REPORT

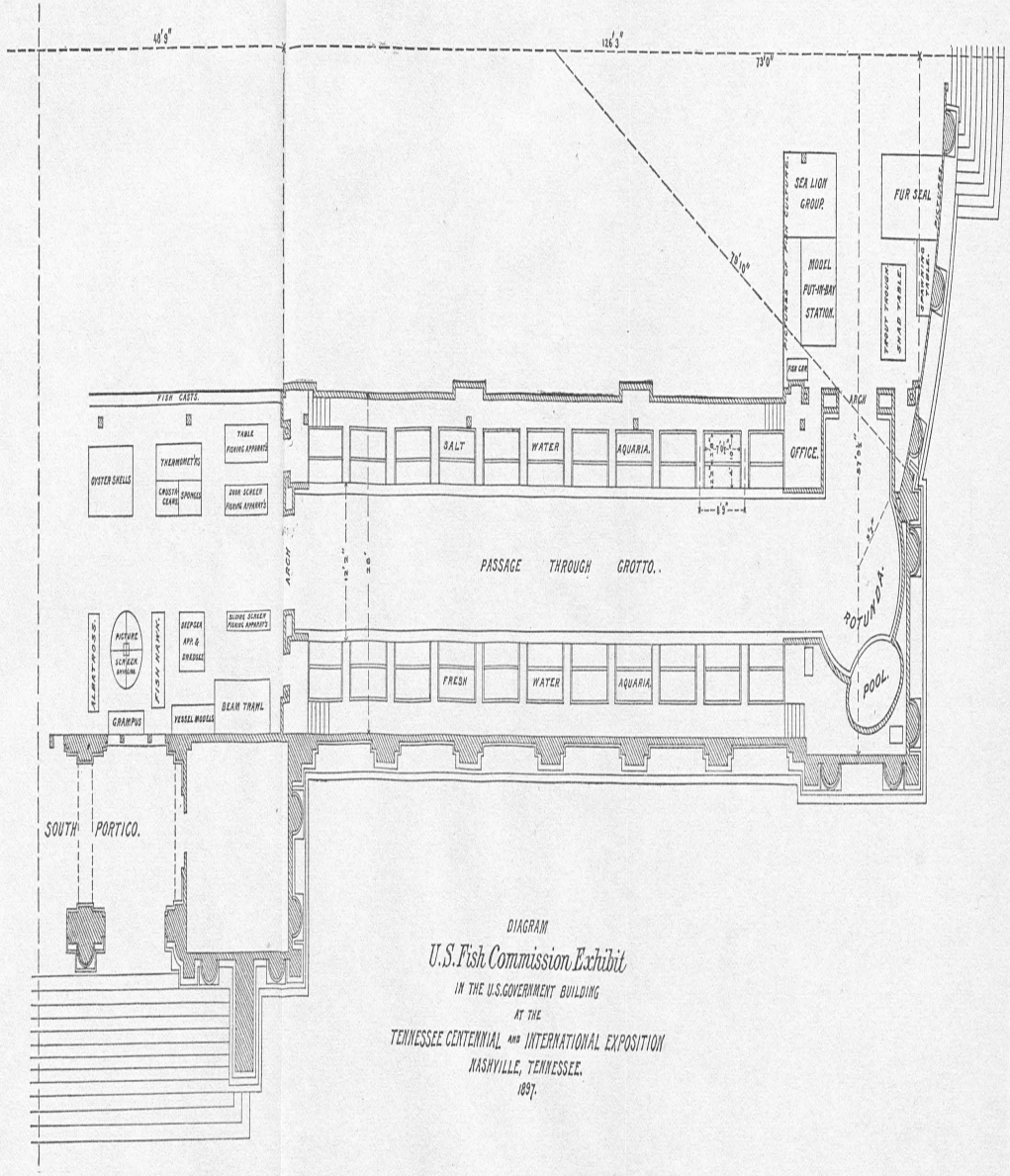
UPON THE

EXHIBIT OF THE UNITED STATES COMMISSION OF FISH AND FISHERIES

AT THE

TENNESSEE CENTENNIAL EXPOSITION IN 1897.

By W. DE C. RAVENEL,
Representative of the United States Fish Commission.



DIAGRAM

U.S. Fish Commission Exhibit

IN THE U.S. GOVERNMENT BUILDING

AT THE

TENNESSEE CENTENNIAL AND INTERNATIONAL EXPOSITION

NASHVILLE, TENNESSEE.

1897.

REPORT UPON THE EXHIBIT OF THE UNITED STATES COMMISSION OF FISH AND FISHERIES AT THE TENNESSEE CENTENNIAL EXPOSITION IN 1897.

By W. de C. Ravenel,
Representative of the United States Fish Commission.

Under the act of Congress approved December 22, 1896, providing for the participation of the United States Fish Commission in the Tennessee Centennial Exposition at Nashville, Tenn., Mr. W. de C. Ravenel, assistant in charge of the Division of Fish-culture, was appointed as the representative of the Commission on the Government Board of Management.

The plan, as approved by the Commissioner, was as follows:

1. Scientific investigations of the Commission, to be illustrated by models of the vessels belonging to the United States Fish Commission, with full-sized forms of the apparatus used, and by illustrations showing the work of these vessels; by collections of marine animals, and by casts of colored fishes, drawn from life; and by collections of sponges, corals, oysters, and other shellfish.

2. Fish-cultural operations, to be shown by models and photographs of important hatching stations; models and full-sized specimens of apparatus used in the collection, transportation, and hatching of eggs, and the distribution of fish; charts showing the work done by the Commission since its organization, and results with reference to special fisheries; also, by the hatching of the eggs of the various species of the salmonidæ and shad; also, an aquarium for showing the important food and game fishes reared by the United States Fish Commission at its various stations, together with the important fishes of the Ohio Valley, and the principal species taken in the South Atlantic Ocean and Gulf of Mexico.

3. Methods and statistics of the fisheries, to be illustrated by models of vessels used in the important fisheries of the South Atlantic and Gulf States; models of boats and the common forms of fishing apparatus, such as pounds, weirs, seines, trawl lines, hand lines, etc.; also, oyster and clam rakes, tongs, hooks for sponges, etc.; besides illustrations of various fisheries by means of photographs, oil paintings, and etchings.

As soon as possible after the organization of the board and the allotment of space and funds, preparations were commenced for the construction of the aquarium and the collection of the material comprising the exhibit. The Commission was allotted $15,500 and 5,000 square feet of space located in the southeast corner of the building. The space was L-shaped and extended from the main aisle at the east

entrance to the intersecting main aisle at the south entrance. By May 17, 1897, when the Government building was opened to the public, the exhibit was installed and ready for inspection, the aquarium stocked with both fresh-water and salt-water fishes, and the hatchery illustrating the methods employed in the hatching of the eggs of the shad and the trout, was in operation.

The accompanying diagram shows the arrangement of the exhibits and the amount of space occupied by the various forms. Of the total allotment of 5,000 feet the aquarium occupied 3,360 feet; the exhibits illustrating fish-cultural work, scientific inquiry, and the methods and statistics of the fisheries, the remaining 1,640.

The articles exhibited are comprised in the following list:

SCIENTIFIC INQUIRY SECTION.

1. Exploring vessels:
   Models: Steamer *Albatross*, steamer *Fish Hawk*.
   Illustrations: Forward deck of steamer. *Albatross*. U. S. Fish Commission steamer *Albatross*.
2. Collecting apparatus:
   Seines and nets: Two Baird seines, 50 and 150 feet long. One herring seine. One herring gill net. Two minnow seines. Two small seines. Two beam trawls, one large (double) and one small model. Two small gauze towing nets.
   Dredges: One naturalist's boat dredge. One naturalist's deep-sea dredge. Two surface tow nets. One dip net. One Chester rake dredge (two nets). Two oyster dredges.
   Tangles: One tangle.
3. Accessories for dredging and trawling:
   Sounding wire: One piece of sounding wire (large size). One piece of sounding wire (common size). Three splices in sounding wire. Two splices in dredge rope.
4. Apparatus for preserving collections:
   One tank box containing one 16-gallon copper tank for storage and transportation of natural-history specimens.
   One tank box containing one 8-gallon and two 4-gallon copper tanks for storage and transportation of natural-history specimens.
   Five jars, assorted sizes.
   Seven glass bottles with cork stoppers, assorted sizes.
   Eleven homeopathic vials with rubber stoppers, assorted sizes.
   Four glass dishes, assorted sizes.
   Three German-silver naturalist's forceps.
5. Apparatus for deep-sea sounding:
   One Tanner deep-sea sounding machine, complete with Sigsbee sounder (shot attached) and deep-sea thermometer.
6. Apparatus for physical observations:
   Thermometers and accessories:
   Three deck thermometers.
   One Miller-Casella deep-sea thermometer.
   One Baird protected thermometer.
   One Negretti & Zambra deep-sea thermometer.
   Three wooden cases for deep-sea thermometers (experimental forms).
   One metal frame for holding deep-sea thermometer (Negretti & Zambra case).
   Eleven brass cases (experimental forms) for deep-sea thermometers with attachments.
   One Magnaghi case for deep-sea thermometer.
   Two Tanner improved metal cases (sixth form), ordinary size, for deep-sea thermometers.
   One water bottle for deep-sea investigations.
   One reading glass for Negretti & Zambra thermometer.
   One set of Hilgard salinometers, with cup and thermometer.
   One magnet.
7. Results of explorations:
   Collections (marine animals, dry):
   (1) Crustaceans:
   One lobster (*Homarus americanus*).
   One crab (*Echinocerus setimanus*).

7. Results of explorations—Continued.
(1) Crustaceans—Continued.
One crab (*Echinocerus foraminatus*).
One deep-sea crab (*Geryon quinquedens*).
One common edible crab of the Pacific coast (*Cancer magister*).
One crab (*Mithrax hispidus*).
Three crabs *Pitho anisodon* (young).
One crab *Pitho anisodon* (adult).
Two mantis shrimp (*Squilla empusa*).
One box-crab (*Calappa flammea*).
One great spider-crab (*Lithodes maia*).
One crayfish nest, or chimney.
One spider-crab (*Libinia emarginata*).
(2) Sponges: Sheepswool, velvet, yellow, glove, and grass.
(3) American ornamental corals:
One piece of star coral (*Porites*).
One piece of coral (*Oculina diffusa*).
Two pieces of fungus coral (*Agaricia agaricites*).
One piece of brain coral (*Manicina areolata*).
One piece of coral (*Mussa*).
One piece of star coral (*Orbicella*).
(4) Mollusks, oyster and other shells:
Oyster spat 2 to 3 weeks old; 3 to 4 weeks old; 1 to 2 months old; 2 to 3 months old; 2 to 3 months old, hard bottom; 2 months old, soft bottom.
Oysters 1 year old, hard bottom; 2 years old, hard bottom; 3 years old, hard bottom; 4 years old, hard bottom; 1 year old, soft bottom; 2 years old, soft bottom; 3 years old, soft bottom; 4 years old, soft bottom; 5 years old, soft bottom; 5 years old, hard bottom; 6 years old, hard bottom; 6 years old, soft bottom; large, mud bottom; large, mud bottom.
Oysters, large, 16 years old, soft bottom; large, 12 years old, hard bottom.
Blue Point oysters.
Oyster shells, greatly thickened, due to stunted growth at margin.
Glenwood oysters; Shinnecock Bay oysters; Rockaway oysters; Shrewsbury oysters.
Rappahannock River oysters; James River (near Newport News, Va.) oysters; Saddlerock oysters; East River oysters.
Oysters from Hampton, Va., 18 months old; from Tangier Sound, Maryland and Virginia.
Oysters from Chincoteague, Va. (first grade); (poorer grade).
Oysters from bottom of scow, Port Royal, S. C., less than 1 year old.
Planted oysters from creeks north of Winyah Bay, S. C.
Oysters from Troups Creek, near Brunswick, Ga.
Raccoon oysters from Cattle Wharf, Charlotte Harbor, Fla.
Oysters from Rocky Point Bed, Tampa Bay, Fla., showing inclusions of mud on inner surface.
Oysters from Catfish Point Oyster Bar, Hillsboro Bay, Fla. (source of supply for Tampa).
Oysters from Little Sarasota Bay, Fla. (a fine grade of oysters, showing inclusions of mud on inner surface).
Oysters from Cape Hayes oyster-bed, Charlotte Harbor, Fla. (important ground, but not much worked until 1888).
Raccoon oysters from mouth of Crooked River, Carrabelle, Fla.
Oysters from Indian Point Bar, Fla. (extra large, showing inclusions of mud on inner surface).
Oysters from Cat Point Bar, Apalachicola Bay, Fla. (showing inclusions of mud on inner surface).
Oysters from St. Mark River, Fla.
Oysters from Cedar Keys, Fla. (average size of those sent to market, showing inclusions of mud on inner surface).
Oysters from St. Vincent, Fla.
Oysters from Watson Bayou, east arm of St. Andrews Bay, Fla.
Oysters from Porter and Sylvia bays, St. George Sound, Fla.
Oysters from Dog Lake, La.
Planted oysters 1 year old, from Escambia Bay, Fla.
Jack Stout oysters, Louisiana.
Oysters from Calcasieu Pass, La.
Oysters from Matagorda Bay, Tex. (average size).
Young oysters from planted beds, Galveston Bay, Tex.
"Saddle-rocks" of Texas, Cedar Bayou, Tex. (125 will often fill a barrel).
Ostrea lurida, growing on shells of *Ostrea virginica* in San Francisco Bay. The native oyster tends to cause much damage in this way.

(4) Mollusks, oyster and other shells—Continued.
Ostrea virginica, natural growth derived from the oysters planted in San Francisco Bay.
Ostrea virginica, transplanted from the Atlantic coast to San Francisco Bay and there raised for market.
Ostrea virginica, Guaymas, west coast of Mexico; used as food.
Ostrea lurida, Pacific coast of the United States; used as food.
Ostrea virginica, Guaymas, Mex., formerly shipped to the San Francisco market.
Ostrea lurida, the native oyster of the Pacific coast of the United States; from Willapa Bay, Wash.
Ostrea lurida, the native oyster of the Pacific coast of the United States; from San Francisco Bay, Cal.
Oyster growing on twig of tree.
Sheet of rubber containing oyster spat.
Rubber shoe with young oyster attached, Connecticut.
Anchor lantern with oysters growing on it.
Earthenware ink bottle with oysters growing on it.
Glass bottle with oysters growing on it.
One-year-old oysters growing on gutta-percha cable across Housatonic River at Stratford, Conn.
Spat about two months old attached to crushed stone off Norwalk, Conn.
Crushed stone, used on planted beds for collecting oyster spat. Recent innovation.
Jingle clutch, used on planted beds for collecting oyster spat; composed of the shells of *Anomia* and other light mollusks, and very highly regarded under some conditions.
Oyster spat growing on child's leather shoe.
Cockle (*Cardium corbis*), Pacific coast of North America; edible.
Horse mussel (*Modiola modiolus*), Greenland to New Jersey, Europe, North Pacific Ocean; used as food and bait.
California mussel (*Mytilus californianus*), Pacific coast of North America; used as food.

(5) Other economic mollusks:
Haliotis, California.
Pearl oyster (*Meleagrina margaritifera*), Gulf of California.
Giant scallop (*Pecten tenuicostatus*), Labrador to New Jersey; used as food.
Common scallop (*Pecten irradians*), Massachusetts to Gulf of Mexico used as food.

(6) Enemies of the oyster:
Starfish attacking oysters. Starfish.
Egg cases of the periwinkles (*Fulgar carica* and *Sycotypus canaliculatus*).
Asterias forbesii and small specimens clustered in shell of periwinkle, off Norwalk, Conn.
Starfish feeding on common mussels (*Mytilus edulis*), Providence, R. I.
Periwinkle (*Sycotypus canaliculatus*), Massachusetts to Gulf of Mexico. Destructive to oysters.
Asterias forbesii. Medium specimen in shell of periwinkle. Connecticut.
Sea snail (*Nerevita duplicata*), Massachusetts to Gulf of Mexico.
Drills (*Purpura lapillus*).
Oyster shells showing the effect of the boring-sponge (*Clione sulphurea*), Tangier Sound, Va.
Drills (*Urosalpinx cinerea*), Massachusetts to Gulf of Mexico; also introduced with oysters in San Francisco Bay, Cal.
Razor-clam.
Flat razor-clams (*Machæra patula*), Alaska to California; used as food.
Giant clams (*Schizothærus nuttallii*), Pacific coast of North America; used as food. New England Coast. Arctic Ocean to South Carolina.
Long clam or soft clam (*Mya arenaria*), Eastern United States; also introduced on Pacific coast; used as food and bait.
Large clams.
Quahog or round clam (*Venus mercenaria*), Gulf of St. Lawrence to Gulf of Mexico; used as food and bait.
Clams (*Mactra planulata*), Alaska; used as food.
Sea clam or surf clam (*Mactra solidissima*), Labrador to Gulf of Mexico; used as food and bait.
Bloody clams (*Argina pexata*), Massachusetts to Gulf of Mexico; occasionally used as bait.
Little-neck clams, hard-shell clams, carpet shell (*Tapes staminea*), Alaska to California; extensively used as food.
Little-neck clams (*Saxidomus aratus*); esteemed as food. San Diego, Cal.
Round clams (*Saxidomus nuttallii*), Pacific coast of North America; used as food.

DIVISION OF FISH-CULTURE.

(1) Transportation apparatus: Model of U. S. Fish Commission Car No. 1.
(2) Hatching apparatus:
(*a*) Working models:
One whitefish table 8 feet long, 3 feet wide, and 3 feet high, with 12 McDonald jars for hatching shad eggs.
Two hatching troughs 8 feet long, 12 inches wide, and 8 inches deep, equipped for hatching salmon and trout eggs.
(*b*) Accessories:
One egg scale, two funnels for shad, two siphon bags, two siphon cages, one aquarium, one pan for washing eggs.
(3) Hatching and rearing establishments:
Model of U. S. Fish Commission hatchery at Put-in Bay, Ohio.
(*a*) Illustrations of hatching stations, showing buildings, interior and exterior, methods employed in collecting, hatching, rearing, and distributing fish, fry, and eggs.
U. S. Fish Commission hatching station, Wytheville, Va., 1885. Interior of hatchery. Men at work. View of spring and ponds, looking west. View of ponds, looking south. View of ponds, looking southeast.
Launch towing spawntakers. Stripping shad on fishing float. Packing shad eggs. Shipping fry.
U. S. Fish Commission shad station, Havre de Grace, Md., 1892. Bird's-eye view of station. Superintendent's cottage. Hatching house, looking northeast. Interior of hatching house.
U. S. Fish Commission hatching station, Wytheville, Va. View of station, looking north. View of station, looking south.
(*b*) Floating stations: Steamer *Fish Hawk*.
(4) Methods and results of fish-culture:
Models: One lay figure, illustrating method of taking salmon eggs.
Charts:
(*a*) Giving names and locations of stations and output of each for the fiscal year 1894–95.
(*b*) Showing effect of fish-culture on the shad fishery.
Objects of the fisheries:

DIVISION OF STATISTICS AND METHODS OF THE FISHERIES.

Cetaceans: Blackfish head (cast). Grampus head (cast). Bottlenose porpoise (cast). Harbor porpoise (cast), young.
Carnivores: Northern fur seals (mounted group). Steller's sea lions (mounted group).
Frogs: Bullfrog (cast). Green frog (cast). Pickerel frog (cast).
Fishes: Casts of 150 species of marine and fresh-water food-fishes.
Drawings and notes: Five swinging screens containing drawings of, and notes on, the important fishes of the Southern States.
Live fishes: Living marine and fresh-water fishes in aquaria.
Invertebrates: Living crabs, mollusks, etc., in aquaria.
Vessels:
Series of models showing the development of fishing vessels from the settlement of America to the present time.
Models of vessels used in the important fisheries of the South Atlantic and Gulf States.
Nets: Three pound nets, one cast net, one whitefish gill net, four fyke nets, one dip net, one aboriginal fish weir, two herring weirs.
Traps and pots: Six eel pots, four lobster pots, one eel trap (model), three fish-cars (models).
Lines: One halibut trawl line, one George's cod hand line, one shore cod hand line, one cod hand line, one shore cod and pollock hand line, one layout line, one sea trout line, one drumfish line, one whiting line, one reef line, one jack trolling line, one kingfish line, one grunt line, one rockfish line, one Italian fishery line, one line with jug floats, one Alaskan halibut line with hook and club.
Appliances for seizing: Two pairs oyster tongs, one pair oyster nippers, one oyster rake, one pair deep-water oyster tongs, three clam hoes, one hand clam hoe, one sponge hook, four codfish jigs, one dolphin drail, twelve bluefish and brass drails, four Eskimo codfish hooks, four British Columbia wooden fish hooks, one series of spring claw or trap hooks, one series of barbless hooks, two shark hooks, one water glass used in sponge fishery.

Appliances for striking: One series of eel spears, two frostfish spears, three crab and flounder spears, one five-pronged grain, one conch harpoon, one turtle peg harpoon, one series of Indian fish spears, one series of swordfish dart heads, two porpoise harpoons, two porpoise lances.

Illustrations of fisheries:

Four pictures illustrating the seal fishery.

One picture of Aleuts killing walrus.

One picture of salmon trap (Indians of Northwest).

One picture of Marsh's improved deep-water oyster tongs.

Thirty-five swinging screens containing views of the different fisheries, U. S. Fish Commission stations, equipments of steamers *Albatross* and *Fish Hawk*, and plates from U. S. Fish Commission Bulletins.

PRACTICAL FISH-CULTURE.

During the months of May and June 3,500,000 shad eggs were received from the Susquehanna, Delaware, and Potomac rivers by express and hatched in apparatus provided for illustrating practical fish-cultural work. Of the fry resulting, 1,400,000 were liberated in the Cumberland River and 215,000 were held until July for exhibit. Besides the black-spotted and rainbow trout eggs from Colorado, received in June, 20,000 eggs of the quinnat salmon were shipped from California during the fall months. These eggs were hatched in water from the artesian well, and the fry were placed on exhibition and planted in suitable waters in the vicinity. This feature of the exhibit was particularly interesting to the people of that section of the country, as it was the first time that the eggs of any of the Salmonidæ had been artificially hatched in Tennessee. This was only rendered possible by the sinking of a well near the Government building, which furnished an excellent flow of water at 59° throughout the summer.

THE AQUARIUM.

The aquarium was a grotto-like, L-shaped structure, 120 feet long and 28 feet wide, containing 22 tanks, arranged in equal numbers on each side of the passageway 12 feet wide. Each tank was 7 feet long, 3 feet high, and 5 feet wide at the top, with a capacity of 55 gallons. The tanks next to the wall were arranged for the exhibition of the various fresh-water species; those upon the opposite side were placed for the exhibition of salt-water species, which included snappers, groupers, pompano, crevalle, mullet, and other bright-colored tropical fishes, as well as the crustaceans, shellfish, etc.

The water for the fresh-water aquaria was obtained from a well 84 feet deep located near the southeast corner of the building, which permitted the exhibition of a number of specimens of rainbow and brook trout and steelhead trout throughout the exposition.

The water in the salt-water tanks was brought from Morehead City, N. C., in tank cars, and stored in a large reservoir beneath the floor; from this it was forced by means of nickel pumps, driven by electricity, into a smaller tank located 18 feet above the floor, whence it passed by gravity to the aquarium, thence returning to the reservoir.

The interior of the grotto was lighted through the aquarium tanks and a number of ventilators, placed in the crown of the grotto arch. It was finished in adamant and cement, partly as stuccowork, partly

plastered in imitation of a roughly blasted tunnel. Where the two arms of the L met, a rotunda was formed, with a pool at the bottom of the rockwork, in imitation of the entrance to a water cave, which was illuminated by electric lights. Here and there in the grotto, masses of ferns and other evergreens were planted in the rockwork. Two arched portals, in imitation of cut stone, and of simple architectural design, formed the entrance to the grotto. The pool in the rotunda referred to was one of the most attractive features of the aquarium, being filled with bright-colored fishes, and lighted with electric lights, submerged in water. It also contained a large sturgeon, about 5 feet long, which was an endless source of amusement and interest to the visiting public.

The plans for the aquarium were prepared by Mr. G. A. Schneider, who was in charge of its construction and installation.

FISHES IN THE AQUARIUM.

Collections of salt-water fishes were made at Morehead City, N. C., and at Pensacola, Fla., under the direction of Mr. L. G. Harron, the superintendent of the aquarium. The fresh-water fishes were chiefly obtained from the Fish Commission stations at Wytheville, Va., and Quincy, Ill., and the fish-ponds in Washington, though collections of fishes native to that section were made from time to time in the immediate vicinity of Nashville.

During the summer much difficulty was experienced in keeping up the display of fishes on account of the intense heat prevailing at that time. In June the temperature of the water rose rapidly, and when it reached 78° it became necessary to resort to artificial means to save the fish, notwithstanding that the specimens on exhibition were all collected in southern waters. This was accomplished by passing the water through 300 feet of iron pipe arranged in the shape of a coil and packed in crushed ice and salt.

By this means the temperature of the water was kept down below 70°, but the method proved very expensive, as it required over 1½ tons of ice per day. Later in the season the water from the well was used for cooling the salt water after it had passed through the trough and tanks containing salmon eggs and salmon.

FISH FOOD.

Round beefsteak was mainly used for food, although the diet was varied by the use of beef liver, live minnows, clams, and fiddler-crabs. The latter were shipped by express from Pensacola, packed in sand. In the preparation of the beef and liver the fat and sinews were carefully removed, and it was then cut in sizes to suit the fish. For the small specimens it was ground fine in a meat-chopper; for the larger, in pieces varying in size. In feeding the marine fishes with beef or liver a small amount of table salt was added. The black bass and crappie, which were the most difficult to keep, were fed entirely on minnows.

FISHES EXHIBITED.

During the exposition over 9,672 fishes and other animals were shown in the aquarium, of the following species:

Marine species.	Marine species.	Fresh-water species.	Fresh-water species.
Red snapper.	Cavally.	Goldfish.	Black bass, large mouth.
Black snapper.	Squirrel-fish.	Golden ide.	Black bass, small mouth.
Mullet.	Stingray.	Quinnat salmon, fry.	Black bass, fingerling.
Sheepshead.	Soapfish.	Quinnat salmon.	Warmouth bass.
Burfish.	Gaff-topsail.	Steelhead trout.	Crappie.
Swellfish.	Pompano.	Rainbow trout, fry.	White bass.
Sea-urchin.	Flounders.	Rainbow trout, adults.	Striped bass.
Sea-robin.	Spot.	Brook trout.	Yellow bass.
Sea bass.	Catfish.	Yellow perch.	Sunfish.
Sea-horse.	Sea trout or spotted squeteague.	White perch.	Rock bass.
Cowfish.	Red drum.	Pike.	Catfish.
Hogfish.	Look-down.	Suckers.	Tench, green.
Pigfish.	Hermit-crab.	Chubs.	Carp.
Sailor's choice.	Blue-crab.	Garfish.	Tench, golden.
Croaker.	Spider-crab.	Eels.	Buffalo-fish.
Red grouper.	Horseshoe-crab.	Sturgeon.	Minnows.
Black grouper.	King-crab.	Dogfish.	Turtles.
Toadfish.	Fiddler-crab.	Redhorse.	
Spadefish.	Clams.		
Filefish.	Conch.		
Pompano.			
Bluefish.			

During the absence of the representative from Nashville, the exhibit was, at different times, under the direction of Mr. L. G. Harron, Mr. W. P. Sauerhoff, and Mr. R. J. Conway. Mr. Conway was in charge at the close of the exposition, and attended to the packing and shipping of the exhibits to Washington and Omaha during the months of November and December.

ACKNOWLEDGMENTS.

The Commission is indebted to the Secretary of the Smithsonian Institution for the loan of material and cases forming part of the exhibit.

Acknowledgments are also due to—

The Union Tank Line Company, of New York, for the loan of tank cars for the transportation of salt water;

The Chesapeake and Ohio Railroad, the Louisville and Nashville Railroad, and the Nashville, Chattanooga and St. Louis Railroad for the free transportation of tank cars containing salt water and the transportation of the Fish Commission cars and messengers engaged in the collection of fishes for the aquarium;

The Exposition Company for assistance rendered in the installation of the electrical appliances and the free use of power;

The Laidlaw-Dunn-Gordon Company, of Cincinnati, for the loan of an electric pump used in the circulation of fresh water;

Mr. C. W. Hicht, for the free use of water from the Cockwell spring.

Assistance was also rendered by Mr. Robert T. Creighton, the engineer of the Exposition Company; Mr. C. H. Pendacost, superintendent of electricity; and Mr. William Reyer, superintendent of the Nashville, Chattanooga and St. Louis railway shops.

EXPENDITURES.

The total cost of the preparation, maintenance, and return of the exhibit of the Commission, including the aquarium, was $16,290.61.

The following statement shows the objects for which the money was expended:

Services	$2,131.94
Special or contract services	2,325.75
Travel	1,117.74
Subsistence	2,261.10
Freight	366.34
Cartage	54.97
Expressage	270.41
Exhibition cases, frames, etc	3,190.25
Lumber and millwork	73.29
Hardware, tools, etc	95.90
Glass, paints, brushes, etc	691.15
Supplies and preparator's materials	1,893.82
Packing material	23.71
Apparatus, specimens, etc	1,131.58
Decorations, partitions, etc	407.30
Office expenses	255.36
Total	16,290.61