form also inhabits the Ohio basin, but occurs rarely. Mr. Annin sent one individual Dec. 4, 1895, and two on May 4, 1896; from these three were obtained the following notes and measurements in inches:

| | Dec. 4, 1895. | May 4, 1896. | May 4, 1896. |
|--|-----------------|-----------------|-----------------|
| | | δ | δ |
| Length, including caudal fin | $23\frac{1}{2}$ | $27\frac{1}{8}$ | $25\frac{3}{8}$ |
| Length to end of scales | .. | $23\frac{7}{8}$ | 23 |
| Length of caudal lobe (horizontally).... | $3\frac{5}{8}$ | .. | .. |
| Length of middle caudal rays | $1\frac{1}{2}$ | .. | .. |
| Depth of body | $3\frac{5}{8}$ | 4 | $3\frac{7}{8}$ |
| Least depth of caudal peduncle | $1\frac{1}{2}$ | $1\frac{3}{4}$ | $1\frac{5}{8}$ |
| Length of head | $5\frac{3}{4}$ | $6\frac{5}{8}$ | $6\frac{1}{8}$ |
| Length of snout | $2\frac{3}{8}$ | $2\frac{3}{4}$ | $2\frac{1}{2}$ |
| Length of maxilla | $2\frac{1}{2}$ | $2\frac{3}{8}$ | $2\frac{1}{8}$ |
| Length of mandible | $3\frac{3}{4}$ | $4\frac{1}{4}$ | $3\frac{3}{4}$ |
| Diameter of eye | $\frac{1}{2}$ | $\frac{9}{16}$ | $\frac{9}{16}$ |
| Distance from snout to dorsal | .. | $18\frac{1}{8}$ | $16\frac{3}{4}$ |
| Length of dorsal base | .. | $2\frac{3}{4}$ | $2\frac{7}{8}$ |
| Length of longest dorsal ray | .. | $2\frac{7}{8}$ | $2\frac{5}{8}$ |
| Distance from snout to ventral | .. | $13\frac{1}{2}$ | $12\frac{3}{4}$ |
| Length of ventral | .. | $2\frac{1}{2}$ | $2\frac{3}{8}$ |
| Length of anal base | .. | $2\frac{1}{4}$ | $2\frac{1}{8}$ |
| Length of longest anal ray | .. | $2\frac{3}{4}$ | $2\frac{3}{8}$ |
| Length of pectoral | .. | $2\frac{3}{4}$ | $2\frac{9}{16}$ |
| Branchiostegals | 19 | 18 | 19 |
| Dorsal rays (developed) | 18 | 16 | 17 |
| Anal rays (developed) | 16 | 15 | 15 |
| Rows of scales | ca. 153 | .. | .. |
| Gill-rakers | 13 + 28 | .. | .. |

[December, 1897.]

In all the specimens the maxilla extends to below the front edge of the pupil. The gill-rakers are mere clumps of spiny tubercles. In the two males the diameter of the eye is contained from $4\frac{2}{3}$ to 5 times in the length of the snout, and from 10 to 11 times in the length of the head.

In the individual of Dec. 4, 1895, the lateral line tubes are distributed over various parts of the sides without much regularity except in the median line. There are no black spots. About twenty entire, blotch-like, irregular cross bands and several parts of bands and blotches intervening. The lower third of the pectoral is pink. The dorsal, caudal and anal with dark blotches making pseudo bands. Iris lemon yellow overlaying silvery white. The general color is olive green with golden tints.

The two males of May 4, 1896, furnished the following color-notes :

Olive green tinged with golden bronze. Sides with about 23 irregular dusky blotches resembling interrupted bands. Dorsal, caudal and anal with numerous large dusky blotches, those on dorsal and anal almost forming bands. Iris lemon yellow and silvery in the larger ; almost vermilion and orange in smaller. A dark blotch at upper edge of opercle.

The Chautauqua Lake Mascalonge, according to Mr. James Annin, Jr., who sent the specimens, is a very fine food and game fish, and attains to the weight of fifty pounds. In the spring of 1895 it was not unusual to capture individuals weighing from 40 to 50 pounds, and 20 to 30 pounds was a very common weight. In winter the fish frequent nearly the same localities as in summer, being found in the vicinity of water-plants. When the lake becomes very clear in February, they go into deep water, but they live in deep water more or less all the year.

For the fish-cultural operations the nets are set as soon after the first of April as the ice leaves the lake. The fish begin to spawn a few days after and continue until the latter part of April. They go into shallower water for spawning ; most of them spawn in from ten to fifteen feet of water. They do not resort to the gravel like many other fish, but to mud, generally going into bays. The eggs are placed in boxes, all of which are provided with screens at top and bottom. The bottom has an extra screen, to prevent minnows from injuring the eggs. The boxes are sunk

from one foot to two feet under the surface of the water. Every day or two they are drawn up, the covers removed, and all bad eggs and sediment cleaned out.

57. *Fundulus majalis* (Walbaum). BASS MINNOW ; KILLIFISH.—This large Killifish is found all the year in Gravesend Bay. It has proved less vigorous in captivity than all the other marine killifishes. In the winter it is found in deep, muddy holes at the mouths of creeks.

58. *Fundulus heteroclitus* (Linnaeus). KILLIFISH.—A permanent resident in Gravesend Bay, going into deep, muddy holes near the mouths of creeks in winter. This species forms the principal supply of live food for the larger fishes in the Aquarium.

59. *Fundulus diaphanus* (Le Sueur). FRESH-WATER KILLIFISH.—This is usually a most difficult species to keep in health. The individuals now in the gallery were seined in the lake at 110th Street and 5th Avenue, Central Park, in August, 1897. As a rule the fish is attacked and killed by fungus before the salt-water treatment can take effect. Its food is chopped hard clams chiefly. Occasionally it takes liver. It cannot be considered hardy in captivity.

60. *Lucania parva* (Baird & Girard). RAINWATER-FISH.—This Killifish is abundant in Peconic, Shinnecock and Great South Bays, and in a fresh-water stream at Water Mill, Long Island. Although small it is always interesting because of its translucent body and its graceful movements ; it is hardy and takes chopped clams very freely. The fish does not exceed $1\frac{1}{2}$ inches in length.

61. *Cyprinodon variegatus* Lacépède. LEBIAS ; SHORT KILLIFISH.—Mr. Spencer has kept a male and two females in a balanced jar nearly two years. They have bred at least once, and the young were reared to a length of $\frac{5}{8}$ inch when they disappeared suddenly, and it is probable that they were eaten by the adults. This is one of the best of the Cyprinodonts for aquarium purposes.

62. *Tylosurus marinus* (Walbaum). SILVER GAR; NEEDLE-FISH.—The Silver Gar is to be found in Gravesend Bay from June to September. It never stands transportation, and cannot be kept long in captivity.

63. *Eucalia inconstans* (Kirtland). BROOK STICKLEBACK.—Living examples were obtained from Mr. James Annin, Jr., at Caledonia, N. Y., April 10, 1896. For some unexplained reason it is difficult to keep the fish alive either in balanced or circulating tanks; it does better in the former. One individual of the lot above mentioned is now alive in a balanced tank. It has always been shy, but feeds readily upon hard clams and *Gammarus*.

64. *Pygosteus pungitius* (Linnæus). NINE-SPINED STICKLEBACK.—Less abundant in Gravesend Bay than the following two species. In the Aquarium it is not difficult to keep alive.

65. *Gasterosteus bispinosus* Walbaum. STICKLEBACK.—The adults have been kept in a balanced marine tank many months, and young were obtained and reared to the length of about $\frac{1}{2}$ inch, but they were then eaten by the adults. All of this species were killed by warm water in the summer of 1896.

66. *Apeltes quadracus* (Mitchill). THREE-SPINED STICKLEBACK.—A hardy species in circulating tanks; but none have ever been known to breed in captivity. Their food consists of chopped hard clams, and broken shrimps.

67. *Siphostoma fuscum* (Storer). PIPE-FISH.—The Pipefish is moderately common in summer in eelgrass and sea lettuce in Gravesend Bay. It is difficult to find suitable food for it in the Aquarium, and, as a consequence, it is short-lived. The species likes shrimp with eggs and small *Gammarus*. Several examples taken at Sandy Hook, Oct. 8, 1897, are still alive in a slightly circulating tank in the Aquarium, in a temperature of 54° Fahrenheit. They feed well upon *Gammarus*, and seem to be in good condition.

68. *Hippocampus hudsonius* De Kay. SEA-HORSE.—The Sea-horse is sometimes found in large numbers in the nets at Gravesend Bay, but has not been abundant since 1895. It endures captivity for a few months only; individuals have been kept eight months in a 'balanced' tank, where they thrive best. The food consists of *Unciola* and shrimp eggs.

69. *Aphredoderus sayanus* (Gilliams). PIRATE PERCH.—Common in a lake at Patchogue, Long Island, where it has sometimes been mistaken for young Carp. The individuals in the Aquarium were sent by Prof. Ulric Dahlgren from Princeton, N. J., in October, 1897. They have never been observed to feed, and do not look well.

70. *Menidia beryllina* (Cope). FRESH-WATER SILVERSIDE.—This small Silverside, heretofore found only in the Potomac River, is abundant in a little mill stream at Water Mill, Long Island, where the writer seined it, Sept. 14, 1897, in company with *Fundulus diaphanus*, *Lucania parva*, *Eupomotis gibbosus*, and *Lucius reticulatus*. The largest of the individuals are $2\frac{3}{8}$ inches long. Owing to high temperature the shipment to New York was unsuccessful, none of the fish having lived in the Aquarium longer than a few days. Following are some of the characters :

D. V, I, 10; A. I, 16-17; scales, 8-40.

71. *Menidia notata* (Mitchill). SILVERSIDE; SPEARING.—This species is found in Gravesend Bay almost all the year, inhabiting spring holes in winter. Individuals brought into the Aquarium in the winter of 1895 are still living (Nov. 28, 1897). They endure the summer temperature, which has sometimes reached $71\frac{1}{2}$ degrees Fahrenheit in the salt-water tanks. They feed here upon hard clams and shrimp.

72. *Labidesthes sicculus* Cope. BROOK SILVERSIDE; SKIP-JACK; GLASS-FISH.—The name Glass-fish is used for the species on Chautauqua Lake. Mr. Annin sent some living examples April 22, 1897, but they were in a very weak condition after the twelve hours' journey by rail, and soon died.

73. *Mugil cephalus* Linnæus. STRIPED MULLET.—The young Mullet are abundant in Gravesend Bay in midsummer ;

larger ones appear in September and October. One winter, some years ago, they hibernated in the mud in Sheepshead Bay and were taken with eel-spears. It feeds and thrives most of the year, but cannot survive the heat of summer. Food in the Aquarium consists of hard clam and shrimp.

74. *Mugil curema* Cuv. & Val. WHITE MULLET.—This appears with the foregoing, but is less abundant in Gravesend Bay.

75. *Sphyræna borealis* De Kay. BARRACUDA.—Several young individuals were captured in Gravesend Bay in September, 1896. The species is not common in that locality. An individual $5\frac{1}{2}$ inches long was seined at Sandy Hook Oct. 8, 1897; it lived only until Oct. 31, and was never observed to take food. The species never has been successfully reared in the Aquarium.

76. *Polydactylus octonemus* (Girard). THREADFIN.—On Sept. 24, 1896, three specimens were obtained by Mr. John B. De Nyse in Gravesend Bay and sent to the Aquarium dead, as they would not endure captivity. The fish agrees in coloration and in every other respect with *P. octofilis* Gill, and is believed to be the adult form of *P. octonemus* Girard. This is probably the first record of its occurrence in New York waters for more than thirty years.

MEASUREMENTS.

| | |
|---|--------------------|
| Length, including caudal..... | $8\frac{3}{4}$ in. |
| Length to end of middle caudal rays..... | $7\frac{1}{2}$ in. |
| Length to origin of middle caudal rays..... | $6\frac{5}{8}$ in. |
| Greatest depth of body..... | .2 in. |
| Least depth of caudal peduncle..... | $\frac{1}{16}$ in. |
| Length of head..... | $1\frac{3}{4}$ in. |
| Length of snout..... | $\frac{1}{8}$ in. |
| Diameter of eye..... | $\frac{5}{16}$ in. |
| Length of upper jaw..... | $\frac{3}{4}$ in. |
| Length of mandible..... | $\frac{3}{4}$ in. |
| Length of longest pectoral filament..... | $2\frac{3}{8}$ in. |
| Length of upper and lower caudal lobes..... | $2\frac{1}{4}$ in. |
| Length of pectoral..... | $1\frac{1}{2}$ in. |
| Length of longest (third) dorsal spine..... | $1\frac{1}{2}$ in. |
| Length of second dorsal ray..... | $1\frac{1}{4}$ in. |
| Length of ventral..... | $\frac{1}{8}$ in. |
| Length of longest anal ray..... | 1 in. |
| Length of anal base..... | $1\frac{7}{8}$ in. |
| Length of base of first dorsal..... | $\frac{3}{4}$ in. |
| Length of base of second dorsal..... | $1\frac{1}{8}$ in. |

The longest pectoral filament reaches to below the interspace between the two dorsals and slightly past the vent. The diameter of the eye equals the length of the snout and one-fifth the length of the head.

77. *Ammodytes americanus* De Kay. SAND LAUNCE ; SAND EEL ; LANT.—The species appears in Gravesend Bay in July, but is more plentiful in winter. In the Aquarium it will not thrive for want of sand and proper food. It swims continually and soon dies. The fish buries itself in sand and sometimes, when alarmed, will leap four inches above the sand.

78. *Mullus auratus* Jordan & Gilbert. RED MULLET ; GOAT FISH.—Three individuals of a *Mullus* were captured in a seine at Sandy Hook, N. J., Oct. 8, 1897, and brought alive to the Aquarium, where they are now (Nov. 30, 1897) in good condition and feed freely upon shrimp. As the fish are living it is uncertain whether or not they are *M. auratus* ; but they agree in the main with the description of that species. Their endurance of water at a temperature of 50 degrees Fahrenheit is unexpected. *M. auratus* is recorded upon our East Coast from Cape Cod to Florida, but it is rare as a rule in the north. Fishermen at Sandy Hook reported that large numbers were seen there in September and October, 1897.

79. *Scomber scombrus* Linnaeus. MACKEREL.—Two young, $3\frac{1}{4}$ to $5\frac{1}{2}$ inches long, were taken in Gravesend Bay, L. I., May 23, 1896, in John B. De Nyse's shad pound. No more were seen, and these were the first for the year. They come about the time of the appearance of Anchovy and Weakfish. They are often seen swimming at the surface of the bay in small bunches of 18 or 20, occasionally 100, in the latter part of May or early in June. They are always split up into small bunches, probably by the attacks of weakfish and other predaceous species which are present at the time. Flukes attack them also in shallow water ; flukes are very destructive to young fish. A fluke will often have 8 or 10 little tautogs in its stomach. They frequent the flats for the purpose of feeding on little fishes.

80. *Scomber colias* Gmelin. THIMBLE-EYE MACKEREL ; CHUB MACKEREL.—This species was not found in large numbers in Gravesend Bay in 1897, but in 1896 it abounded in all the little creeks, and in some instances the fish could be dipped up by the boat loads with scoop-nets. The fish reached ten inches in length before the end of the summer.

81. *Sarda sarda* (Bloch). BONITO.—The fish is generally scarce in Gravesend Bay. Five were taken in one day in a pound net in October, 1897, an unusual number for that species. The fish will not live in captivity.

82. *Trichiurus lepturus* Linnaeus. SCABBARD-FISH.—One young example was caught in John B. De Nyse's pound, Gravesend Bay, in August, 1897. It had been captured by another fish while in the pound, but was rescued in good condition. The species is rarely seen in that bay.

83. *Oligoplites saurus* (Bloch & Schneider). LEATHER JACKET.—An example $9\frac{3}{4}$ inches long and $2\frac{1}{2}$ inches deep was secured in De Nyse's pound in Gravesend Bay in the summer of 1896. It is rarely seen there.

84. *Seriola zonata* (Mitchill). BANDED PILOT.—The species does not endure close confinement, but thrives in the great pool of the Aquarium. Two examples, taken in September in Gravesend Bay, are living at the end of November, 1897. They feed on small killifish, which they take with a rush much the same as the brook trout.

85. *Seriola lalandi* Cuv. & Val. (?). AMBER-FISH.—A large Amber-fish was captured by Mr. De Nyse in Gravesend Bay, July 15, 1896, and was brought alive to the Aquarium Aug. 8, but it never recovered from the effects of the journey. The large *Seriolas* are too active and shy to stand transportation, and they rarely live in captivity, but a species received from Bermuda early in July, 1897, is alive in the Aquarium (Dec. 10), and still feeds regularly upon pieces of herring and live killifish.

A description and measurements in inches of the Gravesend Bay specimen may help to verify or correct the identification :

| | |
|---|---------|
| Length, including caudal..... | 33½ in. |
| Length to end of middle caudal rays..... | 30½ in. |
| Length of external caudal lobes from pit..... | 7 in. |
| Length of middle caudal rays..... | 2 in. |
| Greatest depth of body..... | 6¾ in. |
| Least depth of caudal peduncle..... | 1½ in. |
| Greatest thickness of body..... | 4 in. |
| Length of head..... | 8 in. |
| Length of upper jaw..... | 3½ in. |
| Width across end of maxilla..... | 1½ in. |
| Length of mandible..... | 4½ in. |
| Length of snout..... | 2¾ in. |
| Diameter of eye..... | 1¼ in. |
| Diameter of pupil..... | ¾ in. |
| Distance from snout to vertical from first dorsal origin..... | 10¼ in. |
| Length of first dorsal base..... | 3½ in. |
| Length of first spine..... | ¾ in. |
| Length of second spine..... | 1¼ in. |
| Length of third (longest) spine..... | 1¾ in. |
| Length of seventh spine..... | ¾ in. |
| Distance from snout to second dorsal (obliquely)..... | 14¼ in. |
| Length of second dorsal base..... | 11¾ in. |
| Length of second ray of second dorsal..... | 3¾ in. |
| Length of first ray..... | 1½ in. |
| Length of last ray..... | 1¾ in. |
| Length of pectoral..... | 3¾ in. |
| Length of ventral..... | 4¾ in. |
| Distance from ventral origin to anal origin..... | 10½ in. |
| Distance from vent to anal origin..... | 2 in. |

The jaws are equal. The maxilla reaches to below the middle of the pupil. The pectoral and ventral origins are in the same vertical.

D. VII, 26 ; A. I, 24 ; V. 6 ; P. 21 ; scales, about 24-160-30 ; gill-rakers, 4 + 10, the longest 1½ inches, very thin, much wider at base, and tapering gradually to a small, rounded point, very finely toothed on inner margin.

Teeth in broad, villiform bands in both jaws ; an arrow-shaped patch with long, slender backward process on vomer. Similar bands on palate and pharynx.

The ground color is gray with purplish iridescence. A golden bronze stripe beginning on the snout and continued behind the eye to the caudal in a nearly straight line, slightly above the median line. Another bronze stripe begins above the eye and extends to the first dorsal. In life, two dark bands showed between the eyes and extended to the first dorsal. Sides and lower parts much mingled with silvery white. Iris gray overlaid with golden yellow. Pupil bluish black. All the fins colored like the body except the ventrals, which are whitish underneath, and gray mingled with white above.

The weight of the fish was 13 pounds, 1½ ounces.

86. *Elagatis bipinnulatus* (Quoy & Gaimard). RUNNER.

—On Aug. 2, 1895, a fresh dead specimen of the Runner was

brought from Mr. De Nyse's pound in Gravesend Bay. This tropical species has once before been recorded from Long Island.

87. *Decapterus punctatus* (Agassiz). SCAD ; ROUND ROBIN.—The Spotted Scad is not recognized in Gravesend Bay. It was found abundant, Aug. 31, 1897, in the ocean at Southampton, Long Island.

88. *Decapterus macarellus* (Cuv. & Val.). MACKEREL SCAD.—The Mackerel Scad has not yet been recorded in Gravesend Bay, but was found common at Southampton, Long Island, in the Atlantic, Aug. 31, 1897, associated with the preceding species and young *Scomber*, *Pomatomus*, *Rhombus*, *Clupea*, *Etrumeus*, *Clupea*, two species of *Stolephorus* and *Paralichthys*.

89. *Trachurops crumenophthalmus* (Bloch). BIG-EYED SCAD.—This is taken in the fall in Gravesend Bay. It is another fish that soon dies when closely confined, but will live within suitable ranges of temperature in the large pool. The food is small killifish, chopped clams and shrimp. Found Aug. 31, 1897, in the surf at Southampton, Long Island.

90. *Caranx hippos* (Linnaeus). YELLOW MACKEREL ; CREVALLÉ.—The remarks made concerning the Big-eyed Scad will apply to the two species of Crevallé.

91. *Caranx crysos* (Mitchill). CREVALLÉ.—At the end of November, 1897, several Crevallés of this and the preceding species are living and feeding in the large pool. Occasionally they school together under the Sand Shark and follow it about.

92. *Alectis ciliaris* (Bloch). THREAD-FISH.—This species is occasional in summer in Gravesend Bay. In the Aquarium it usually lives about three months, dying when the temperature falls much below 60 degrees.

93. *Vomer setipinnis* (Mitchill). HORSE-FISH ; SHINER.—An example was brought from Gravesend Bay, Oct. 21, 1896. The young, called 'Dollar-fish' here, was brought from the bay Oct. 22, 1896, for examination.

94. *Selene vomer* (Linnaeus). MOON-FISH.—On Sept. 8 and 29, 1897, three examples of the Moon-fish were taken in Gravesend Bay. In November these were transferred to a tropical tank, in which the water is kept at a temperature of 68 to 70 degrees Fahrenheit, and they are taking their food regularly.

95. *Trachinotus carolinus* (Linnaeus). POMPANO.—The young are summer and fall visitors in Gravesend Bay. Twenty-two individuals were placed in the Aquarium in August, 1897, and thrived until the temperature of the water fell below 60 degrees Fahrenheit, in November, during which month all of them died.

96. *Trachinotus falcatus* (Linnaeus). ROUND POMPANO.—The young are occasionally taken in summer in Gravesend Bay. Early in September, 1897, a small individual was placed in the Aquarium and lived more than two months; it died in November on account of the low temperature of the water. As long as the temperature was suitable it fed and grew rapidly.

97. *Pomatomus saltatrix* (Linnaeus). BLUEFISH; SNAPPER.—This is usually regarded as a difficult species to keep in the Aquarium. On Oct. 8, 1897, five young were brought from Gravesend Bay and Sandy Hook, and three of them are now living (Nov. 30) and feeding freely.

98. *Coryphæna hippurus* Linnaeus. DOLPHIN.—A fine example, 17 inches long and $2\frac{3}{4}$ inches deep, was brought in from off Sandy Hook late in August, 1897. It was caught by a trolling line while fishing for bluefish, and so badly injured in one of the eyes that it could not be kept alive.

99. *Palinurichthys perciformis* (Mitchill). RUDDER-FISH.—Rare in Gravesend Bay. Some years none are seen, but usually one or two will appear during the summer.

100. *Rhombus triacanthus* (Peck). HARVEST-FISH; BUTTER-FISH.—This is found in Gravesend Bay from April to November. It is not a hardy fish in the Aquarium.

101. *Rhombus paru* (Linnaeus). HARVEST-FISH; PAPPY-FISH.—A summer visitor in Gravesend Bay and sometimes rare, but formerly abundant. Not well adapted to Aquarium life.

102. *Eupomotis gibbosus* (Linnaeus). SUNFISH.—The common Sunfish abounds in the parks, and living individuals have been received also from Canandaigua Lake, the Adirondack lakes and elsewhere. It is hardy but subject to fungus attacks, which yield readily to treatment with brackish water.

103. *Micropterus dolomieu* Lacépède. SMALL-MOUTHED BLACK BASS.—Fourteen young of the year were received from James Annin, Jr., Caledonia, N. Y., on Oct. 6, 1896. On the approach of cold weather they remained nearly dormant and took almost no food during the winter, but when the spring was advanced they fed eagerly and grew rapidly.

104. *Micropterus salmoides* (Lacépède). LARGE-MOUTHED BLACK BASS.—Three individuals, about 4 inches in length, were received from Mr. Annin, at Caledonia, Oct. 6, 1896. They hibernated and almost always refused food in the winter, but fed ravenously in spring, summer and fall. Young fish from $1\frac{1}{2}$ to 2 inches long were seined in Bronx River in August, and they prove hardy in captivity.

105. *Stizostedion vitreum* (Mitchill). PIKE PERCH; WALL-EYED PIKE; PIKE.—Mr. James Annin, Jr., of Caledonia, sent two individuals, April 23, 1896, for identification. They furnished the following notes and measurements in inches:

| | ♀ | ♂ |
|--|-----------------|-----------------|
| Length, including caudal..... | $18\frac{3}{4}$ | 18 |
| Length to end of middle caudal rays..... | 18 | $17\frac{1}{8}$ |
| Depth of body..... | $3\frac{1}{2}$ | $3\frac{3}{8}$ |
| Least depth of caudal peduncle..... | $1\frac{1}{8}$ | $1\frac{1}{4}$ |
| Length of head..... | $4\frac{3}{4}$ | $4\frac{3}{8}$ |
| Length of snout..... | $1\frac{1}{4}$ | $1\frac{1}{8}$ |
| Diameter of eye..... | $\frac{1}{8}$ | $\frac{1}{8}$ |
| Length of maxilla..... | 2 | $1\frac{1}{8}$ |
| Length of mandible..... | $2\frac{3}{4}$ | $2\frac{1}{2}$ |
| Dorsal..... | XIV, I, 21 | XIV, I, 20. |
| Anal..... | III, II. | III, II. |
| Scales..... | 92 | 93 |

The pyloric coeca are long and loaded with fat. The male is brassy; the female gray and whitish.

In November, 1896, and again in the same month of 1897, Mr. Annin had living adult Pike Perch shipped by express from Canandaigua Lake, and a fish was seldom lost in transportation.

106. *Perca flavescens* (Mitchill). YELLOW PERCH.—The species is abundant in the parks of New York and Brooklyn. It is a fairly good aquarium fish, somewhat susceptible to fungus attacks but easily treated with salt water. Its food is chiefly hard clam ; sometimes live 'killies are used.

107. *Boleosoma olmstedii* (Storer). TESSELLATED DARTER.—The species was found sparingly in Bronx River in August, 1897. A number of individuals were placed in a balanced tank and are still living at the end of November. They are fed principally on hard clam, *Gammarus*, and, occasionally, earth-worms.

108. *Roccus chrysops* (Rafinesque). WHITE BASS.—Mr. Annin obtained a specimen in Oneida Lake Sept. 4, 1896, and sent it for identification. Its length is $12\frac{1}{4}$ inches, and its weight $16\frac{1}{2}$ ounces. The following additional measurements in inches were taken :

| | |
|--|---------------------|
| Length to end of middle caudal rays..... | $11\frac{1}{2}$ in. |
| Length to end of scales..... | 10 in. |
| Depth of body..... | 4 in. |
| Least depth of caudal peduncle..... | $1\frac{3}{8}$ in. |
| Length of head..... | 3 in. |
| Length of snout..... | $\frac{5}{8}$ in. |
| Diameter of eye..... | $\frac{9}{16}$ in. |
| Length of fourth dorsal spine..... | $1\frac{3}{8}$ in. |
| Length of second dorsal ray..... | $1\frac{1}{4}$ in. |
| Length of second anal ray..... | $1\frac{1}{4}$ in. |

109. *Roccus lineatus* (Bloch). STRIPED BASS ; ROCKFISH.—A permanent resident, but the height of the fishery in Gravesend Bay occurs from Oct. 10 to Nov. 10. Large fish, up to 45 pounds, are caught in May, but the fall fish will range from 9 to 24 inches in length. In the Aquarium the species is hardy and grows rapidly. Its food consists of killifish, pieces of herring, shrimp and, occasionally, chopped clam. Many examples have been kept here $3\frac{1}{2}$ years, and are still alive.

110. *Morone americana* (Gmelin). WHITE PERCH.—This species is never plentiful in Gravesend Bay; it is abundant in fresh-water lakes of Central Park, New York, and Prospect Park, Brooklyn. Near Montauk, Long Island, individuals weighing two to three pounds and more are reported. In the Aquarium the White Perch is very susceptible to fungus attacks, but the parasite is readily killed by changing the water supply from salt to fresh, or *vice versa*.

111. *Centropristes striatus* (Linnaeus). SEA BASS.—The Sea Bass makes its appearance in Gravesend Bay in May. It is not abundant. The young in October are found in the eel grass, measuring from $1\frac{1}{2}$ to 2 inches in length. The species is well adapted to life in the tanks during all but the coldest months.

112. *Orthopristis chrysopterus* (Linnaeus). PIG-FISH.—Several examples were taken in Gravesend Bay, Oct. 24, 1894.

113. *Stenotomus chrysops* (Linnaeus). SCUP; PORGY.—The Scup comes into Gravesend Bay in May, and is taken as late as November. In the Aquarium it lives until December, and in warmed water can be kept indefinitely. It is thrifty, and is seldom out of condition.

114. *Lagodon rhomboides* (Linnaeus). SAILOR'S CHOICE.—Not a common fish in Gravesend Bay; it is found occasionally in summer.

115. *Archosargus probatocephalus* (Walbaum).—SHEEPS-HEAD.—Very unusual in Gravesend Bay. A large example, weighing 13 pounds, was caught Sept. 16, 1897, at Coney Island, and brought to the Aquarium, but was badly injured and never recovered. The species is well adapted to Aquarium life.

116. *Kyphosus sectatrix* (Linnaeus). BERMUDA CHUB.—This rare species was taken in Gravesend Bay in October, 1896, and again in September, 1897. It is hardy in the Aquarium, but cannot endure the winter temperature.

117. *Cynoscion regalis* (Bloch & Schneider). WEAKFISH ; SQUETEAGUE.—An adult example, now living in the Aquarium, has been kept in good condition during two winters, and is now in winter quarters in the great central pool. At one time a white membrane covered both eyes, and the fish was supposed to be blind; but its eyes are now (Dec. 11, 1897) in perfect condition.

118. *Larimus fasciatus* Holbrook. BANDED LARIMUS.—An individual was captured in Gravesend Bay July 25, 1895, and another one Aug. 2 of the same year. These fed freely, and were kept in a healthy condition until Jan. 16, 1896, when the low temperature of the water killed them. The fish is not common anywhere, and has not before been recorded north of Chesapeake Bay.

119. *Bairdiella chrysura* (Lacépède). YELLOW-TAIL ; SILVER PERCH.—The young of the Silver Perch are found every summer in Gravesend Bay, and adults are to be seen occasionally. On Sept. 8, 1896, Mr. De Nyse took an example $1\frac{1}{4}$ inches long with a shrimp net in eel grass back of the flats at extreme low tide. Pools containing two feet of water are common here, and many species of fish become imprisoned in them. In August Mr. W. I. De Nyse has captured a half-dozen adult *Hippocampus* in such localities. On Oct. 5, 1896, and again in the fall of 1897, the Silver Perch was obtained in the bay.

120. *Sciaenops ocellatus* (Linnaeus). RED DRUM ; CHANNEL BASS.—A Red Drum, or Spotted Bass, weighing 14 pounds, was obtained by Mr. E. G. Blackford from New Jersey, and was purchased alive for the Aquarium. At the time of writing (Dec. 11, 1897) it is in the central pool, and is, apparently, in perfect health. It swims sometimes immediately under the sand shark. Its food consists of large pieces of herring, which it takes readily.

121. *Leiostomus xanthurus* Lacépède. SPOT ; LAFAYETTE.—Rather common in Gravesend Bay from July to as late as December, and is well adapted to captive life. It is most abundant usually in September.

122. *Micropogon undulatus* (Linnaeus). CROAKER.—A very uncommon species in Gravesend Bay.

123. *Menticirrhus saxatilis* (Bloch & Schneider). KING-FISH.—This was formerly abundant in Gravesend Bay, but it seldom makes its appearance there now.

124. *Pogonias cromis* (Linnaeus). DRUM.—The Drum is an occasional summer visitor in Gravesend Bay. In the fall of 1896, fourteen young individuals, 8 inches long, were brought from there alive to the Aquarium, and lived until Feb. 10, 1897, when the low temperature (38°) overcame them. In the fall of 1897 none were seen in the bay.

125. *Tautogolabrus adspersus* (Walbaum). BERGALL ; CUNNER.—Found throughout the year. Hardy in the Aquarium. Individuals have been kept three years or longer. The food is chiefly hard clam.

126. *Tautoga onitis* (Linnaeus). BLACKFISH ; TAUTOG.—Found during the entire year. An excellent aquarium fish. Examples now here have been kept longer than three years, and their growth in some cases is remarkable. They are fed upon chopped hard clams, live killifish, shrimp and, occasionally, fiddler-crabs.

127. *Chætodon ocellatus* Bloch.—Very rare in Gravesend Bay.

128. *Teuthis hepatus* Linnaeus. SURGEON ; DOCTOR-FISH.—A young individual, about three inches long, was caught in Mr. John B. De Nyse's pound, Oct. 22, 1897. It was injured when captured, and lived only a few days in the Aquarium. The species has not been known before north of Charleston.

129. *Balistes carolinensis* Gmelin. TRIGGER-FISH ; TURBOT.—An uncommon species in Gravesend Bay, but seen occasionally in the bays opening into the Atlantic.

130. *Monacanthus hispidus* (Linnaeus). FILEFISH.—This fish is taken in Gravesend Bay in moderate numbers occasionally in the fall. Individuals have been sent from there in September and November, 1897. Some are now (Dec. 11) living in a tropical tank and feeding freely.

131. *Alutera schoepfii* (Walbaum). ORANGE FILEFISH.—The young are rather common in Gravesend Bay in August, September, October, and sometimes as late as November. Adults are rarely seen. The species will not survive the winter except in warmed water. It feeds freely when the temperature is agreeable.

132. *Lactophrys trigonus* (Linnaeus). TRUNK-FISH.—The only individual taken in Gravesend Bay was found in August, 1897; it was three-eighths of an inch long. The fish lived a very short time in a balanced jar, although it appeared to feed freely upon minced hard clam. It is seen oftener in Vineyard Sound and neighboring waters in the summer.

133. *Lagocephalus lævigatus* (Linnaeus). RABBIT-FISH; SMOOTH PUFFER.—Occasionally taken in the fall in Gravesend Bay. Five young were obtained in October, 1897, but all of them died in November, notwithstanding that they had been taking food readily. The temperature could not be endured.

134. *Spheroides maculatus* (Bloch & Schneider). PUFFER; SWELL-FISH.—The species is found in Gravesend Bay at all times except the cold months. It is hardy, but cannot be kept with other fish because of its predatory habits.

135. *Chilomyterus schoepfii* (Walbaum). SPINY BOXFISH; BURRFISH.—The species is found occasionally in small numbers from May to October in Gravesend Bay, but no very small ones are seen. It lives in the Aquarium in winter only in water heated to a temperature of 68 to 70 degrees Fahrenheit.

136. *Acanthocottus æneus* (Mitchill). MITCHILL'S SCULPIN.—This little Sculpin spawns in winter. The eggs have a beautiful green color. The fish is practically a permanent resident of Gravesend Bay.

137. *Acanthocottus octodecimspinosus* (Mitchill). SCULPIN; HACKLEHEAD.—Taken only in winter and early spring in Gravesend Bay. It will not live in the warm water of summer in the Aquarium.

138. *Hemitripteris americanus* (Gmelin). SEA RAVEN.—The Sea Raven spawns in November. The eggs are amber or yellow.

The eggs of *Hemitripteris* in the Aquarium, Nov. 29, 1897, are in masses sticking tightly together. The egg is $\frac{5}{32}$ inch in diameter, and showing the form of the fish distinctly. The color of the egg is pale salmon, but is brighter when just deposited.

139. *Cyclopterus lumpus* Linnaeus. LUMPFISH.—Found in Gravesend Bay in May. It never lives in the Aquarium longer than a few weeks.

140. *Rissola marginata* (De Kay). SLIPPERY DICK.—A rare fish in Gravesend Bay. A specimen was obtained there Oct. 24, 1894.

141. *Gobiosoma bosci* Lacépède. GOBY.—Taken in the oyster dredge at Eaton's Neck, Long Island, in the fall of 1896. The fish lived all winter in a balanced tank, and took food greedily; but on the approach of summer all perished. It seizes its food with a snap, and immediately rushes off to conceal itself in a rock crevice or behind plants.

142. *Astroscopus guttatus* Abbott. STAR-GAZER.—An example was caught in Gravesend Bay Oct. 24, 1894. It did not live longer than a month in captivity, and was killed by the cold water.

143. *Opsanus tau* (Linnaeus). TOADFISH.—Not present in the hot summer months in Gravesend Bay, but can be kept in the Aquarium by careful treatment. Most of the individuals brought from there to the Aquarium have come in August, September and October.

144. *Pholis gunnellus* (Linnaeus). ROCK-EEL; BUTTERFISH.—Taken in the oyster dredge at Eaton's Neck in the fall of

1896, and brought alive to the Aquarium. It did not live long in captivity.

145. *Zoarces auguillaris* (Peck). MUTTON-FISH; EEL-POUT.—Found in fall and winter on the fishing-banks. It never endures the warm water in summer.

146. *Prionotus carolinus* (Linnaeus). SEA ROBIN.—This species appears in Gravesend Bay in May, and is caught in the shad fykes. It is the earliest of the Sea Robins to arrive.

147. *Prionotus strigatus* Cuv. & Val. RED-WINGED SEA ROBIN.—Makes its appearance later than *P. carolinus*.

148. *Prionotus evolans* (Linnaeus). STRIPED SEA ROBIN.—This arrives in Gravesend Bay later than *P. carolinus*.

149. *Cephalacanthus volitans* (Linnaeus). FLYING GURNARD.—An uncommon fish in Gravesend Bay. An example sent from there Oct. 30, 1897, lived only two days.

150. *Echeneis naucrates* Linnaeus. REMORA; SUCKING-FISH.—The Remora is found in Gravesend Bay in summer only, attached to sharks, usually the sand shark, *Carcharias littoralis*. An example obtained July 28, 1897, lived and fed until Nov. 13, when it ceased feeding, and on Nov. 23 it died because of the low temperature of the water. In the Aquarium the fish is usually stationary on the bottom, but will often rise to the surface to take pieces of fish or clam.

151. *Merluccius bilinearis* (Mitchill). WHITING.—Found in Gravesend Bay in spring and fall. A poor fish for the Aquarium. One individual lived in a large pool two months.

152. *Pollachius virens* (Linnaeus). POLLACK.—The Pollack appears in the fall. It prefers cool water, and will not endure the summer temperature. It is a ravenous feeder.

153. *Microgadus tomcod* (Walbaum). TOMCOD.—A fall and winter species that does not live in captivity in summer.

154. *Gadus morrhua* (Linnaeus). COD.—The Cod is abundant in Gravesend Bay in November, 1897, and thrives in the tanks during the winter and spring, but cannot be kept later than June without refrigeration of the water.

155. *Melanogrammus æglefinus* (Linnaeus). HADDOCK.—This species is not at all adapted to aquarium life.

156. *Lota maculosa* (Le Sueur). BURBOT ; LING ; LAWYER.—Perhaps one of the most difficult of the fresh-water fishes to transport. It is easily overcome by fungus. An individual obtained by Mr. Annin in Canandaigua Lake in November, 1897, is now alive, but may not recover from the effects of the journey.

157. *Phycis regius* (Walbaum). SPOTTED CODLING.—This fish is found in small numbers in Gravesend Bay in the fall. It lives in water below 60 degrees Fahrenheit, and is a good aquarium species, but cannot be kept in summer without artificial cold. Its habit of lying upon the side in imitation of the tautog, and other Labroids, is often observed here.

158. *Phycis tenuis* (Mitchill). HAKE.—As a rule, the common Hake does not live in water above 60 degrees Fahrenheit, but one example survived during last summer, and is now in plump condition. In the hot weather it was emaciated, and suffered greatly from attacks of fungus.

159. *Phycis chuss* (Walbaum). SQUIRREL HAKE.—Found only occasionally in Gravesend Bay ; it lives in the deeper water off shore.

160. *Paralichthys dentatus* (Linnaeus). FLUKE ; FLOUNDER.—A summer visitor in Gravesend Bay, arriving in May or June, and leaving when cold weather sets in. It does not live in the Aquarium in winter.

161. *Bothus maculatus* (Mitchill). SPOTTED FLOUNDER.—The Spotted Flounder, or Window Pane, is not adapted to aquarium life ; it delights in cold water.

162. *Pseudopleuronectes americanus* (Walbaum). FLAT-FISH.—A permanent resident, and a good aquarium fish. Individuals have lived two years or longer in captivity, and their growth has been remarkable.

163. *Achirus fasciatus* Lacépède. AMERICAN SOLE; HOG CHOKER.—This species has been brought from Gravesend Bay every month, except the first four, of the year. It is a hardy and interesting animal for the Aquarium. Its habit of clinging to the glass is remarkable.

164. *Lophius piscatorius* Linnaeus. ANGLER; GOOSEFISH.—The Angler is moderately abundant on the fishing banks, and small ones are sometimes taken in Gravesend Bay. It has never lived in the Aquarium in summer, and no individual has survived longer than four months at any season. The species seems to need sand, which cannot be provided for it in our tanks.

165. *Pterophryne histrio* (Linnaeus). MOUSE-FISH.—An individual caught off the Long Island shore in August, 1897, was brought to the Aquarium in a dying condition. It is not uncommon in the floating masses of gulf weed in the Gulf Stream.

As a supplement to the notes upon the fishes of the State, collected for exhibition and identification, a record of the shipments of living fish and occasional species intended for study only by W. I. De Nyse and John I. De Nyse from Gravesend Bay during 1895, 1896, and all of 1897, except December, is here given. This is not based upon exhaustive collections systematically made throughout the year, but upon the captures made in the pounds and fykes of John B. De Nyse, and in the small nets employed by the brothers for obtaining fish food, young fish and other marine animals for the Aquarium. The number of species included in the list is 87, which is far from the total of forms known to occur in that bay. Mr. De Nyse intended to include chiefly the species that were delivered alive at the Aquarium, and purposely omitted some species forwarded for examination dead. The statement is the only one now available for publication, and it will be found very useful as the beginning of a systematic record of the fish faunal conditions.

[illegible]

¹ The three xxx indicate that the species was sent in 1895, 1896, and 1897; two xx placed to the right of the column indicate the years 1896 and 1897, to the left, 1895 and 1896; two xx with a dash between (thus x-x) indicate not received in 1896.

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