SEC. 7. Every milk dealer who runs a milk wagon, milk depot, or sells milk from a store in the cities that have over ten thousand inhabitants, in the State of Iowa, shall obtain a permit from the State Dairy Commissioner's office, for which he shall pay the sum of one dollar ($1 00) annually. The Commissioner shall keep a book in which shall be registered the name, location and number of each dealer in milk, and a record of each analysis. Whoever violates the provisions of this section, upon conviction thereof, shall be fined not less than ten dollars ($10.00) nor more than twenty-five dollars ($25.00).

SEC. 8. The Dairy Commissioner or his agents shall have power and authority to open any can or vessel containing milk which is offered for sale, and may inspect the contents thereof and may take therefrom samples of milk for analysis.

SEC. 9. That there is hereby appropriated out of any money in the State Treasury not otherwise appropriated, the sum of twenty-five hundred dollars, or so much as may be necessary for the purpose of carrying out the provisions of this act.

REGULATION PASSED BY THE STATE BOARD OF HEALTH.

The attention of all who handle milk is directed to the following regulation made by the State Board of Health, and which is binding upon all the people. It is known that very few substances absorb the germs of contagious diseases so quickly as milk. The purpose of this regulation is to prevent the spread of such diseases through this media. It is supplemental to the statute which prohibits the sale of impure milk.

When Asiatic Cholera, Small Pox, Diphtheria, Scarlet Fever (Scarlatina, Scarlet Rash), Typhoid Fever, Typhus Fever, Membranous Croup, Measles, or any other contagious disease exists in any house or dwelling place of a dealer in, or seller of milk, he shall discontinue, and cease to give or sell, or distribute milk to any person, or to creameries or butter factories, or in anywise handle such milk, until a permit is granted therefor by the mayor (or clerk), countersigned by the health officer. And no person who attends cows, and the milking, or who has the care of milk vessels or the sale or distribution of milk shall be permitted to enter any premises or place wherein exists any of the diseases named herein, nor have any communication, direct or indirect, with any person who resides in, or is an occupant of, such infected place; nor shall any milk or butter be given away, sold or distributed from such infected place.

TENTH BIENNIAL REPORT

OF THE

FISH COMMISSION

OF THE

STATE OF IOWA,

1892-3.

T. J. GRIGGS, Commissioner.

DES MOINES:
G. H. RAGSDALE, STATE PRINTER.
1893.
1893.

REPORT OF STATE FISH COMMISSION.

To His Excellency, Governor HORACE BOIES:

I beg leave to submit herewith the biennial report of the Iowa State Fish Commission, for the years 1892 and 1893.

In the early days of fish commissions the chief efforts of those engaged in the work were directed toward the propagation and distribution of brook trout, and the work was mainly in the interest of the angler. As the years wore on the attention of the people generally was drawn to the subject by the gradual depletion of the public waters, and the necessity of taking active measures toward restocking the streams and lakes and protecting their products, became apparent. As the outgrowth of such public sentiment, nearly all of the States established fish commissions, and, through their legislatures, enacted a code of laws for the protection of fish. The waters of many of the western States were not adapted to the culture of brook trout, and some method of restocking the streams with fish indigenous to them became a necessity. Hon. B. F. Shaw, formerly commissioner of Iowa, conceived the idea of utilizing the fish that annually went to waste along the rivers, taking them from the ponds and sloughs where they were left by the spring overflow and transporting them to the inland streams and lakes. This plan was taken up by Commissioner Bartlett, of the Illinois State Fish Commission, and carried into practical effect. The work in this direction attracting the attention of the United States Fish Commission, they adopted the method and inaugurated a system of work in the benefits of which all of the western States were to share. Iowa has received her proportion of the product of this work, with the other States, and during the last two years the United States Fish Commission has distributed through the various sections of this State, fifteen carloads of fish. I desire, in this connection, to acknowledge our indebtedness to Hon. Marshall McDonald, United States Commissioner of Fisheries, Senator William B. Allison, and Dr. Bartlett of the Illinois Fish Commission for favors received, and to extend thanks for many courtesies rendered.

Iowa has great natural resources as a fish producing state. Filled as it is with beautiful lakes and streams, it presents a magnificent opportunity for making it the first in the list of States engaged in this work. Aside from the food thus produced—in itself no small consideration—there is also to be gained the advantage of adding to the manifold natural attractions of our magnificent lakes and streams, already famous as summer resorts, by furnishing a plentiful supply of fish for the lovers of line and reel. Some of our lakes are well worthy of special mention; Spirit and Okoboji Lakes with their tributaries, have a shore line of fifty miles, Clear Lake twenty miles, Storm Lake fifteen miles, Wall Lake twelve miles, Twin Lakes fifteen miles, Iowa Lake eight miles, Lake Park, or Silver Lake, ten miles, Lost Island Lake six miles, besides many other lakes all fairly well supplied with fish, and thousands of pleasure seekers visit their shores every year for fishing and recreation. Spirit and Okoboji Lakes are, beyond question, the most popular summer resorts in the Northwest. The people of Iowa are justly proud of these lakes, and, I believe, interested in improving them and making them what they can and should be, the finest in the country. As these lakes belong to the rich and poor of the State, alike, there should be an appropriation made for their improvement, in my opinion, and to this end I would recommend that there should be erected a dam at the outlet of Lower Gar Lake, to maintain the water in these lakes at its normal height, and not allow it to be drawn down until their shores look like the borders of frog pond. There should also be placed in this dam a fish weir to keep the fish in these lakes. There are a great many sloughs and small lakes around Spirit and Okiboji Lakes that are connected with these lakes in the spring time, and fish go up the sloughs and deposit their spawn by millions during the summer months. The sloughs, for the greater part, dry up during the latter part of the season, and the young fish perish. The rushes and grass filling the waters of these sloughs with such rank growth make seining the young fish out to return them to the lakes an impossibility. There should be large tiling laid from some of these sloughs and small lakes connecting them with the large lakes, so that the young fry could return, during the dry season, to the larger lakes. In some places, small obstructions should be placed to prevent the fish from running out, in the spring, except into those sloughs and lakes from which the young fry could return to the lakes. By this means I am satisfied that the quantity of fish could be increased at least one-third.

STATE HATCHERY.

Our State Hatchery has been successful so far as its limited capacity would admit, but its size and equipments are totally inadequate to the demands for fish in this State.

I would recommend that the barn at the hatchery be removed from its present site to the southeast corner of the barn lot. This would prevent the drainage therefrom flowing into the ponds, and would make room for at least four new ponds, which are badly needed.

FISH CAR.

There is urgent need of a car, with necessary equipments for transporting fish to the various sections of the State, as they are rescued from the drying sloughs and bayous of the Mississippi and Missouri rivers. Millions of fish of all kinds and sizes perish annually in such waters that might be utilized by the State simply for the taking. In my judgment, such a car is one of the most important needs of the commission, and one which will be productive of more benefit, from an utilitarian standpoint, than any other one that may be provided. The railroad managements will, in most cases haul the fish car free of charge within the limits of the State, and the work of the commission can be materially aided and increased with comparatively small expense, beyond the original cost of construction.

DISTRIBUTION.

One of the most important interests of Iowa to-day is the reproduction of fish in its public waters. Every acre of water should be made productive, and the food so furnished would aggregate an amount that would seem incredible to those not accustomed to giving the matter personal investigation. The fact is that our waters throughout the State have been considered common property, not as regards the taking of fish from them with rod and line, but by irresponsible parties who simply deplete them for their spoil by all sorts of unlawful methods. This has been the practice for so many years that patient and unremitting exertions on the part of the State through its commission will be necessary to bring back the natural conditions to these waters, and make them teem with food as they once did.

To the restocking of these waters I have directed a considerable part of the means at my command, and submit herewith a list of such distributions as have been made by me, and through me, by the United States Fish Commission.

DISTRIBUTION BY T. J. GRIGGS, COMMISSIONER.

UPPER DES MOINES RIVER.

Crappie	5,000	Cat-fish	500
Pickerel	500	Pike perch	500
Black bass	5,000	Ring perch	5,000

SPIRIT LAKE (HATCHERY).

Black bass	200,000	Ring perch	100,000
Crappie	100,000	Miscellaneous fish	250,000
Wall-eyed pike	10,000		

OKOBOJI LAKE.

Black bass	200,000	Ring perch	100,000
Crappie	100,000	Miscellaneous fish	100,000
Wall-eyed pike	50,000		

Fish taken from sloughs around Spirit and Okoboji Lakes and transferred to those lakes.

SPIRIT LAKE.

Black bass	500,000	Crappie	200,000
Perch	500,000	Cat-fish	100,000
Silver bass	200,000		

LAKE TROUT DISTRIBUTION.

NAME.	LOCATION.	Number.
Senator E. E. Mack	Storm Lake	12,000
Hon. Marshall McDonald	Baird	10,000
J. H. Vernon	Iowa Falls	10,000
H. C. Bargess	Cresco	10,000
A. Garner	Waverly	20,000
Fred Libby	West Union	10,000
C. H. Talmage	Turkey River	10,000
George Bremer	North McGregor	10,000
West Okoboji Lake		8,000

CARP DISTRIBUTION.

That the carp has become an important factor in the food supply of the State is an established fact. Our streams and lakes are now thickly populated by them, and while not so fine in quality, perhaps, as the average of our native fish, they form no unwelcome addition to the tables of the poor, as they may be had for the taking in most sections of the State, and so benefit the many who could not afford to purchase fish as a luxury. Successful carp propagation has followed all intelligent efforts on the part of those having private ponds devoted to that purpose. I have furnished carp to the following applicants. The carp were delivered in lots running from twelve to thirty-five, according to size of pond and necessities of applicant. A sufficient number was given, in each case, to insure a stock to breed from:

LIST OF CARP APPLICANTS SUPPLIED.

G. Waterhouse	Farley	T. Reubzor	West Union
P. Ehlers	Minden	Wm. O. Funk	Lyman
A. A. Cassil	Weldon	E. W. Whittiam	Fairfield
Jno. Aveylser	Clarion	H. Heuer	Middleton
Jas. A. Edwards	Dubuque	R. S. Hurley	Leoni
Geo. Migge	Communia	L. L. Johnston	Wirt
Correctionville Roller Mill Co.	Correctionville	W. A. McDonald	Keota
C. Mitchell	Meridan	W. G. White	Hillsdale
Jno. M. Lewis	Randalia	O. Oleson	Goodell
Jno. M. Manchester	Burnsides	J. W. Kregel	Monona
Chas. Harsh	New Virginia	Joseph Baker	Russell
E. O. Macy	Pleasant Plain	J. C. Hindman	Frederica
Halle W. Dale	Fairfield	H. B. Smith	Odebolt
Jas. Ryan	Creston	J. W. Moore	Mt. Pleasant
E. B. Bates	Creston	Wm. Stowell	Stuart
A. V. Jones	Creston	V. W. Roberts	Knoxville
C. J. Perry	Davenport	L. A. Scott	Corydon
W. B. Copeland	Logan	Wm. White	Greenfield
P. H. Goslin	Clarion	L. B. Snyder	Letts
Jno. S. Hite	Gilman	Jacob Eschelman	Altoona
H. Pitman	Bloomfield	F. B. Rogers	Britt
C. W. Payne	Swedesburg	Wm. Welsh	Williamsburg
W. M. Lowenburg	Ottumwa	S. White	Vinton
W. H. Hammans	Larimor	James Hanson	Scranton
G. H. Yousling	Ida Grove	R. R. Vanlair	Tilton
S. G. Finney	Blakesburg	W. A. Davidson	Eldon
A. W. Cox	Blockley	A. T. Rains	Council Bluffs
Jno. Brooks	Griswold	A. Warneck	Keswick
W. M. Payton	Sigourney	G. A. Byers	Farragut
J. B. Bershier	Indianola	S. B. Bighey	Whiting
J. B. Stickey	Unionville	A. Warneky	Keswick
Jas. Riley	Indianola	W. B. Copeland	Logan
David Voltemer	Sigourney	Chas. Voltner	Sigourney
A. Palmer	Charlton	J. M. Urie	Atwood
P. E. Boling	Barney	A. M. Spears	Neola
Jas. Todd	Barney	W. F. Boggs	Boonesborough
Eli Landreth	Tingley	B. A. Hall	Tama
J. W. Akers	Des Moines	T. B. Hoyer	Woodbine
N. Bartholomew	Des Moines	D. Kahl	Radcliffe
Jno. D. Lewis	Sigourney	J. W. Skidmore	Vannert
Jno. Bishop	Sheldon	E. Belgard	Ottumwa
W. M. Kaylor	Unionville	S. A. Shetterly	Bard
L. A. Stream	Spaulding	J. A. Johnson	Bard
D. E. Backard	Belmond	J. C. Fellowes	Riceville
W. T. Marr	Ainsworth	J. W. Youngerman	Camphill
John Paulson	Eagle Grove	E. P. Noble	Harlan
S. L. Evans	Bloomfield	C. A. Caskly	Tioga
E. Mann	Beloit	Frank Pippin	Tioga
G. Shaw	Foster	Jas. A. Prichard	Des Moines
W. H. Harvey	Wellman	P. Mollet	Des Moines
Mathew Templeton	Riceville	Owen Stevens	Sigourney
J. W. Laney	Decatur	H. R. Young	Winterset
J. W. Fuller	Mystic	Wm. Leonard	Winterset
A. P. Garretson	Salem	F. Freemire	Chester
D. Fine	Hopkins	H. Copeland	Chester
Jas. Craig	Moulton	George S Beach	Lenox
P. Jacobson	Brayton	H. Powers	Lenox
P. H. Hetzer	Delphos	George Cooney	Ft. Atkinson
M. L. Childes	Coatsville, Mo	Samuel Rotaker	Ft. Atkinson
A. Steckel	Bloomfield	A. T. Glendening	Ingart
C. H. Hastings	Williamsburg	J. A. Ballard	Millersburg
B. F. Tipton	Williamsburg	J. S. Throckmorton	Monroe
Lyman Parshall	Maquoketa	S. F. Creitz	Tilton
John Howat	Welton		

DISTRIBUTED BY UNITED STATES FISH COMMISSION.

CARP TO PRIVATE PONDS.

J. A. Ballard	Millersburg	135	T. Danbury	Frankville	30
J. B. Bets	Ladora	30	N. H. McHenry	Woodbine	30
George Cooney	Ft. Atkinson	30	Abe Kosier	West Union	30
T. B. Crocker	Charlton	60	Wm. B. Snapp	Coddwith	30
R. E. Davis	Pleasantville	30	Wm. Randolph	Council Bluffs	60
Andrew Fisher	Logan	30	Wm. Thrall	Grinnell	30
J. W. Fowler	Grinnell	30	John Townsley	Kellerton	30
Henry Rieran	Frankville	30	T. B. Williams	Danville	100
W. B. Mensinger	Frankville	30	Abner Graves	Dow City	300

MISCELLANEOUS FISHES.

A. R. STRONG, DOW CITY.

Warmouth bass	269	Black bass	247
Crappie	95	Pike	95
Cat-fish	195	Sunfish	50

MINERAL PARK LAKE.

Red-eye perch	270	Sunfish	50
Crappie	95	Bass	248
Pike	98	Cat-fish	195

UPPER IOWA RIVER, WINNESHIEK FISH AND GUN CLUB.

White bass	249	Channel cat-fish	50
Sunfish	447	Red-eye perch	480
Crappie	567	Sunfish	53

DECORAH.

Bass	200	Sunfish	320
Ring perch	150	Spotted cat-fish	202
White bass	100	Wall-eyed pike	200

MAQUOKETA RIVER.

Black bass	358	Crappie	90
White bass	195		

TURKEY RIVER.

Black bass	500	Perch	150
White bass	100		

ROBERT WILLIAMS, CEDAR RIVER.

Black bass	1,400	Cat-fish	500
Perch	900	Crappie	500

SENATOR J. B. HARSH, CRESTON.

Black bass	150	Crappie	200
Channel cat-fish	147	Warmouth bass	100

OTTUMWA, DES MOINES RIVER.

Tench	7,000

YEARLING TROUT.

Bloody Run	5,000	Decorah	1,000
Cresco	7,000	Garner	1,927
Strawberry Point	980		

GOLD-FISH.

NAME.	POST OFFICE ADDRESS.	Number.
Mrs. Ira J. Brown	Washington	6
Mrs. J. H. Fitton	Nevada	20
Mrs. Geibert	Marshalltown	6
Mrs. A. B. How	Council Bluffs	6
Kendall & Co	Oskaloosa	6
M. G. Long	Hedrick	6
Mrs. Emily Smith	Camanche	6
Mrs. W. Y. Williams	Manchester	6
Mrs. W. G. Wright	Ames	6

In addition to above list of fish distributed by the United States Fish Commission, I expect to receive several car-loads more yet this fall from the same source.

T. J. GRIGGS, SPIRIT LAKE.

Small-mouth black bass	685	Sunfish	190
Crappie	300	White bass	75
Spotted cat-fish	358	Perch	300

T. J. GRIGGS, CEDAR RIVER, WATERLOO.

Black bass	1,500	Crappie	400
White bass	500	Warmouth bass	200
Cat-fish	500	Pike perch	300

S. J. ROBERTSON, FT. DODGE.

Channel cat-fish	500

C. H. HUSTED, MANCHESTER.

Channel cat-fish	150	Black bass	75
Warmouth bass	75		

L. M. MARTIN, TWIN LAKES.

Channel cat-fish	2,800	Warmouth bass	100
Black bass	100		

E. E. MACK, STORM LAKE.

Channel cat-fish	4,000	Black bass	150
Crappie	150	Warmouth bass	150

MASON CITY GAME AND FISH CLUB.

Cat-fish	600	Bass	50
Tench	50	Sunfish	50

LIME SPRINGS.

Channel cat-fish and bass	400

J. H. BISHOP, SHELDON.

Cat-fish	300	Bass	50
Perch	50		

EAST OKIBOJI.

Channel cat-fish	500	Small-mouth bass	500

GOLD-FISH DISTRIBUTION.

A good many applications have been made for these ornamental fish, and I have tried to supply the demand, as nearly as possible.

While in no sense a food fish, it affords an unlimited amount of pleasure to its possessor, and, judging from the increased demand, its distribution will form no insignificant part of our work in the future. Below is a list of applicants supplied:

Mrs. Ella Hickerson	Primghar	Mrs. Stringfield	Sheldon
Mrs. J. H. Hinman	Primghar	Milt. Allen	Sanborn
Mrs. Mitchell	Primghar	H. Roden	Sanborn
Mrs. P. McCormick	Primghar	C. Pallen	Sanborn
Mrs. C. Cooper	Primghar	C. Green	Sanborn
Mrs. Wm. Noyes	Primghar	H. DeLong	Sanborn
Mrs. Chas. Winterhill	Primghar	A. Hop and six others	Spencer
Mrs. H. Codson	Primghar	E. Sullivan	Washta
Mrs. M. C. Harris	Sheldon	F. Conway	Brooklyn
Mrs. F. Woods	Sheldon	S. R. Petion	Osage
Mrs. J. C. O'Donnell	Sheldon	M. P. Messenger	Manson
Mrs. W. Davis	Sheldon	G. T. Finn	Bedford
Mrs. McHoward	Sheldon	Senator Brower	Garner
M. B. Darnell	Sheldon	C. H. Gatch	Des Moines
F. Howard	Sheldon	F. Carroll	Des Moines
Mrs. H. F. Lanning	Sheldon	Wm. McFarland	Des Moines
Mrs. W. W. Reynolds	Sheldon	Mrs. R. B. Young	Sheldon
C. Dixon	Sheldon	Mrs. J. E. Glendy	Clarion
Miss May Van Epps	Sheldon	Sanborn Pioneer	Sanborn
Mrs. B. Jones	Sheldon	P. J. Sargent	Iowa Falls
Mrs. T. Piper	Sheldon	E. P. Newman	Des Moines
Mrs. E. C. Brown	Sheldon	H. B. Alhurst	Andover
Mrs. H. B. Wyman	Sheldon	H. C. Neny	Sibley
Mrs. A. Woods	Sheldon	H. H. Andrew and twelve others	Audubon
B. Harris	Sheldon	F. A. Carter	Primghar
Mr. Cheever	Sheldon	W. B. Tracy	Clarion
Mrs. Farron	Sheldon	W. H. Kiefer	Sheffield

A. H. Miller.....Persia
F. H Tyler.....Watertown
A. Messler.....Worthington
J. Burrows.....Washta
Miss Mary Rotzler.....Clarion
Bertie Miller.....Winterset
J. C. O'Connell.....Sioux City
C. W. Mallicomb.....Wyoming
Dr. Jones.....Shelby
F. W. Neymen.....Cherokee
E. H. Obye.....Lohrville
W. W. Hildawand.....LeMars
J. D. Perry.....Floyd
C. A. Brock.....West Side
A. E. Hornblander.....Cedar Rapids
A. H. Treat.....Charles City
B. P. Smith.....Newton
L. W. Tresner.....Hansel
J. B. Davis.....Des Moines
James Metcalf.....Primghar
G. N. Elder.....Clarion
Charles Vangerder.....Audubon
Wm. Weinnebienner.....Hawarden
E. E. Hill.....Hartley
M. Gormley.....Eagle Grove
H. J. Green.....Fayette
James Thompson.....Dubuque
H. C. Foote.....McGregor
A. N. Hardy.....Carroll
Charles Wand.....Lenox
Mrr. A. Gromley.....Estherville
C. F. Root.....Estherville
F. Burgman.....Spirit Lake
F. Barr.....Whiting
J. Barney.....Council Bluffs
C. Pain.....Logan
R. P. Walker.....Mt. Pleasant
B., C. R. & N. R. R.....Burlington
A. Volk.....Burlington
C. Brown.....Burlington
W. W. Dodge.....Burlington
State Leader.....Des Moines
State Register.....Des Moines

Added to this list are a great many others who have been supplied at my office, or through friends who have called for their supply, and of which no record has been kept.

PRIVATE FISH PONDS.

During my term of office I have given close attention to the question of pond culture, as an economic food resource for the farm. Having become convinced that this industry would prove an important adjunct to the farms of this State, and with a view to creating an interest in the matter, I caused a notice to pond owners to be placed in several newspapers of the State, asking them to correspond with me if they desired a stock of fish for their ponds, and I would furnish them with such varieties as they might deem desirable. The responses to this notice have been numerous, and, as far as possible, the applicants have been supplied. The following is a list of owners of private ponds in the State supplied by the commission as far as possible.

C. W. Whittiam.....Fairfield
Henry Heuer.....Middletown
L. L. Johnston.....Wirt
W. G. White.....Hillsdale
O. Olson.....Goodell
J. W. Kregel.....Monona
H. B. Smith.....Odebolt
J. A. Aldrich.....Campbell
A. La Rue.....Indianapolis
L. L. Iverson.....Locust
Wm. Guy.....Templeton
E. Belgard.....Ottumwa
Amos Steckel.....Bloomfield
M. McDonald.....Bayard
W. K. Barker.....Cresco
W. T. Marr.....Ainsworth
Chas. Voltner.....Sigourney
Frank Mathews.....Mt. Pleasant
Jas. Hanson.....Scranton City
Lyman B. Parshall.....Maquoketa
John H. Welton.....Clinton
Eli Landreth.....Tingley
N. Bartholomew.....Des Moines
John D. Lewis.....Sigourney
T. Renbyor.....West Union
Wm O. Funk.....Lyman
Dr. Palmer.....Davenport
John Burrows.....Washta
G. H. Yousling.....Ida Grove
C. Gitchel.....Meridan
S. G. Finney.....Blakesburg
A. W. Cox.....Blockley
S. L. Evans.....Bloomfield
John Book.....Griswold
E. Mann.....Beloit
E. P. Dunn.....Sioux City
W. H. Hammans.....Lorimor
C. W. Payne.....Swedesburg
Harry Pittman.....Bloomfield
G. Shaw.....Foster
John C. Hite.....Gilmore
W. H. Harvey.....Wellman
S. B. Snyder.....Myrtle
Jacob Esbelman.....Altoona
T. H. Rogers.....Britt
J. M. Urie.....Atwood
Wm. Welsh.....Williamsburg
S. White.....Vinton
R. R. Vanlaw.....Tilton
J. B. Lindle.....Muscatine
W. A. Davison.....Eldon
F. Nobby.....Oskaloosa
Wm. Spears.....Neola
John Gregner.....Oskaloosa

J. E. Stoner.....Atlantic
Alfred Pole.....Murray
E. Quade Balley.....Clough
E. A. Bay.....Harlan
J. C. Curry.....Mt. Ayr
John Heithusen.....Conroy
J. A. Ballard.....Millersburg
Owen Stevens.....Sigourney
D. Kahl.....Radcliffe
E. P. Kelphrey.....Mt. Pleasant
H. R. Young.....Winterset
W. V. Orman.....Belknap
Frank Everts.....Glidden
C. D. Bevington.....(six ponds) Winterset
John Fredericks.....Sturgis
J. M. Stamets.....Lenox
A. W. Potts.....Iconium
R. D. Roys.....Iconium
Charles Liebert.....Key
Kyle Miller.....Newton
H. J. Kenhuer.....Denison
J. M. Wilson.....Anderson
Perry Engle.....Newton
F. Yout.....Campbell
H. S. Freeman.....Paris
J. C. Schomburg.....Paris
George H. Pickard.....Charleston
Joseph Bird.....Templeton
George Cooney.....Ft. Atkinson
Austin A. Castle.....Weldon
G. Waterhouse.....Farley
P. Ehlers.....Minden
Charlas Harsh.....New Virginia
J. P. Standley.....Plattville
H. W. Dale.....Fairfield
J. Ryan.....Creston
J. M. Manchester.....Burnsides
W. C. Bershier.....Indianola
S. A. Stream.....Spaulding
J. M. Lewis.....Randalia
Charles J. Perry.....Davenport
W. B. Copeland.....Logan
P. H. Goslin.....Clarion
J. H. Vernon.....Iowa Falls
Mathew Templeton.....Riceville
J. W. Fuller.....Mystic
Douglas Fine.....Siam
W. K. Baker.....Cresco
A. P. Garretson.....Salem
M. S. Childs.....Coatsville, Mo.
J. B. Stuckey.....Unionville
John Ryan.....Parnell
P. F. Hetzer.....Delphos
J. F. Bishop.....Sheldon
P. Jacobsen.....Brayton
Chris. Marte.....Long Grove
J. A. Burmison.....Elliott
N. C. Burgess.....Cresco
H. W. Rothert.....Council Bluffs
A. Kindall.....Onawa
Jas. Craig.....Moulton
Chas. Husted.....Manchester
B. F. Tipton.....Lexington
W. M. Stowell.....Arbor Hill
R. E. Tewksberry.....Montour
N. W. Roberts.....Attica
Geo. Van Gorder.....Audubon
J. W. Laney.....Decatur
J. C. Hindman.....Monroe
J. W. Griggs.....Goodell
C. H. Hastings.....Williamsburg
C. F. Dane.....Williamsburg
J. Baker.....Zero
—— Baker.....Independence
W. M. White.....Greenfield
A. C. Tatro.....Castalia
J. W. Hoover.....West Union
R. H. Hurley.....Lenox
M. B. Sapp.....Corwith
L. Thornburg.....Perry
J. Rubzor.....West Union
W. A. McDonald.....Keota
A. Lee.....Thayer
Thos. Bisky.....Knox
C. A. Caskly.....Tioga
P. E. Boling.....Barney
A. Palmer.....Chariton
Wm. Payton.....Sigourney
S. F. Creitz.....Tilton
J. S. Throckmorton.....Monroe
Geo. S. Beach.....Lenox
F. Freemore.....Chester
B. A. Hall.....Tama
J. H. Shearer.....Prairie City
Thos. M. Neal.....Bristow
Jesse Marr.....Washington
Fred Anthony.....Randolph
A. Warneck.....Keswick
J. N. Skidmore.....Long Creek
S. A. Shetterly.....Ford
Thos. C. Sherwood.....Des Moines
Frank Rieman.....Altoona
J. S. Baker.....Eagle Grove
W. H. Harvey.....Wellman
D. E. Golpin.....Lineville
H. G. Brown.....Marshalltown
R. C. Delmege.....Lorimor
Levi Huff.....Anita
A. H. Brown.....Murray
W. J. Mottern.....Pleasantville
Wallace & Brackett.....Atlantic
Martin Moehn.....Burlington

FISH-WAYS.

The provision of adequate fish-ways over dams is one of the most important factors in the consideration of the fish interests of the State, and it requires no argument to demonstrate the necessity of causing some device of the kind to be placed in dams that will give the fish a free and unobstructed passage up the streams until their natural spawning grounds are reached. It is but affording the fish an opportunity of following natural methods, without which the natural yearly increase is cut off to such an extent as to almost constitute total failure. During the spawning season the fish in our rivers and streams ascend the waters to or near the flats at their source and there deposit their spawn, which under favorable circumstances, hatches, and the young fry, finding their way down such streams and their tributaries,

naturally restock them all. If, then, during the spawning season, the fish find their way obstructed by a dam, they remain there in their endeavors to get beyond it until their spawn is lost. This is evidenced by the great number of fish gathered near the dam during the spawning season, and the small amount of fry found between dams. Every dam should be provided with a good and sufficient fish-way. The laws of Illinois make it imperative that this shall be the case in that State, and the supreme court of Illinois has, in the case of Parker vs. the People, March term, 1883, given an opinion to the effect that the fish of the rivers and streams were the property of the people, and that the restriction of that right in any section of the State by obstructing the free passage of the fish to such section, is a violation of the law.

Fish-ways can be so constructed as to permit the free passage of fish without injury to the dam, or any material diminution of power. The following is the law relating to fish-ways:

CHAPTER 188, LAWS SEVENTEENTH GENERAL ASSEMBLY.

SECTION 1. That the owner or owners of any dam or obstruction across any river or stream, creek, pond, lake or water course in this State shall, within a reasonable time, erect, construct and maintain over or across said dam or obstruction, a suitable fish-way, of suitable capacity and facility to afford a free passage for fish up and down through such water course, when the water of said stream is running over said dam.

SEC. 2. Any dam or obstruction mentioned in Section 1 of this Act, not provided with such fish-way within a reasonable time after the taking effect of this Act, is hereby declared a nuisance, and may be abated accordingly.

SEC. 3. Any person found guilty of the violation of the provisions of this Act shall, upon conviction before a justice of the peace, be fined not less than five dollars nor more than fifty dollars, for the first offense, and not more than twenty-five dollars for each subsequent offense, and shall stand committed until such fine is paid.

As will be seen in section 1, the law can now be interpreted to mean that fish-way outlets should be flush with top of dam. This is in no sense practical. In order that a flow of water sufficient to admit of passage of fish over a dam, the inlet to fish-way should be at least 12 inches below top of dam, that is, affording at least 12 inches depth of water into fish-way from water above dam. Taking this view of the matter as specified in the statute, while water enough would probably find its way over the dam to supply the fish-way itself, yet it would not afford any opportunity for fish to pass out of it and over the dam, unless set in as above described, to a depth of at least 12 inches. The cut necessary to obtain the flow of water does not reduce the power, as it need not be more than five feet wide, and can not weaken the dam as the fish-way itself acts as a brace and

would fully compensate for any cut that would be necessary for the purpose.

The law is defective, too, inasmuch as it compels the Fish Commissioner to abate the nuisance before a justice of the peace, instead of before a court of record, where the State could have the right to appeal, and constitutional questions be passed upon by a proper tribunal, instead of by a justice of the peace.

I have in my office petitions signed by five thousand people, from various parts of Iowa, requesting that fish-ways be put in dams. I have endeavored to get a supreme court decision bearing upon the constitutionality of the law, but having been compelled to prosecute before justices of the peace; they have constituted themselves a supreme court and decided the act to be unconstitutional, and the State having no right to appeal from such a decision of justice or jury, the case was settled, for the time being at least.

The owners of the dam at Milford have agreed to put in a fish-way without further recourse to law.

At Rock Rapids, Rock Valley, Le Mars, Peterson, Linn Grove and Sioux Rapids, the owners have already constructed their fish-ways, without recourse to law.

The following are a list of dams, with names of owners, where fish-ways are still unprovided.

DAMS UNPROVIDED WITH FISHWAYS.

GUTHRIE COUNTY.

OWNERS	LOCATION OF DAM	OWNERS	LOCATION OF DAM
G. C. Mitchell	Guthrie Center	Louisdale Bros.	Dale City
J. D. Lenon	Panora		

FLOYD COUNTY.

Charles City Water Power Co.	Charles City	W. E. Summers	Rockford
Fairchild, Griffith & Case	Floyd	Peter Nelson	Nora Springs
Shell Rock River Dam	Shell Rock River	John McDonnell	Marble Rock
P. E. Phelps	Rockford		

ALLAMAKEE COUNTY.

A Derlmore	Village Creek	August Tangeman	Volney
August Doehler	Village Creek	Joe Doehler	Ion
H. B. Blackman	Volney	John Evenson	Myron

MONTGOMERY COUNTY.

John Vanhorn	Nodaway River	Wm. Clark	Nishnabotna River
John Elenwood	Nodaway River	P. P. Johnson	Nishnabotna River
J. W. Kimble	Nodaway River	Thomas Richards	Nodaway River
J. M. Smith	Nodaway River		

MONROE COUNTY.

W. A. Gray	Albia	J. H. Love	Albia
C., B. & Q. R. R. Co. (per B. F. Duffy)	Albia	S. A. Smith	Selection

JOHNSON COUNTY.

Iowa Electric Light Co. (T. C. Carson & D. F. Sawyer)	Iowa City	Mrs. Mary A. Sanders (Iowa City)	Coralville

FREMONT COUNTY.

Replogle & Brown (two dams).	(One dam across E. Nishnabotna River, the other across Walnut Creek..... Farragut

WRIGHT COUNTY.

G. N. Thompson	Belmond	Mr. Wilbur	Rowan

MARSHALL COUNTY.

Hiram Hammond	Le Grand	W. E. McMillon (Paris, Ill.)	Albion
H. J. Benson (Union)	Marshalltown		

KOSSUTH COUNTY.

Jones & Stacy	Algona

WARREN COUNTY.

Glasscock's Mill	Spring Hill

BREMER COUNTY.

J. H. Schuneman	Janesville	J. Ridgeway, (La Porte, Ind)	Waverly
Rev. Smith (Waverly)	Frederika	E. Stowell, Sr.	Waverly

DALLAS COUNTY.

Adel Mill Co.	Adel	Mabbitt & Eppard	Redfield
Mrs. D. D. Van Meter	De Soto	E. F. Keeler	Linden

HOWARD COUNTY.

T. C. Sovereign	Cresco	Reed & Heath	Lime Springs
H. C. Salisbury	Cresco	W. W. Williams	Lime Springs
Mary A. Combs	Chester	Myer Friend (Milwaukee, Wis)	
Frod Hill	Lime Springs		

SHELBY COUNTY.

J. W. Chatburns	Harlan

GREENE COUNTY.

Geo. Fleck		Reece Seaman	

CARROLL COUNTY.

N. W. R. R. Co.	Carroll City	W. H. Readue	Coon Rapids
W. Heater (Sec. 34, Tp. 85)	Carroll County		

SAC COUNTY.

J. E. Robbins	Sac City	Jones, Deemer & Co	Grant City

FRANKLIN COUNTY.

Wm. G. Reed	Hampton

BLACK HAWK COUNTY.

Waterloo Water Power Co	Waterloo	Forest Milling Co.	Cedar Falls
Union Mill Co.	Waterloo	Wm. Beatty	Finchford

EMMET COUNTY.

Ammon & Brown	Estherville

MAHASKA COUNTY.

J. S. Whitmore	Oskaloosa	Jas. Allen	Union Mills
Wm. Curier	Rose Hill	D. C. Tucker	Mauch Chunk
J. Warren			

PLYMOUTH COUNTY.

J. J. Heacock	Kingsley	Akron Roller Mill Co	Akron
G. Y. Brown (Leeds)	Hinton	Susan J. Heron	Le Mars
Mr. Crill	Westfield		

LYON COUNTY.

Wm. Berkholtz	Rock Rapids	F. E. Barber	Rock Rapids

BENTON COUNTY.

S. W. Watson	

JASPER COUNTY.

Ezra Craven	Lynnville

IDA COUNTY.

OWNERS	LOCATION OF DAM	OWNERS	LOCATION OF DAM
George W. King	Ida Grove	Anna Derst	Battle Creek

RINGGOLD COUNTY.

G. A. Wyant	Clearfield	P. Dinkle	Mt. Ayr

WASHINGTON COUNTY.

Vincent & Allen	Brighton	Mapels' Mill	Wellman
T. L. Coppock	Coppock	Wassonville Mill	Wellman
Bunkers' Mill	Kalona		

HUMBOLDT COUNTY.

C. H. Brown & Son	Dakota City	C. Rickard	Humboldt

IOWA COUNTY.

O. Dillon	Marengo	Mrs. H. Rowe (P. O. Foote)	North English
Amana Society	South Amana	T. Dillen	Millersburgh
Amana Society	Homestead		

JACKSON COUNTY.

A. Clark & Co.	Canton	A. Butleson	Maquoketa
A. Riling & Co.	Bellevue	Crabb Bros	Crabb
Nickerson & Son	Maquoketa		

HARDIN COUNTY.

Wm. Pagle	Alden	Steel & Dobney (Rickord)	Hardin City
Robt. Wright	Iowa Falls	Benson & Lockwood	Steamboat Rock
Mrs. S. M. Easter	Iowa Falls	Mrs. H. L. E. Copp	
W. H. Woods	Iowa Falls	D. G. Meador	Eldora
Charles Fossler (Iowa Falls)	Eagle Grove	H. J. Benson	Union
Henry Fossler			

HAMILTON COUNTY.

D. C. Chase	Webster City	Struble & Hart (Le Mars)	Tremaine
Gill Perry	Webster City	J. Bell	Homer

ENFORCEMENT OF THE LAW.

In the matter of enforcing the law, I have done all in my power to stop the wanton destruction of fish in our public waters by unlawful methods. That I have succeeded in bringing a large number of such violators of the law to give an account of their acts before the courts is also true, as citizens from all parts of the State will testify. I have prosecuted over six hundred, and obtained fully five hundred convictions out of that number, placing to the credit of the school fund an amount nearly equal to the entire appropriation of the Fish Commission.

The law should be materially changed in many respects, viz.: The Fish Commission should also be the game warden, with power to appoint a deputy fish and game warden in each county of the State, or wherever necessary.

Instead of the fine going to the school fund, a portion of it should be directed to the compensation of deputy fish and game wardens and the balance turned into the State treasury to the credit of the Fish Commission, to assist in the expenses of that Commission.

I have received this year, two hundred or more letters from all parts of the State, requesting me to come immediately and enforce the game law, as the manner in which game was being slaughtered out of season was a disgrace to the State. As this does not come under my supervision, under the present law, I could afford no relief. I would respectfully call attention to the matter, and trust such enactment will be made by the legislature as will afford the relief asked for. The Commissioner and wardens should have power to investigate freezers during the closed season.

It is the custom of fishermen and others who fish for market, when ponds and lakes are frozen over, to build houses upon the ice, over holes cut for the purpose of spearing fish, which are lured to the holes by various devices. This work is largely done by poachers. I would recommend the abolishment of such houses and devices, and of anything which might be used for such purposes at that season. In other words, I would recommend that market fishing on our lakes during winter, be abolished altogether, which would do away with this class of poachers entirely.

The ownership of a seine should be *prima facie* evidence of guilt, and the owner should be required to furnish positive proof that such seine or other unlawful fishing devices was not used by himself or others while in his possession, to catch fish.

The law should be amended so as to give the Fish Commissioner jurisdiction over boundary rivers as far as the State's jurisdiction extends in criminal cases, also over bayous and sloughs of all rivers. Unless the spawning grounds of the fish can be protected there can be no proper protection of the fish. As the law now stands, my jurisdiction is presumed to extend only to the banks of boundary rivers, and does not extend to all sloughs and bayous connected with them. This gives the poachers a chance to rob these places of fish during such season as they are gathered there for spawning purposes. It also gives the poachers a chance to stretch seines and nets across the mouth of all rivers emptying into boundary rivers, in such close proximity as to obstruct the passage of fish up such rivers to spawning grounds. In fact, during the spawning season is the time when poachers make their largest catches, and deprive the inland rivers of the benefits they should have. It should be *prima facie* evidence of violation of the law to have in possession during the closed season, any seine, net, spear, or other device for catching fish, along any of the rivers, lakes, ponds, or outlets thereto. For the purpose of protecting our fish over boundary lines I would recommend the enactment of the following law, taken from the fish laws of Minnesota.

The possession or having under control any bird, animal or fish of any of the kinds the killing of which is at any or all times herein prohibited, shall be *prima facie* evidence that it was the property of this State at the time it was caught, taken or killed, and that it was caught, taken and killed in this State, to disprove which it shall be necessary to show by the testimony of the party who actually caught, took or killed the same, that at the time it was caught, taken or killed, it was not the property of this State, or that it was caught, taken or killed outside of this State.

Whenever it shall appear that any bird, animal or fish of any of the kinds the killing of which is at any or all times herein prohibited, was caught, taken or killed outside of this State, it shall be *prima facie* evidence that at the time it was caught, taken or killed, it was the property of the State, territory or county in which it was caught, taken or killed, and that such bird, animal or fish was caught, taken or killed at a time, in a manner and for a purpose prohibited by the laws of the State, territory or county where it was caught, taken or killed, and that it was shipped or taken out of said State, territory or county where it was caught, taken or killed, and that it was shipped out of said State, territory or county in violation of the laws thereof, to disprove which it shall be necessary to show by direct and positive evidence that at the time it was caught, taken or killed, it was not the property of the State, territory or county in which it was caught, taken or killed, or that it was killed at a time, in a manner and for a purpose permitted by the law of the State, territory or county where it was killed, and that it was not shipped out of said State, territory or county in violation of any law thereof.

RECOMMENDATIONS.

I would respectfully recommend that money enough be appropriated to cover the following items herewith:

For moving barn and building four new ponds at State hatchery	$ 1,000.00
For painting barn and hatchery.....	100.00
For purchase of car and equipments for transporting fish..... ...	4,000.00
For distribution and reproduction of fish for next two years.....	16,000.00
For miscellaneous uses, covering help at hatchery, office uses, and payment of assistant..... ...	2,000.00

This will make an appropriation of $8,750.00 per annum for the work of the Commission.

I take this opportunity of acknowledging the assistance and courtesies received at the hands of the various railroad managements of the State, who have contributed liberally in transportation for the movement of cars whenever requested.

To Col. M. McDonald, United States Commissioner of Fisheries, we have been indebted for a very liberal supply of native food fishes and fish eggs, and Iowa, as well as all our western States, has had his hearty co-operation in any interest that looked toward the improvement of our fish supply.

To S. P. Bartlett, of the Illinois State Fish Commission, I am indebted for many favors.

To Senator W. P. Allison for repeated courtesies.

To the people of Iowa generally, for their hearty co-operation in the work when needed. The fish protective associations have always materially assisted in the enforcement of the law, and have given such assistance as occasion demanded at all times, which I thoroughly appreciate.

To the press of Iowa I am indebted for generous co-operation which has made it possible for me to interest the various localities in the work.

STATEMENT OF EXPENDITURES.

APPROPRIATED BY THE TWENTY-FOURTH GENERAL ASSEMBLY.

Sum appropriated		$ 4,000.00
Expended April, 1892	$ 377.71	
Expended May, 1892	164.88	
Expended June, 1892	157.47	
Expended August, 1892	209.07	
Expended September and October, 1892	393.39	
Expended November, 1892	98.11	
Expended December, 1892	119.30	
Expended January, 1893	90.20	
Expended February, 1893	94.10	
Expended March, 1893	127.35	
Expended April, 1893	232.27	
Expended May, 1893	182.46	
Expended June, 1893	204.61	
Expended July, 1893	249.72	
Expended August, 1892	167.45	
Expended September, 1893	158.20	
Expended October, 1893	203.55	
		$ 3,229.54
Amount on hand October 15, 1893		$ 770.46

An itemized report is filed with Auditor of State.

Respectfully submitted,

T. J. GRIGGS,
Commissioner.

FISHES OF IOWA.

BY THE HON. TARLETON H. BEAN, OF THE U. S. FISH COMMISSION AND SMITHSONIAN INSTITUTE.

CLASS CYCLOSTOMI. THE MYZONTS.

Order HYPEROARTIA.

FAMILY PETROMYZONTIDÆ. THE LAMPREYS.

GENUS AMMOCOETES DUMERIL.

The genus *Ammocoetes* is best distinguished from *Petromyzon* by the structure of its co-called maxillary tooth, which has the form of a crescent-shaped plate with terminal cusps and sometimes an additional cusp. In *Petromyzon* this bony plate is short and contains two or three teeth, which are very closely placed.

Ammocoetes Niger Rafinesque.

The brook lamprey, or mud lamprey, also known as the small black lamprey, is found in the Great Lake region, the Ohio valley and the Upper Mississippi valley. It occurs also in Cayuga Lake, New York. According to Jordan it ranges west to Minnesota and south to Kentucky. It grows to a length of eight inches. Dr. Jordan considers it identical with the common brook lamprey of Europe. *A. branchialis.* The brook lamprey ascends the small streams in the spring to spawn just as the silver lamprey does. It is parasitic, and its spawning habits are similar to those of the sea lamprey. It clings to stones and clogs of earth while depositing its eggs, and is believed by some persons to die after spawning. The probability is that it goes into deep water, where it remains until the spawning season again approaches.

Petromyzon Concolor KIRTLAND.

Silver Lamprey.

The silver lamprey or mud eel is found in the Great Lake region and the Ohio and Mississippi valleys. It grows to a length of twelve inches and is usually found in deep water, but runs up the small streams to spawn in the spring. It is a troublesome parasite on the lake sturgeon, the paddle-fish, yellow perch and some other species. It becomes fixed to the skin by means of its suctorial disk, and the irritation of its teeth sometimes causes deep ulcers at the point of attachment. This lamprey has the same peculiarities of development as the sea lamprey and sometimes remains in the larval condition, blind and toothless, until it has reached a length of eight inches.

CLASS PISCES. THE FISHES.

SUBCLASS TELEOSTOMI. THE TRUE FISHES.

Order SELACHOSTOMI. The Paddle Fishes.

FAMILY POLYODONTIDÆ.

GENUS **POLYODON** (LACEPEDE) BLOCH AND SCHNEIDER.

Polyodon spathula WALBAUM.

The Paddle Fish.

This is known as the paddle-fish, spoon-bill or spoon-billed sturgeon, shovel-fish, bill-fish and duck-billed cat; it is called "salmon" in some western hotels.

The names are derived from the remarkable snout, which is produced into a long spatula-shaped process, covered above and below with an intricate network and has very thin flexible edges. The head and snout form nearly half of the entire length of the fish. The fish cannot be confounded with anything else in the waters of the United States. There is in China a similar one, which, however, belongs to a different genus.

Distribution.—The single species of American paddle-fish is confined to the Mississippi valley.

Size.—The paddle-fish grows to a length of six feet, and a weight of thirty pounds or more.

Habits.—The species frequents muddy bottoms, but does not feed upon the mud and slime, as many persons have supposed. The long

snout is useful in procuring its food, which consists chiefly of entomostraca, water worms, aquatic plants, leeches, beetles and insect larvæ.

Prof. S. A. Forbes, director of the Illinois Laboratory of Natural History, has published the first and most satisfactory account of the feeding habits of this shark-like fish. He found very little mud mixed with the food. Prof. Forbes was informed by the fishermen that the paddle-fish plows up the mud in feeding with its spatula-like snout, and then swims slowly backward through the water.

"The remarkably-developed gill-rakers of this species are very numerous and fine in a double row on each gill arch, and they are twice as long as the filaments of the gill. By their interlacing they form a strainer scarcely less effective than the fringes of the baleen plates of the whale, and probably allow the passage of the fine silt of the river bed when this is thrown into the water by the shovel of the fish, but arrest everything as large as a *Cyclops*."

I have not found anything recorded as to the spawning habits of the paddle-fish. The young have the jaws and palate filled with minute teeth, which disappear with age.

Mode of Capture.—The fish are generally caught by seining.

Edible Qualities.—The flesh of the paddle-fish is generally considered tough and shark-like, but individuals of eight or ten pounds are skinned and sold in some of the western markets very freely, and by some persons are thought to be very fair for the table.

Order GLANIOSTOMI (The Sturgeons).

FAMILY ACIPENSERIDÆ.

GENUS **SCAPHIRHYNCHUS** HECKEL.

The genus *Scaphirhynchus* is distinguished from the genus of the common sturgeons, *Acipenser*, by the absence of spiracles, and by the complete armature of the tail with bony plates. Tail much depressed, wider than deep. Snout depressed, acutely triangular in shape and in the form of a spade. In the young the tail ends in a long filament, gill-rakers fan-shaped. Pseudobranchiæ not developed.

Body elongate, with tapering snout and tail. It has rows of bony plates along the top of the back, the median line and near the abdominal outline. Under the dorsal these shields are confluent and are continued over the top of the tail, forming a complete bony covering.

Scaphirhynchus platyrhynchus Rafinesque.

The Shovel-nosed Sturgeon.

The shovel-nosed or white sturgeon is found in the Ohio and Mississippi valleys, extending to the upper Missouri and to the Rio Grande. In the large tributaries of the Mississippi the species is very common. Its maximum length is eight feet, but it is not an important food fish, being but little esteemed. Nothing is recorded of its habits, except that it runs up in the small streams in May for the purpose of spawning.

Acipenser rubicundus Le Sueur.

The Lake Sturgeon.

This is known as the lake sturgeon, Ohio river sturgeon, rock sturgeon, bony sturgeon, red sturgeon, and ruddy sturgeon. It inhabits the Mississippi and Ohio rivers and the Great Lakes, and is abundant in the Allegheny. From the lakes it ascends the streams in spring for the purpose of spawning. Dr. Richardson states the northern limit of the sturgeon in North America to be about the fifty-fifth parallel of latitude.

Size.—The lake sturgeon is smaller than the common marine sturgeon, the average adult being less than five feet in length. The average weight of 14,000 mature sturgeon taken at Sandusky, Ohio, was about fifty pounds. It frequently reaches a length of six feet.

Order GINGLYMODI. (The Bony Gars.)

Family LEPISOSTEIDM. (The Gar Fishes.)

Genus LEPISOSTEUS Lacepede.

Lepisosteus osseus Linnaeus.

The Gar Pike.

This is the common long-nosed pike of the Great Lakes, the Mississippi valley and the eastern states from Pennsylvania to South Carolina. It ranges south to Mexico and west to the plains. Additional names for the species are bill-fish, sword-fish, bony gar, bony pike, alligator gar and buffalo-fish.

The gar pike attains to a length of five or six feet, of which the head and snout usually form about one-third.

This species is more abundant in the Great Lakes and large streams than in the small rivers. It is emphatically a fish of prey and extremely tenacious of life. It spawns in shoal water, or in the streams, in the late spring and early summer months.

The gar pike is said to be nowhere used for food, because its flesh is tough, and it is believed to be unwholesome. I have seen it, however, with the bill cut off and the skin removed, offered for sale in the market at Washington, D. C.

Lepisosteus platystomus Rafinesque.

The Short-nosed Gar Pike.

The short-nosed gar, because of its shorter snout, which even in young specimens does not much exceed the rest of the head in length, has been considered as representing a separate subgenus, *Cylindrosteus* of Rafinesque.

The fish seldom exceeds three feet in length. Its habits are presumably the same as those of the long-nosed gar and it is equally worthless for food. It may be readily distinguished from the long-nosed species by the shape of its snout, and by its more robust form.

The short-nosed gar inhabits the Great Lakes and the Ohio and Mississippi valleys. It is more abundant in the southern portion of its habitat.

Order HALECOMORPHI. (The Bow-Fins.)

Family AMIIDÆ.

Genus AMIA Linnaeus.

Amia calva Linnaeus.

The Mud Fish.

The bow-fin has various common names, among them mud-fish, dog-fish, lawyer, grindle and John-a-grindle. Its range is as extensive as its character is generally worthless. It is found in the Great Lakes and tributary streams, in the Ohio and Mississippi valleys southward to Texas, and in eastern waters from Pennsylvania to Florida.

The female bow-fin is larger than the male, reaching a length of two feet, while the male seldom exceeds eighteen inches. The male is still further distinguished by the presence of large black, margined with orange or yellow, spot or spots at the base of the tail fin. The greatest recorded weight of this fish is twelve pounds.

Habits.—This is one of the most voracious of all fishes. It feeds upon all other fish of suitable size and, also, destroys other animals within reach. The capture of the bow-fin by means of the trolling spoon has recently come into greatly increased favor with anglers because of the game qualities of the fish and its wonderful tenacity of life. The species has been known to live out of water, exposed to the sunlight, for twelve hours or more. The young may be kept in an aquarium or other receptacle without change of water for months. The spawning season of the bow-fin is in May and June and stagnant sloughs are favorite localities for this purpose. The eggs and young are protected by the parents, and the young remain in the pools after the falling waters cause the departure of the adults. Dr. Estes, who has made the best observations upon the reproduction of this species, states that the little ones are protected in the mouth of the parent when suddenly alarmed. The jumping of the bow-fin is one of its most characteristic habits. Dr. Estes saw them turn complete somersaults while in the air.

The bow-fin is not a food fish, its flesh being soft and unsavory, yet Dr. Goode found them to be highly esteemed as a sweet morsel by the negroes of the south. The young are in great demand as bait for pike and pickerel, and both these and the adults are interesting for the aquarium because of their colors, the ease with which they endure captivity, and the peculiarities of their anatomical structure and their affinities with extinct Ganoids.

Order MENATOGNATHI.

Family SILURIDÆ.

Genus ICTALURUS Rafinesque.

Ictalurus punctatus Rafinesque.

The Spotted Cat-fish.

This species is variously styled the channel cat, white cat, silver cat, blue cat and spotted cat. It is found over a vast extent of country, comprising the Mississippi and Ohio valleys and the Great Lake region. In the eastern states it is absent from streams tributary to the Atlantic, but occurs from Vermont southward to Georgiae westward to Montana and southwestward to Mexico. The adults of this species are bluish silvery and the young are spotted with olive.

It is one of the handsomest of the family of cat-fishes, and an excellent food fish. Its introduction into waters in which it is not nativ, has begun and the multiplication of the species is greatly to be desired.

The spotted cat grows to a length of three feet and a weight of twenty-five pounds. It is extremely variable in color and in number of fin rays, and has consequently been described under more than twenty different names. It is most abundant in large, clear streams. This species is less hardy than most of the other cat-fish.

Genus AMIURUS Rafinesque.

Amiurus nigricans Le Sueur.

The Great Cat-fish.

This is the great fork-tailed cat, Mississippi cat, Florida cat, flannel-mouth cat, and great blue cat of various writers. It is also called mud cat in the St. John's river, Florida. The species is very variable, as we would expect from its wide distribution. In 1879 Prof. Spencer F. Baird received from Dr. Steedman, of St. Louis, a Mississippi river cat-fish weighing 150 pounds, and measuring five feet in length. The writer described this fish as a new species related to the great black cat-fish of the Mississippi valley, *Amiurus nigricans*. At the present time it is somewhat doubtful whether or not this is merely an overgrown individual of the species under consideration, and the matter must remain in doubt until smaller examples of *Amiurus ponderosus* have been obtained.

The great fork-tailed cat is a native of the Great Lakes and the Ohio and Mississippi valleys, and in the southern states its range extends southward to Florida; northward it ranges to Ontario. This cat-fish reaches a weight of 100 pounds or upward, and if it includes the giant form above referred to, we may place the maximum weight at over 150 pounds. Dr. Steedman was informed by an old fisherman that the heaviest one he had ever seen weighed 198 pounds, but it is doubtful if such large individuals are to be taken at the present time. In Lake Erie this species usually weighs from five to fifteen pounds, and the largest specimens reach forty pounds.

The habits of this fish are presumably about the same as in other species of the family. On account of the great size of the fish it naturally prefers lakes and large rivers. It is a bottom feeder and will take most any kind of bait. This species is wonderfully tenacious of life. It spawns in the spring and protects its young, which follow the parent fish in great schools. Dr. Theodore Gill has reviewed the subject of the cat-fish's care of their young in *Forest and Stream* of November 27, 1890.

This is a valued food species, although not a choice fish. In Lake Erie, according to the review of the fisheries of the Great Lakes recently published by the United States Fish Commission, the cat-fish rank next to white-fish in number of pounds taken.

Amiurus albidus (Le Sueur).

The Channel Cat-fish.

This is the white cat or channel cat, in Philadelphia distinguished as the Schuylkill cat.

The channel cat ranges from Pennsylvania to North Carolina, and is one of the most abundant of its family in the Potomac river. It is abundant in the Susquehanna and common in the Schuylkill.

This species reaches a length of two feet and a weight of five pounds. It is extremely variable with age. Old examples have the mouth so much wider than in the young that they have been described as a distinct species. The big-mouthed cat of Cope is now considered to be the old form of the white cat. The habits of this species agree with those of other species already mentioned. The name channel cat suggests a favorite haunt of the fish. As a food fish it is highly prized.

Amiurus natalis (Le Sueur).

The Yellow Cat-fish.

The yellow cat or chubby cat is found from the Great Lakes to Virginia and Texas. The species is not credited to the region east of the Alleghenies.

The length of the yellow sometimes reaches two feet, but averages much less. Nothing special is recorded about the habits of this species. It is most abundant in sluggish streams.

Amiurus vulgaris (Thompson).

The Long-jawed Cat-fish.

The long-jawed catfish is found in the Great Lake region and westward to Manitoba. It is believed to be very nearly related to the common catfish, *A nebulosus*, but its projecting lower jaw will serve to distinguish it. This character, however, we know by experience is not so satisfactory as it might be.

This catfish is occasionally taken in the Ohio river, but it is more abundant in Lake Erie. The species reaches a length of eighteen inches and a weight of four pounds.

Amiurus nebulosus (Le Sueur).

The Common Cat-fish.

This is known as the common cat-fish, bull-head, horn-pout, bull-pout and minister. This species has a wider distribution than the white cat, its range including New England and southward to South Carolina, west to Wisconsin and southwest to Texas.

From Jordan's Manual of the Vertebrates I quote Thoreau's account of the habits of this species: "The horned pout are dull and blundering fellows, fond of the mud, and growing best in weedy ponds and rivers without current. They stay near the bottom, moving slowly about with their barbels widely spread, watching for anything eatable. They will take any kind of bait, from an angle-worm to a piece of a tomato-can without coquetry, and they seldom fail to swallow the hook. They are very tenacious of life, opening and shutting their mouths for half an hour after their heads have been cut off." They spawn in the spring, and the old fishes lead the young in great schools near the shore, seemingly caring for them as the hen for her chickens.

Genus LEPTOPS Rafinesque.

Leptops olivaris Rafinesque.

The Mud Cat-fish.

This is known under the name of mud-cat, flat-head cat, Russian cat, yellow cat and goujon.

The mud-cat in Pennsylvania is limited to the Ohio and its tributaries. It is abundant in the Mississippi valley in deep, sluggish waters, ranging westward to Iowa and southward to Georgia, but it is not found in tributaries to the Atlantic.

This is a very large species, reaching a weight of seventy-five pounds, and a maximum length of three feet. The mud-cat prefers muddy bottoms and large sluggish streams. It is a food fish of good qualities and is extensively used notwithstanding its ugliness.

Genus NOTURUS Rafinesque.

Noturus flavus Rafinesque.

The Stone Cat-fish.

The yellow stone cat is found from Ontario to Virginia and in the Ohio valley. In the Mississippi region it extends west to Nebraska.

It inhabits the larger streams. The species has very little value as food on account of its small size. It seldom exceeds twelve inches in length, but it is a very good bait for black bass. The stone cats are much dreaded by fishermen because of the painful wounds sometimes

produced by their pectoral spines. There is a minute pore in the axil of the pectoral which is the outlet of a noxious liquid secreted by a poison gland. When this poison is discharged into a wound it causes a very painful sore.

Order EVENTOGNATHI.

Family CATOSTOMIDÆ. The Suckers.

Genus ICTIOBUS Rafinesque. Buffalo Fishes.

Ictiobus urus Agassiz.

The Big-mouthed Buffalo Fish.

The black buffalo, big-mouthed buffalo, or mongrel buffalo of authors, occurs in the Mississippi and Ohio valleys, but it is less abundant than the other species of the genus. It grows to a length of two and one-half feet, and is extensively used for food. The species is found only in the larger streams, and is distinguished from all other buffalo fishes by its darker colors, as well as by its large mouth and stout body.

Ictiobus bubalus (Rafinesque).

The Red-mouthed Buffalo Fish.

The red-mouthed buffalo fish, also known as the brown buffalo, high-backed buffalo, small-mouthed buffalo, sucker-mouthed buffalo and buffalo fish, is a common inhabitant of the Mississippi and Ohio valleys, but does not occur east of the Alleghenies.

This species reaches a length of two and one-half feet and a weight of fifteen pounds. It frequents large streams. Prof. Forbes has been informed by fishermen that one or more species of buffalo fish have the "peculiar habit of whirling around in shallow water or plowing steadily along, with their heads buried in the mud and their tails occasionally showing above the surface. These operations have nothing to do with spawning, and it is likely that fishes thus engaged are burrowing for small mollusks and for mud-inhabiting larvæ." The food of this buffalo fish consists of aquatic plants, in the Illinois river chiefly duck weed and *ceratophyllum*. The animal food includes mollusks, insects and their larvæ and crustaceans. Worms are rarely found in their stomachs. The buffalo is not a choice fish and its flesh is filled with innumerable small bones, yet it is abundant and is eaten in very large quantities. These fish do not take the hook and are usually caught in seines.

Ictiobus velifer (Rafinesque).

The Sail Fish.

Common names of this species include the following: Quill-back, skim-back, sail fish, spear fish, carp sucker and sailing sucker. In some localities it is called river carp.

The quill-back reaches a length of one foot, and is not an important food fish. The majority of the common names are bestowed with reference to the very high anterior part of the dorsal fin. It is extremely common in the Mississippi and Ohio valleys, and occurs, also, in the great lakes and lakes of western New York.

The food of this fish includes small mollusks, insect larvæ, crustaceans and aquatic plants. Prof. Forbes finds that worms and protozoans are rarely present in the stomachs of this species. The amount of vegetation eaten is rather small, and it is much mingled with mud. The mollusk most commonly found is a thin-shelled *sphoerium*.

Ictiobus cyprinus (Le Sueur).

The Quill Back.

This is called the carp sucker, silver carp sucker, quill-back, skim back, spear-fish, sail-fish and carp. As now limited, its range is stated to be from Pennsylvania to Virginia, and its center of abundance the region about Chesapeake Bay. Prof. Cope also recognized it as occurring in the Allegheny river and generally throughout the Ohio valley.

The best account of the food of this fish is given by Prof. S. A. Forbes, who records the fish from the large rivers of Illinois and their principal tributaries, and from Lake Michigan and small lakes of northern Illinois. He found it abundant in the lakes and ponds of the river bottoms, and less common than other species of the carp suckers in running water. The species consumes less vegetation than the other fishes of its genus, and more mud is mingled with its food. It devours fewer of the large insect larvae, and no pond snails.

"Mollusks made about one-fourth of the food—all the thin-shelled *Sphoerium*. Insects averaged about one-third, and *Entomostraca* made nearly one-fourth." No worms or polyzoans were observed, but occasionally protozoa were noticed. This species reaches a length of one foot.

Genus CYCLEPTUS Rafinesque.

Cycleptus elongatus (Le Sueur).

The Black Horse.

This is known as the black horse, Missouri sucker, gourd-seed sucker and suckerel. It inhabits the Mississippi valley, and is not uncommon in the Ohio river.

The black horse reaches a length of two and one-half feet and a maximum weight of fifteen pounds. It is the best food fish of the sucker family. The sexes differ in color; the males have the upper parts jet black while the sides are black with coppery luster. The females are olivaceous with coppery shadings. The male has minute tubercles on the snout in the breeding season in spring. Dr. Kirtland noted a migration down stream at the approach of winter. The mouth of this sucker is small and the lips are covered with numerous tubercles.

Catostomus teres (Mitchill).

The Common Sucker.

The common sucker, also known as the pale sucker, white sucker, grey sucker and brook sucker, styled by the Canadian French the carpe blanche, is the commonest member of its genus in waters east of the Rocky mountains. It is found from Canada to Florida and westward to Montana. Covering such a wide range of territory the species is naturally variable and has been described over and over again by many authorities under a great variety of names. The male of this sucker in spring has a faint rosy stripe along the middle of the side. The young are brownish in color and somewhat mottled and have a dark median band or a series of large blotches. The adults are light olive varying to paler and sometimes darker; sides silvery. The species reaches a length of twenty-two inches, and a weight of five pounds. It is a very common inhabitant of ponds and streams of the low lands, and a small race occurs in certain cold mountain streams of the Adirondack region, where it is dwarfed in size and changed in color, but does not differ in essential characters. Dr. Rothrock also obtained a mountain race of this sucker in Twin Lakes, Colorado, at an elevation of 9,500 feet above the sea level.

Catostomus nigricans Le Sueur.

The Stone Toter.

The stone roller has a wide distribution and a wonderful variety of common names. Among them are hammer head, stone lugger, stone toter, crawl-a-bottom, hog molly, hog mullet, mud sucker, hog sucker, banded sucker, large-scaled sucker and black sucker.

The species grows very large, reaching a length of two feet. It delights in rapid streams of cold, clear water. Its habit is to rest quietly on the bottom, where its color protects it from observation. It is sometimes found in small schools. The spawning season is in spring and the young are found abundantly in small creeks as well as in the rivers. The food consists of insect larvæ and small shells, and it is especially fitted for securing its prey under stones in the rapids. As a food fish this sucker has little value.

Genus ERINYZON. Jordan.

Erinyzon sucetta (Lacepede).

The Chub Sucker.

This is known as the chub sucker, sweet sucker, creek fish and mullet. It has a wide range, practically including all the waters of the United States east of the Rocky mountains. The chub sucker grows to a length of about one foot. It is very tenacious of life, and is a ready biter, but has little value for food. The young, up to the length of several inches, have a very distinct black lateral band. They are often found in the shelter of water lilies and other aquatic plants close to brackish waters.

Genus MINYTREMA. Jordan.

Minytrema melanops Rafinesque.

The Striped Sucker.

The striped sucker, also called soft sucker, sand sucker and black-nosed sucker, is found in the Great Lakes and south to South Carolina and Texas.

The striped sucker grows to a length of eighteen inches. Old males have the head tuberculate in the breeding season in the spring. The species is very readily distinguished by the dark stripes along the sides produced by spots at the base of each scale. In the young of this sucker there is no lateral line, but in adults it is almost entire.

This species prefers clear, sluggish waters and grassy ponds. It readily adapts itself to life in the aquarium. It feeds almost entirely on mollusks, insects and insect larvae. The species is not much esteemed as a food fish, although it is sold in large numbers.

Moxoxtoma macrolepidotum (Le Sueur).

The Red Horse.

The common red horse, also known as the white sucker, mullet and large-scaled sucker, is an extremely variable species occurring in the Great Lake region, Chesapeake Bay region, south to Georgia and Alabama, and west to Dakota. It is a large species and reaches a length of two feet.

The red horse inhabits clear waters and ascends small streams in May to spawn. As a food fish it ranks low, but the species is freely sold. Its food consists principally of mollusks and a small percentage of plants and insects. Minute crustaceans also form a small portion of its food.

Family CYPRINIDÆ. The Minnows.

Genus CAMPOSTOMA Agassiz.

Compostome anomalum (Rafinesque).

The Stone Roller.

The stone roller is likewise called stone toter, stone lugger and steel-back minnow. It is a fish of very wide distribution, ranging from western New York to North Carolina and throughout Ohio and Mississippi valleys, west to Minnesota and southwest to Texas. It is an extremely variable species, and everywhere common. It is, moreover, one of the most singular of American fishes, in having the air bladder surrounded by numerous turns of the long intestine. In this respect it is unique among fishes. The stone roller grows to a length of eight inches, but has no importance as food. It feeds upon aquatic plants. The young are hardy in the aquarium, where they feed upon confervæ and diatoms. The sexes are very unlike. The males in the breeding season have the head, and frequently the entire body, covered with large tubercles, and the upper half of the dorsal and anal fins fiery orange and with a dark cross-bar about the middle of these fins.

The species is rather sluggish, but when frightened its movements are very rapid. It is a bottom feeder.

Genus CHROSOMUS Rafinesque.

Chrosomus erythrogaster Rafinesque.

The Red-bellied Dace.

The red-bellied minnow or dace is found from Pennsylvania to Dakota and Tennessee. It is abundant in small streams, and is a

strikingly beautiful fish. Along the sides are two blackish bands, one beginning above the eye and extending to the tail; another traverses the eye and follows the lateral line to the base of the caudal, where it ends in a black spot. The belly and the space between the bands are bright silvery, replaced by scarlet red in breeding males, which have the same color at the bases of the dorsal, caudal and anal fins.

In the height of the breeding season the fins are bright yellow, and the body is covered with small tubercles. It reaches a length of three inches, and is similar in its habits to the stone roller, with which it associates. It prefers clear streams, which have their origin in springs. As an aquarium fish this is scarcely excelled in beauty and hardiness, and as a bait for black bass it has few superiors.

Genus HYBOGNATHUS Agassiz.

Hypognathus muchalis Agassiz.

The Silvery Minnow.

The silvery minnow, or blunt jaw, according to the present interpretation of the species, occurs from New Jersey to South Carolina, west to Dakota, and southwest to Texas. In the Potomac river there is a large variety described by Girard as *H. regius*, which reaches a length of seven inches. This variety has the body deeper and the eye larger than in the western form. The largest individuals recorded were nine inches long.

This species spawns in the early spring, and is extensively used for food along with the *Notropis hudsonius*, spawn eater, or so-called smelt or gudgeon.

Genus PIMEPHALES Rafinesque.

Pimephales promelas Rafinesque.

The Fat-head Minnow.

The fat-head or black-head is an inhabitant of the Ohio valley and the Great Lake region west to Dakota and southwest to Texas. It is common in sluggish brooks, and instances have been known of its distribution by the action of cyclones. In Iowa it is common in tributaries of the Mississippi.

The fat-head grows to a length of two and one-half inches. The sexes differ in color, the females being olivaceous, while the males are covered with numerous large tubercles. The species has no value as food, but it is an interesting one for the aquarium. Its food consists of mud and algae, and it seems to prefer a muddy bottom.

Pimephales notatus Rafinesque.

The Blunt-nosed Minnow.

The blunt-nosed minnow is a larger species than the fat-head, reaching a length of four inches, and its range extends from Quebec to Delaware, west to Kansas and south to Mississippi. It differs from the fat-head in having a complete lateral line, but the sexual differences in this species are similar to those in the fat-head. The males in spring have the head black and the snout with many large tubercles. The species is extremely variable and changes greatly with age. It frequents small and muddy streams, and its food consists of decaying vegetable matter.

Notropis whipplei Girard.

The Silver Fin.

The silver-fin ranges from western New York to Virginia and west to Minnesota and Arkansas. It is a common species and a variable one. It reaches a length of four inches. In Iowa it occurs in all the rivers and creeks. It is one of our finest minnows for the aquarium, and is useful as food and bait for larger fishes.

Notropis megalops Rafinesque.

The Rough Head.

This is the common shiner, and has received the additional names of red-fin, dace and rough-head. The species is very widely distributed and is extremely variable, and as a consequence some geographical races have received distinct names. It extends from Maine to the Rocky Mountains, but it is absent from the Carolinas and Texas. It grows to a length of eight inches.

The upper parts of this fish are steel blue, and the scales are dusky at the edge and base. The sides are silvery, overlaid with a gilt line; there is another gilt band along the back. The belly is silvery, except in spring males, in which it is a bright rosy color. The male, in the breeding season, has the lower jaw and the top of the head and nape covered with small tubercles. In the breeding condition this is a very handsome species, although the females and the young lack the bright colors of the adult male. In Iowa the species is common and is best known under the name of red-fin. It has no value except as food and bait for more valuable fishes, especially the black bass and pike-perch. The flesh is very soft and cannot be kept long after death.

The shiner runs into small brooks, and is most abundant in eddies and other quiet portions of the streams.

Notropis ardens Cope.

The Red-fin.

The red-fin is found from Minnesota to Tennessee; east of the Alleghenies its southern limit is Virginia. The red-fin attains to a length of three and one-half inches. The sexes are conspicuously different in color, especially in the breeding season. The male has the fins brick red in spring and the upper surface of its head is covered with many whitish tubercles. The species has a large black spot at the base of the front portion of the dorsal fin. The red-fin delights in small clear streams.

Notropis dilectus Girard.

The Rosy-faced Minnow.

The rosy-faced minnow, although reaching a length of only three inches or less, is a very beautiful fish. It is abundant in the Ohio valley and extends westward to Nebraska.

Genus ERICYMBA Cope.

Ericymba buccata Cope.

The Silver-mouthed Dace.

This singular and interesting little fish is found in the Ohio and Mississippi valleys, and has recently been taken in the Mississippi and in west Florida. Northward it ranges to Michigan and west to Kansas.

This dace reaches a length of five inches, and it is one of the most remarkable of the members of the minnow family, because of the depression in the bones of the lower part of the head. The color is olivaceous, with silvery sides. There is a lateral chain of brown dots and a narrow vertebral line. This species has no importance except as food for black bass and other valuable species.

Genus RHINICHTHYS Agassiz.

Rhinichthys cataractæ C. & V.

The Long-nosed Dace.

The long-nose dace or Niagara gudgeon is found in New England and the Middle States, and in the Great Lake region, in clear, cold water. It grows to a length of five inches. The sides are without the black lateral band, which is characteristic of the black-nosed species. The general color is olivaceous or dark green with the lower

parts paler. The back is nearly black. Some of the scales are mottled with dark and olivaceous. The young have a trace of a dusky lateral band. The spring males have the fins, lips and cheeks crimson. Its movements are swift and powerful, and it is a very shapely little fish. As a bait for the black bass it is scarcely surpassed.

Rhinichthys atronasus Mitchill.

The Black-nosed Dace.

The black-nosed dace or rock-fish is represented in our waters by two forms, one of which is found in the eastern portion of the Great Lake region, and from Maine to Virginia; this is replaced in the upper lake region and in the Ohio valley, southward to Georgia and Alabama by the blunt-nosed variety, *Rhinichthys obtusus*, of Agassiz. The black-nosed dace reaches a length of three inches. This fish prefers clear, small brooks. Swift and active in its movements, and beautiful in color, it is one of the most interesting inhabitants of the waters in which it lives.

Genus HYBOPSIS Agassiz.

Hybopsis dissimilis (Kirtland).

The Spotted Shiner.

The spotted shiner occurs in the Great Lake region and Ohio valley, southward to Kentucky, and west to Iowa. This species grows to a length of six inches, and derives its name of spotted shiner from the bluish band along the sides which is interrupted so as to form spots. The sides are bright silvery in color, and the fins unspotted. The body is long and slender. This fish is most common in the Great Lakes, and in channels of large streams, and does not run into small brooks. It is a ready biter, and is caught in large numbers by hook fishing. It is useful as bait.

Hybopsis kentuckiensis Rafinesque.

The Horned Chub.

The horned chub is known in some localities as nigger chub, river chub and jerker; occasionally it is called horned dace or horny-head. The species ranges from Pennsylvania westward to Dakota and south to Alabama. It abounds in large rivers and is rarely seen in small brooks. This fish grows to a length of ten inches and is good for the table. As a bait for the black bass the young horned chub can not be excelled, because of its endurance on the hook.

Semotilus atromaculatus Mitchell.

The Horned Dace or Chub.

The common chub, creek chub, smaller fall fish or horned dace has a wider distribution than *S. bullaris*, but it does not grow quite so large, seldom exceeding one foot in length. Its range extends from New England to Missouri, southward to Georgia and Alabama. It is extremely common and ascends the small streams. It reaches four pounds in weight and is a fair food fish. This species is more characteristic of the small streams and clear ponds, and it takes the hook very freely.

Genus NOTEMIGONUS Rafinesque.

Notemigonus chrysoleucus (Mitchill).

The Roach.

The roach, shiner, golden shiner or bream is one of the commonest fishes of Iowa. It is found from New England to Minnesota and southward. A variety of the roach replaces the common northern form from North Carolina to Texas.

The roach grows to a length of one foot and a weight of one and one-half pounds. It frequents sluggish waters, abounding in bayous and weedy ponds, as well as in tidal waters. According to Jordan its favorite shelter is the yellow pond lily. It may be readily distinguished by its shape, which resembles that of a shad, and by the very long anal fin, which contains from fourteen to seventeen rays. The colors of this fish are greenish above and the sides silvery with golden reflections. Fins usually yellowish; lower fins scarlet in breeding males. Although the roach is not a good food fish, it is taken by the hook in large numbers, and is a very useful species for bait.

Genus CARASSIUS Nilsson.

Carassius auratus (Linnaeus).

The Gold Fish.

The common gold fish or silver fish is a native of Asia, from whence it was introduced into Europe, and from there into America, where it is now one of the commonest aquarium fishes, and is extremely abundant in many of our streams. It is extremely variable in color, and form, usually orange, or mottled with black and orange, but in some streams silvery individuals are more common than any of the mottled varieties. It grows to a length of twelve inches and is an

indifferent food fish. It spawns early in the spring, and in pond culture it is subject to many dangers and attacked by numerous enemies. The species, however, is extremely hardy, prolific and tenacious of life.

Genus CYPRINUS Linnaeus.

The Carp.

The carp is a native of Asia and has been introduced into Europe and America as a food fish, chiefly for pond culture; it thrives in all warm and temperate parts of the United States and reaches its best condition in open waters. In Texas it has grown to a length of twenty-three inches in eleven months after planting. The leather variety is most hardy for transportation. Mr. Hessel has taken the carp in the Black and Caspian seas; salt water seems not to be objectionable to it, and it will live in stagnant pools, although its flesh will be decidedly inferior in such waters. The carp hibernates in winter, except in warm latitudes, takes no food and does not grow; its increase in size in temperate latitudes occurs only from May to August.

The spawning season begins in May and continues in some localities until August. A carp weighing four to five pounds, according to Mr. Hessel, yields from four hundred thousand to five hundred thousand eggs; the scale carp contains rather more than the other varieties. During the spawning the fish frequently rise to the surface, the female accompanied by two or three males. The female drops the eggs at intervals during a period of some days or weeks in shallow water on aquatic plants.

The eggs adhere in lumps to plants, twigs and stones. The hatching period varies from twelve to sixteen days.

According to Hessel the average weight of a carp at three years is from three to three and one-fourth pounds; with abundance of food it will increase more rapidly in weight. The carp continues to add to its circumference until its thirty-fifth year, and in the southern parts of Europe Mr. Hessel has seen individuals weighing forty pounds and measuring three and one-half feet in length and two and three-fourths feet in circumference. A carp weighing sixty-seven pounds and with scales two and one-half inches in diameter was killed in the Danube in 1853. There is a record of a giant specimen of ninety pounds from Lake Zug in Switzerland. Examples weighing twenty-four pounds have been caught recently in the Potomac river at Washington, D. C.

The carp lives principally on vegetable food, preferably the seeds of water plants, such as the water lilies, wild rice and water oats. It will eat lettuce, cabbage, soaked barley, wheat, rice, corn, insects and their larvae, worms and meats of various kinds. It can be readily caught with dough, grains of barley or wheat, worms, maggots, wasp larae, and sometimes with pieces of beef or fish.

Hiodon tergisus Le Sueur.

The Moon-eye.

This species is called the moon-eye, toothed herring and silver bass. It is found in Canada, the Great Lake region, and the upper part of the Mississippi valley, being very common in large streams and lakes. It abounds in Lake Erie and the Ohio, and is seined in large numbers.

This species grows to a length of one foot, and, like the other, although a beautiful fish and possessed of excellent game qualities, its flesh is full of small bones. It is a good fish for the aquarium. It will take a minnow or the artificial fly very readily, and the utmost skill is required in its capture. Its food consists of insects, small fishes and crustaceans. Dr. Richardson describes this fish as a member of the minnow family, which, he says, is known to the Canadians under the name of La Quesche. The fish is described as having the back brilliant green, sides and abdomen with a silvery lustre. The specimens which were taken in the Richelieu, where it falls into the St. Lawrence, were about nine or ten inches long.

Clupea chrysochloris Rafinesque.

The Golden Shad.

The golden shad or skip-jack is a common inhabitant of the Ohio and Mississippi valleys and the Gulf of Mexico. The presence of the golden shad in the salt water of the Gulf of Mexico was discovered by Mr. Silas Stearns, near Pensacola, Florida. This species grows to a length of eighteen inches.

Unlike most other species of *Clupea*, this one, according to observations of Prof. S. A. Forbes, in Illinois, is predaceous, feeding upon other fishes. Two examples examined by him had eaten gizzard shad (*Dorosoma*) and another one individuals of some unidentified fish. The young of the golden shad, two and one-fourth inches long, had consumed nothing but terrestrial insects, including flies, small spiders, etc.

As far as we can learn, it never ascends small streams. In the lower part of the Mississippi valley it migrates into salt water; in the upper portion of this region its permanent residence is in fresh water. Having many small bones and its flesh being tasteless, this fish has no value for food.

Genus DOROSOMA (Rafinesque.)

Dorosoma cepedianum (Le Sueur).

The Mud Shad.

The mud shad, also known as gizzard shad, winter shad, stink shad, white-eyed shad, hickory shad, hairy back and thread herring, is found in brackish waters along the coast from New York southward to Mexico, ascending streams and frequently becoming land-locked in ponds. A variety of this fish is also common in the Ohio and Mississippi valleys, from whence it has spread through canals into Lakes Erie and Michigan.

This fish grows to a length of fifteen inches and a weight of two pounds. It spawns in summer and its food consists of algae, confervae desmids and diatoms. With its food it takes large quantities of mud, from which it separates the organic matter after swallowing.

This is a beautiful species, somewhat resembling the shad in general appearance and has been very successfully kept in the aquarium, where its bright colors and graceful movements make it attractive, but its flesh is soft, tasteless and seldom eaten when any other can be obtained. In most regions fishermen consider it a great nuisance and throw away their entire catch. Negroes eat the mud shad from tributaries of the Chesapeake, and in Florida the fish has been utilized to some extent in making guano. The name gizzard shad alludes to the form of the stomach, which is much like that of a hen.

Salmo irideus Gibbons.

The Rainbow Trout.

The rainbow trout is known also as California mountain trout, speckled trout, golden trout and brook trout.

This species ranges from California, near the Mexican boundary, to southern Alaska. A small specimen was taken at Sitka in 1880, by Captain L. A. Beardslee, U. S. N. The rainbow is found chiefly in mountain streams west of the Sierra Nevadas. It rarely descends into lower stretches of the rivers, but occasionally does so and passes out to sea. This trout has been very widely distributed artifically, and in numerous localities thrives greatly beyond all expectations. Favorite states for this species are Wisconsin, Michigan, Missouri and North Carolina. In Missouri the growth of the species is most remarkable, at the Neosho station of the United States Fish Commission averaging about one inch per month up to the age of one year.

The average individuals of this species are less than one foot in length, but specimens measuring nearly two feet and weighing eight pounds have been recorded. The Neosho station has individuals nearly one foot long at the age of one year.

The rainbow feeds on worms, insect larvæ and salmon eggs. In streams in which the California salmon and rainbow exist together, the rainbow is the one species most destructive to salmon eggs. Spawning takes place in winter and early spring, varying with temperature and locality. The bulk of the eggs are usually taken in January, February and March, and the average yield from each female is about 900 eggs.

The rainbow is a good table fish, although held in variable estimation in different localities. In most places, however, it is considered fully equal to the common brook trout. On the McCloud river, California, it is regarded as superior to salmon.

Salmo fario Linnaeus.

The Brown Brook Trout.

In European countries in which this species is native it bears the name of trout or brook trout, or the equivalents of these terms. In Germany it is *Bachforelle;* in Italy, *Trota;* in France, *la Truite.* In the United States it is known as the brown trout and von Behr trout, the latter in honor of Herr von Behr, late president of the Deutscher Fischerei Verein, who was very active in the acclimation of the fish in America.

Under favorable conditions the brown trout has been credited with a weight of twenty-two pounds and a length of thirty-five inches. In New Zealand rivers, where it was introduced with unusual success, it now approximates equal size, but in most localities ten pounds is about the limit of weight, and five or six pounds is a good average, while in some regions the length seldom exceeds one foot and the weight ranges from one-half to one pound. In the United States a wild specimen, seven years old, weighed about eleven pounds. In a well in Scotland an individual aged fifteen years, measured only about one foot in length.

These illustrations will serve to show how much the growth of a brown trout is affected by its surroundings and food supply. The species has been known to become sexually mature when two years old and eight inches long.

The brown trout thrives in clear, cold, rapid streams and at the mouths of streams tributary to lakes. In its movements it is swift, and leaps over obstructions like the salmon. It feeds usually in the morning and evening, is more active during evening and night, and often lies quietly in deep pools or in the shadow of overhanging

bushes and trees for hours at a time. It feeds upon insects and their larvae, worms, mollusks and small fishes, and, like its relative, the rainbow trout, it is fond of the eggs of fishes. In Europe it is described as rising eagerly to the surface when in pursuit of gnats, and is said to grow most rapidly when fed upon insects.

Spawning begins in October and continues through December and sometimes into January. The eggs are from one-sixth to one-fifth of an inch in diameter and yellowish or reddish in color. They are deposited at intervals during a period of many days in crevices between stones, under projecting roots of trees and sometimes in nests excavated by the spawning fishes. The parents cover the eggs to some extent with gravel. The hatching period varies, according to temperature, from forty to seventy days. Females, aged three years, furnish on the average about three hundred and fifty eggs each, and even at the age of two years sone females produce from four to five hundred. When four or five years old the number of eggs has reached fifteen hundred to two thousand. The young thrive in water with a temperature of about fifty degrees Fahrenheit.

The brown trout is in its prime from May to the last of September. Its flesh is very digestible and nutritious, and a deeper red than that of the salmon when suitable food is furnished; the flavor and color, however, vary with food and locality. Insect food produces the most rapid growth and best condition. This species has been so long known as one of the noblest of the game fishes and its adaptability for capture with artificial flies, because of its feeding habits, is so well understood that I need not dwell upon these familiar details.

Salvelinus fontinalis (Mitchill).

The Brook Trout.

The brook or speckled trout of the east is indigenous to the region east of the Alleghenies and the Great Lake region, extending from Georgia on the south to Labrador on the north. The distribution of this trout has been wonderfully extended by artificial introduction, as it has always been a favorite with fish culturists. It is now to be found thriving in many of the western states and territories, and is particularly thrifty in Iowa, Nebraska, Colorado, Nevada and California. It has also been sent to Mexico and to European countries.

The average brook trout seldom exceeds seven or eight inches in length and smaller individuals are much more abundant and require legal protection. In the northeastern part of its habitat the brook trout grows much larger, specimens weighing from three to six pounds being not uncommon, and in one of the rangely lakes an individual

weighing eleven pounds is recorded; while Seth Green took a twelve pound specimen in the Sault Ste Marie, and Hallock mentions one which was said to weigh seventeen pounds.

The brook trout does not flourish in water warmer than 68 degrees, and prefers a temperature of about 50 degrees. It is an inhabitant of the cold, clear mountain streams, and will leave a region which becomes polluted by mill refuse and other hurtful substances. In the Long Island region and around Cape Cod where the brook trout has free access to salt water, it has the habit of going to sea in the fall and remaining during the winter. It then grows rapidly and becomes a much more beautiful fish than many which live exclusively in fresh water. In hot weather when the temperature of the streams becomes too high and lakes are accessible, trout seek the deep parts of the lakes and the vicinity of cold springs. In streams they are to be found in deep pools or in channels. They feed in spring and early summer among the rapids upon insects and small crustaceans.

The brook trout is the nest builder. Cavities are made in the gravel and the nest is shaped with the tail and the larger stones are carried in the mouths of the parents. After the eggs are deposited they are covered with gravel. The eggs are not all deposited at one time.

Spawning usually begins in October, but brook trout are spawning at some locality in almost every month of the year except midsummer. The egg is about one-fifth of an inch in diameter, and varies in color from pale lemon to orange red.

Genus ZYGONECTES Agassiz.

Zygonectes notatus (Rafinesque).

The Black-sided Top Minnow.

The black-sided top minnow, or killifish, is an inhabitant of the Mississippi valley and of streams flowing into the Great Lakes from the south. In the Mississippi valley it extends south to Texas.

This species grows to a length of three and one-half inches. It is very abundant in still waters and frequents sloughs and ponds caused by the overflow of streams. In the rivers it seeks the shelter of aquatic plants. It is a surface swimmer, and this fact gives rise to its common name. The species is useful for bait and is well adapted for the aquarium. It is a beautiful little fish and extremely hardy.

Zygonectes dispar Agassiz.

The Striped Top Minnow.

The striped top minnow is found in lakes and sluggish streams in the Ohio valley and part of the Mississippi valley. Its known western limit is Iowa. It grows to a length of two and one-half inches, and has no importance except as food for larger fishes. It frequents large bodies of water, and swims at or near the surface and is very sluggish in its movements.

Family ESOCIDÆ (The Pikes).

Genus ESOX. (Artedi) Linnaeus.

Subgenus PICORELLUS

The genus *Esox* is readily sub-divided into three groups distinguished by their size, scaling and coloration. In the first group are three species of true pickerels, in which the cheeks and opercles are entirely scaly, the color greenish, usually with dark reticulations and the largest species reaches a length of about two feet. To this group the subgeneric name *Picorellus* was formerly applied; it includes the banded pickerel, the little pickerel and the chain pickerel.

Esox vermiculatus Le Sueur.

The Little Pickerel.

This pickerel inhabits the valleys of the Ohio and Mississppi rivers and streams flowing into the Great Lakes from the southward. In ponds formed in the spring by the overflow of river banks it is one of the characteristic fishes and is often destroyed in great numbers by the drying up of such bodies of water. In Iowa the little pickerel, or trout pickerel, is common in the Mississippi and its tributaries.

The fish grows to the length of one foot and is, therefore, too small to have much importance for food.

Subgenus ESOX.

The longest known and most widely distributed species of *Esox* is the common pike—the typical species of the genus. In the sub-division into groups this would be the sole representative of the *Esox* group, which has the cheeks fully scaled and the lower half of opercles naked. The sides are pale spotted, on a darker ground and the size is very much larger than in the pickerels. Fossil remains of the pike have been found in quaternary deposits in Europe.

Esox lucius Linnaeus.

The Pike.

Pike is the best known name for this species, although the misnomer "pickerel" is rather extensively used. The origin of pike is involved in uncertainty; some trace it to the resemblance in shape of the snout to the pike or spear, while others believe it to refer to the darting motion of the fish when speeding through the water. The name pickerel is used in Vermont and around Lake George, New York. "Frank Forester" (Herbert) styles it the great northern pickerel. The name jack is applied in Great Britain to the young pike. *Brochet* is the French name, *hecht* the German and *luccio* the Italian designation of the species.

In the North Temperate and Arctic regions of North America, Europe and Asia the pike is equally common. In North America it extends from Pennsylvania to high northern latitudes. In Alaska Townsend and others found it above the Arctic Circle, and Dall and Nelson took it in abundance in the Yukon. From Greenland and the islands of the Arctic Ocean the pike appears to be absent. The identity of our American pike with the common one of Europe was recognized by Cuvier and Richardson more than half a century ago; the former compared specimens from Lake Huron with European examples and Richardson with the English pike and both were unable to find specific differences between the two.

The pike is a voracious fish and destroys everything within its reach in the form of animal life; other fish, water birds and mammals are consumed in enormous numbers. From its concealment, like a beast of prey, it darts out suddenly upon its victims and seldom missed its mark. The pike is even more destructive than the pickerel and two of the latter, measuring five inches in length, have been reportes to eat more than one hundred minnows in a day. Spawning takes place in winter and early spring on shallows and frequently upon meadows. The eggs are about one-eighth inch in diameter and a female weighing thirty-two pounds was estimated by Buckland to contain 595,000.

The young pike has a very large yolk sac. The period of hatching varies with the temperature of the water, from fourteen to thirty days. The female is said to be larger than the male; the fish breeds at the age of three years. At the age of one year the fish may reach a length of twelve inches, and, if well supplied with food, it will increase in weight from two to three pounds yearly.

Order APODES. (The Eels).

Family ANGUILLIDÆ.

Genus ANGUILLA Thunberg.

Anguilla rostrata Le Sueur.

The Eel.

The eel appears to have only one common name. It is one of the best known and most singular of our fishes, yet its breeding habits are even now enveloped in doubt. The species ascends the rivers of eastern North America from the Gulf of St. Lawrence to Mexico, the former being the northern limit of the species on our coast. In the Ohio and Mississippi valleys it is extremely common, and its range has been much extended by the opening of canals and by artificial introduction. It has been transferred to the Pacific coast. A similar and perhaps identical species is found in northern Europe and Asia.

The eel has been known to exceed a length of four feet. Dr Mitchell records a Long Island specimen which weighed sixteen and one-half pounds. The average length of individuals, however, is about two feet. The female is larger than the male, paler in color, and is different in certain other particulars, which will be mentioned in the description of the specimens referred to below. Both adults and young eels ascend the streams in spring, the young coming in millions, but in the fall run small eels are seldom seen. Until a comparatively recent date it was not known certainly that the eels have eggs which are developed outside of the body. Even now the breeding habits are unknown, but it is supposed that spawning takes place late in the fall, or during the winter near the mouths of rivers on muddy bottoms. Dr. Jordan has expressed the belief that the eel sometimes breeds in fresh water, since he has found young eels less than an inch long in the head waters of the Alabama river about five hundred miles from the sea. It is estimated that a large eel contains about nine million eggs. The eggs are very small, measuring about eighty to the inch, and can scarcely be seen by the naked eye. The ovary of an eel containing this number of eggs was nearly a foot in length and about one-half an inch in greatest diameter. When the eels meet obstructions in streams they will leave the water and travel through wet grass or over moist rocks.

They have not been able to surmount the falls of Niagara. At the foot of this barrier hundreds of wagon loads of young eels have been seen crawling over the rocks in their efforts to reach the upper waters.

For the sake of completing the record of the habits of the eel I quote from W. H. Ballou's descripton: "They are among the most voracious of carnivorous fishes. They eat most inland fishes except the gar and the chub. They are particularly fond of game fish, and show the delicate taste of a connoisseur in their selections from choice trout, bass, pickerel and shad. In their hunting excursions they overturn huge and small stones alike, working for hours if necessary, beneath which they find species of shrimp and cray-fish, of which they are exceedingly fond. They are among the most powerful and rapid swimmers. They attack the spawn of other fishes open mouthed, and are even said to suck the eggs from an impaled female. They are owl-like in their habits, committing their depredations at night."

The difference of size in the sexes has already been referred to. According to one writer the males are much smaller than the females, rarely exceeding fifteen or sixteen inches in length. The question whether eels will breed in fresh water has an important bearing upon their introduction into places from which they cannot reach the sea.

The generally accepted belief is that while the eels will grow large and fat they will not reproduce under such circumstances. The male eel has only rarely been recognized on the American coast. I had the good fortune to collect five examples on Long Island in the fall of 1884, and several specimens have been taken at Woods Holl, Mass. One of these latter specimens and several of those collected by myself were studied by Prof. John A. Ryder, of the University of Pennsylvania, and found to contain the male organs so well developed as to leave no doubt concerning the sex of the individuals. These eels, which were known to the fishermen as silver eels, have remarkably large eyes, short snout, and long pectoral fins when compared with the common form.

Order HEMIBRANCHII (The Half-gilled Fishes).

Family GASTEROSTEIDÆ (The Sticklebacks).

Genus EUCALIA Jordan.

Eucalia inconstans (Kirtland).

The Brook Stickleback.

The brook stickleback grows to a length of two and one-half inches and has no value for food, but is an interesting aquarium fish. It is, however, extremely pugnacious and when kept in confinement great mortality is caused by its quarrels. The species is abundant in small streams, where it secretes itself among aquatic plants and is always on the alert for an attack upon small fishes and insects. Specimens have recently been obtained from an artesian well in South Dakota, the well having a depth of seven hundred feet. From this great depth the fish were brought up in full strength and vigor and were kept in an aqarium for several months afterwards. A similar occurrence has been recorded by Mrs. Eigenmann in the proceedings of the National Museum for 1883, page 217 of Williamson's Stickleback at San Bernardino, Cal. The well in this case was only one hundred and ninety-one feet deep. There is no doubt that the fish reach the wells through streams which become subterranean in a certain part of their course.

This species is a nest builder and is vigorous in the defense of its eggs and young.

Order PERCESOCES.

Family ATHERINIDÆ (The Silversides).

Genus LABIDESTHES Cope.

Labidesthes sicculus Cope.

The Brook Silverside.

The brook silverside or skip jack is found in streams and ponds in the Ohio and Mississippi valleys. It has also been discovered recently in some of the southern states from South Carolina to Florida.

This fish grows to a length of four inches and is important only as food for larger species. It has been kept in the aquarium, but does not endure captivity. The brook silverside is a surface swimmer, and the name skip jack is derived from its habit of skipping out of and along the surface of the water. It abounds in "clear pools left in summer by the fall of the waters in the stream, which has filled them."

Order ACANTHOPTERI (The Spring-fin Fishes.)

Family APHREDODRIDÆ (Pirate Perches).

Genus APHREDODERUS Le Sueur.

Aphredoderus sayanus (Gilliams).

The Pirate Perch.

The pirate perch ranges from New York westward to Minnesota and in the Mississippi valley it extends to Louisiana. It grows to a length of four inches. Nothing is recorded about its habits except that it is very varacious and feeds at night. It is common in sluggish streams and ponds in the shelter of aquatic plants. In a pond near Patchoque, Long Island, we found the pirate perch to be quite common, and the owners of the pond mistook it for the young German carp which they had introduced.

This is one of the most interesting little fishes of the fresh waters, particularly because the position of the vent varies with age. In the young it is behind the ventrals while in the adult it is in the throat.

Family CENTRARCHIDÆ (The Sun Fishes).

Genus POMOXYS Rafinesque.

Pomoxys sparoides Lacepede.

The Calico Bass.

The calico bass, on account of its wide distribution and variability, has received a profusion of names. Many of these are variations of the term bass. It is known, for example, as strawberry bass, grass bass, lake bass, Lake Erie bass, bank lick bass, silver bass, and big-fin bass. Other names for the species are strawberry perch, chinquapin perch, goggle-eyed perch, silver perch and sand perch. Still other

names of local application are bar fish, bitter head, tin mouth, sac-a-lait, lamp-lighter, razor-back, goggle-eye, black croppie and lake croppie.

The distribution of the calico bass is naturally extensive, and it has been still further increased by artificial introduction. The fish has been carried to France, and examples measuring about eight inches in length were recorded there several years ago. There is, however, some confusion in that country between the calico bass and the common sun-fish, and there is no doubt that some of the latter species have been introduced into Germany under the mistaken belief that they were calico bass.

This bass is indigenous east of the Alleghenies from New Jersey southward to Georgia. It abounds in the Great Lake region, Mississippi valley south to Louisiana, most common northward, and it occurs in the Missouri. In the Ohio valley it was rather uncommon until its introduction in large numbers. This bass grows to a length of about one foot and a maximum weight of nearly three pounds, but the average weight is about one pound. It spawns in the spring and the close season in some states extends to June 1. Gravid females were caught near Havre de Grace, Maryland, in May. These were taken in the Susquehana and Tidewater canal, where the species is becoming rather abundant. The food of the calico bass consists of worms, small crustaceans and fishes. Although a native of deep, sluggish waters of western rivers and lakes, it readily adapts itself to cold and rapid streams, and thrives even in small brooks. The species is suitable for pond life, and may be kept in small areas of water provided they have sufficient depth. It does not prey upon other fishes, and its numerous stiff spines protect it from larger predaceous species. It swims in large schools and is often found in comparatively shoal water. The nest building habits have been described by Duclos from observations made at Versailles, France. This writer, unfortunately, had under observation both the calico bass and the common sun-fish and his statements need confirmation. The game qualities of this bass are noteworthy. It is a vigorous and free biter, and its endurance is rather remarkable considering its size. As a food fish this species is highly prized.

Pomoxys annulariys Rafinesque.

The Crappie.

Among the many names which have been applied to the crappie are: Bachelor, new light, Campbellite, sac-a-lait, bridge perch, strawberry perch, chinquapin perch, speckled perch, tin perch, goggle eye, John demon, shad, white croppie and timber croppie.

In the lower Mississippi valley the crappie is one of the commonest fishes. The Illinois, Ohio and Mississippi rivers are particularly noted for an abundance of crappies.

The crappie is a very general favorite for pond culture, can be readily transported and under favorable conditions multiplies prodigiously. Its range has been very much extended by artificial means. The best distinguishing marks between the crappie and the calico bass are the more elongated form of the crappie, the presence of six spines in the dorsal and the nearly uniform whitish color of the anal. In the crappie the greatest depth of the body is usually contained two and one-half times in the total length without the tail, while in the calico bass the depth equals one-half the length. These two species are so closely similar in size and habits that they are rarely distinguished except by ichthyologists.

The crappie grows to the length of about one foot and usually weighs one pound or less, but in a lake near St. Louis an individual weighing three pounds has been recorded.

Crappie fishing usually begins in June and lasts until the coming of cold weather. Large numbers of this fish are collected near Quincy, Illinois, for distribution in other waters. At Peoria, Illinois, Professor Forbes has taken them in March and April; he has found them also in Pistakee Lake and at Ottawa. Cedar Lake, Indiana, and King's Lake, Missouri, are celebrated crappie waters. Near Covington, Kentucky, in private ponds belonging to Joseph Schlosser there are myriads of crappie as well as other game fishes.

Prof. S. A. Forbes has studied the feeding habits of the crappie and finds that the young live chiefly upon *entomostraca* and small insect larvæ. The adults subsist upon the same food when obtainable, but in times of scarcity they feed to some extent upon other fishes.

Small minnows and darters have been found in their stomachs. In the autumn Prof. Forbes has found a larger per centage of small fishes, sometimes constituting nearly two-fifths of their food. The helgramite is eaten by the crappie. In cold weather it does not consume one-fourth the amount of food which it takes in the early spring. The crappie prefers still waters, thriving even in warm and muddy water, and has been taken in large numbers in mid-summer at depths of only a few feet; in cold weather it retires to deeper water, becomes rather sluggish and takes little food. The crappie is a very free biter and can be caught readily with minnows or worms. Spoon bait has been successfully used in trolling for this species. It is recorded that two men have taken a thousand crappies in three days' fishing with hook and line. As the fish is gregarious, congregating in large schools, and fearless, it can be taken in the large numbers cited. The best bait for crappie is a small shiner. It rises well

also to the artificial fly. As a food fish this is one of the best in our inland waters and its adaptability for life in artificial ponds should make it a favorite with fish culturists.

Genus AMBLOPLITES Rafinesque.

Amblopites rupestris (Rafinesque).

The Rock Bass.

The rock bass is known under a variety of names. Among them are the following: Red-eye or red-eyed perch, goggle-eye and lake bass. It is found in lower Canada, Vermont and throughout the Great Lake region, west to Manitoba, and it is native in Minnesota and Dakota; southward it ranges through the Mississippi valley to Texas. In the Ohio valley it is very common, while in the middle Atlantic states, east of the Alleghenies, it has probably been introduced. Its existence in the Susquehanna has been known for about twenty years.

Under favorable circumstances as to water and food supply the rock bass grows to a length of fourteen inches and a weight of two pounds. It increases in depth and thickness with age. The largest example we have examined is one of two pounds weight, length fourteen inches, from the James river, Virginia, taken near Richmond. Dr. Wm. Overton reports that rock bass weighing three and three-fourths pounds have been taken in his vicinity at Stony Creek, Virginia.

In February and March this fish frequents the mouths of small streams and in summer it seeks shady places under high banks or projecting rocks. The species is gregarious, going in large schools. It thrives where there is not much current and is very well adapted for culture in artificial ponds. It is as common in lakes and ponds as in the streams. Sluggish, pure, dark water suits it best. The fishing season begins in June and lasts until the approach of cold weather.

The rock bass feeds upon worms, crustaceans and larvae of insects early in the season; later its food consists of minnows and crawfish; The young feed upon insects and their larvae. The spawning season is in May and June and gravelly shoals are resorted to for depositing the eggs.

The rock bass bites very freely and is a fair game fish and excellent for the table. It fights vigorously, but its endurance is not great. Suitable baits are white grubs, crickets, grasshoppers, crawfish and small minnows. Common earthworms are also successfully used.

Genus LEPOMIS Rafinesque.

Lepomis cyanellus Rafinesque.

The Green Sunfish.

The blue-spotted sun-fish, also known as the green sun-fish and red-eye, occurs from the Great Lake region throughout the Ohio and Mississippi valleys south to Mexico. It does not occur in the middle Atlantic states east of the Alleghenies. The species reaches a length of seven inches and is an extremely variable one. Professor Cope refers to it as a good pan fish, and states that it is abundant in the Ohio basin. In the Ohio valley it is one of the most characteristic fishes, inhabiting ponds and ascending small streams. It frequents deep holes and the shelter of overhanging roots.

Lepomis pallidus (Mitchill).

The Blue Sunfish.

The blue sun-fish, blue bream, copper-nosed bream or dollerdee, is a very widely-diffused species and varies greatly in size, color and length of the earflap. It is found in the Great Lakes and throughout the Mississippi valley to Mexico.

The blue sun-fish grows to a length of nearly one foot and individuals weighing nearly two pounds are on record. Adults, however, average eight inches in length with a weight of less than one pound. The size of the individuals depends upon the habitat. In large lakes and streams it attains to a larger size than in small bodies of water. In southern waters it grows to a larger size than in northern waters. It lives in ponds as well as in streams, and thrives in warm waters. It is considered equal to the rock bass as a pan fish and can very readily be taken by hook fishing.

Lepomis auritus Linne.

The Long-eared Sunfish.

The long-eared sunfish has a very extensive range and is known under many common names, among which are the following: Bream, red-tailed bream, red-head bream, red-bellied bream, perch, sun perch, red-bellied perch and red breast. The species is common in streams east of the Alleghenies from Maine to Florida, and in tributaries of the Gulf of Mexico to Louisiana. In the southern states the typical long-eared sunfish is replaced by a variety with larger scales on the cheeks and belly and a dusky blotch on the posterior part of the soft dorsal fin.

In size the long-eared sunfish averages about eight inches when adult and weighs about one pound. In the south the size and number of individuals is greatly increased. This fish feeds upon worms, insect larvæ, crustaceans, mollusks and small fishes.

Lepomis negalotis (Rafinesque).

The Red-Belled Bream.

The red-bellied bream or long-eared sunfish is very abundant in the Ohio valley and also in tributaries of Lake Erie and Lake Michigan. It extends west to Dakota, south to South Carolina and Mexico, but is absent from Atlantic waters of the northern and middle states. It is especially abundant in small brooks. The species grows to a length of eight inches and is one of the handsomest of the sunfishes. The specific name is derived from the large opercular flap, generally spoken of as the ear flap.

The sides are blue and orange, the blue occurring in undulating streaks, and the orange in spots. There are distinct blue stripes on the head. The thin membranes are generally orange and the rays blue. This fish is extremely variable and has been described under about twenty different names. According to Dr. Jordan it avoids muddy water and frequents deep still places in rivers and clear ponds. It runs into very small streams. The red-bellied bream is used for food and takes the hook very freely.

Lepomis Gibbosus (Linne).

The Common Sunfish.

The common sunfish or sunny, pumpkin seed, bream, tobacco box, and pond sunfish, is one of the best known of the native fishes of Iowa. It is found from Maine westward through the Great Lake region to Minnesota, and in the eastern states to South Carolina. In western rivers, however, it is seldom found south of the latitude of Chicago. It grows to a length of eight inches, and a weight of one-half pound. Its food is similar to that of the long-eared sunfish, and it is one of the readiest biters known to the angler. The nest is a depression in the mud, sand or gravel, hollowed out by means of the fins. The male watches the nest and drives away all intruders. The eggs are only about one-thirty-second of an inch in diameter, and not very numerous. They are attached to stones and aquatic plants.

Genus MICROPTERUS Lacepede.

Micropterus dolomieu Lacepede.

The Small-mouthed Black Bass.

One of the early names for the small-mouthed black bass is that of growler, which appears in the writings of Cuvier, who was under the impression that the name was applied because of a noise sometimes produced by this bass. At the time of his writing the name growler was pretty generally identified with the black bass. Among the names applied to this fish by Rafinesque are lake bass, big bass, spotted bass and achigan. He also mentions it under the names painted tail, bridge perch, yellow bass, gold bass, brown bass, dark bass, minny bass, little bass, hog bass, yellow perch, black perch, trout perch, black pearch, streaked head, white trout and brown trout. In the southern states the small-mouthed form is known as the trout perch and jumper. In Alabama it is called mountain trout. Some persons style it the bronze backer. The most appropriate name and the one by which it is best known is that of black bass or small-mouthed black bass.

This bass does not grow so large as the large-mouthed, seldom exceeding eight pounds in weight and averaging but two and one-half pounds. A fish of the latter weight will measure fifteen inches in length, while one of eight pounds would measure two feet.

The food of the black bass consists of crawfish, frogs, insects and their larvæ, minnows and other aquatic animals of suitable size. The young can be fed on small fresh water crustaceans, such as *Daphnia* and *Cyclops*. Among the successful baits for this species are stone cat-fish, helgramites and crickets.

This bass prefers rapid water, is extremely active, and frequents clear, rapid-flowing streams where the water is pure, and thrives in greater elevations than those preferred by the large-mouthed. It hibernates in winter and spawns in the shallow or gravelly bottoms in spring. It follows its prey into shallow water, and frequently leaps far out of water in its efforts to escape from the hook or when frightened by the sudden approach of an enemy. It swims in schools and is often found in the shelter of sunken logs and in the vicinity of large rocks.

The spawning season begins in March and ends in July. The period of incubation lasts from seven to fourteen days. The eggs are bound together in bands or ribbons by an adhesive substance. They adhere to stones on which they are deposited. The parent fish build nests and protect the eggs and young. By some writers it is believed that the female prepares the nest before the male joins her. The

males fight for the possession of the female, and are said to help the process of ejecting the eggs by biting or pressing the belly of the female. After the eggs are deposited the female guards the nest from the attacks of the crawfish and some other enemies. The young are consumed by many birds and by frogs and snakes, yet notwithstanding the numerous enemies of the black bass its multiplication has been rapid and enormous.

Micropterus salmoides (Lac).

The Large-mouthed Black Bass.

Common names for this species are Oswego bass, river bass, green bass, moss bass, bayou bass, trout, jumper, chub and Welshman. Throughout the North it is generally known as bass, in Virginia and North Carolina as chub, and in Florida and west to Texas as trout. The average weight of the large-mouthed bass in southern waters is less than five pounds, and still less in northern waters. In Florida it attains a large size, as much as three feet in length, and a weight of twenty-five pounds. Its growth and size depend upon the waters where found, the natural food supply of small fish, crawfish, frogs, etc.

The large-mouthed bass has a wide distribution, being indigenous to the eastern United States, from Manitoba to Florida and Texas, except New England and the Middle Atlantic states east of the Alleghenies, where it has been extensively introduced. It inhabits the fresh water ponds, lakes and sluggish streams. It is also found at the mouths of rivers emptying into the gulf of Mexico, where the water is brackish.

It is a very active fish; its movements are affected by seasonal changes, search for food and places of spawning. In polluted streams the bass are often compelled by the impurities to seek new haunts and pure water.

The young bass feed apon animal food at an early age. The large-mouthed bass is said to be more cannibalistic than the small-mouthed, Small fishes (minnows) of all kinds, crawfish, frogs, insects and their larvæ, and aquatic animals of all kinds, suitable in size, make up the diet of this fish. It feeds both at the surface and on the bottom, pursuing its prey with great activity. When surrounded by seines or caught on hooks this species will often leap five or six feet out of the water, and its habit of jumping over the cork lines of seines has given it the name of "jumper."

In cold weather the bass seeks deep places, often hibernating under rocks, sunken logs and in the mud. Favorite localities are under overhanging and bush-covered banks, in the summer, and among

aquatic plants where the fish lies in wait for its prey. The spawning season of the large-mouthed bass is about the same as that of the small-mouth species, beginning in April and lasting until July. Its eggs are adhesive, sticking to stones during the incubation period, which lasts from one to two weeks according to the temperature of the water. The young bass remain in the nest a week or ten days, and at the age of two weeks will measure about three-fourths of an inch in length. In suitable waters it is estimated that the large-mouthed bass will weigh at the age of three years from two to four pounds.

Family PERCIDÆ (The Perches).

Genus ETHEOSTOMA Rafinesque.

Etheostoma Rafinesque.

The Johnny Darter.

The Johnny Darter ranges from western Pennsylvania to Missouri and Dakota. In the Great Lake region it is abundant, and is one of the commonest darters in the streams of Iowa.

Etheostoma aspro (Cope and Jordan).

The Black-sided Darter.

The black-sided darter or blenny darter is found from western Pennsylvania to Dakota and Arkansas. It grows to a length of four inches, and is among the most beautiful of the darters. It prefers clear streams with gravelly bottoms, and is more active in its habits than most of the other species, not concealing itself so closely under stones. It is admirably adapted for life in the aquarium.

Etheostoma coeruleum (Storer).

The Blue Darter.

The blue darter, Johnny darter, rainbow darter and soldier fish, is found in the Ohio valley and in some parts of the Mississippi valley. It reaches the length of two to three inches, and is one of the most brilliantly colored of all the darters. It frequents gravelly bottoms in deeper parts of streams, and is not common in small brooks. The blue darter is not so active as some of the other members of its family, but in coloration it is the most beautiful of all darters.

Genus PERCA (Artedi) Linne.

Perca flavescens (Mitchill).

The Yellow Perch.

The yellow perch, ringed perch or striped perch is found throughout the Great Lake region, rivers and ponds of New England and northwestward, and in streams east of the Alleghenies south to Georgia. It does not occur in the Ohio valley or southwest.

The species reaches a length of one foot and weight of two pounds. It is one of the best known of our food fishes and has excellent game qualities. Its flesh, however, is rather soft and coarse and is far inferior to that of the black bass and other members of the sunfish family. It is a voracious feeder, its food consisting of small fishes, crustaceans, and other animal matter.

The yellow perch spawns early in the spring. The eggs are adhesive and enclosed in thin translucent strips of adhesive mucus.

Genus STIZOSTEDION Rafinesque.

Stizostedion vitreum (Mitchell).

The Pike Perch.

The pike-perch has received a great many common names. One of the most suitable is that of "Susquehanna salmon", which is used in Pennsylvania. In the eastern states the species is styled the perch-pike or the pike-perch, glass-eye and wall-eyed pike. In the Great Lake region it is known as blue pike, yellow pike, green pike and grass pike. In the Ohio valley and western North Carolina it is the jack; in Lake Erie and Canada, the pickerel; in some parts of the Ohio valley it is the white salmon or jack salmon. The Cree Indians call it the okow and the French Canadians dore or picarel. Among the fur traders of British America it is called the horn-fish.

The pike-perch, or wall-eyed pike, inhabits the Great Lake region, and extends northward into British America, where it has been recorded as far as fifty-eight degrees north by Dr. Richardson. It ranges south in the Mississippi valley to Arkansas, and in the Atlantic streams to Georgia. This species is said to reach a weight of fifty pounds, but the average weight of the market specimen is less than five pounds. In the Susquehanna it occasionally reaches ten pounds or upwards in weight. The pike-perch feeds on the bottom upon other fishes, and has been charged even with destroying its own young. It prefers clear and rapid waters, and lurks under submerged logs and rocks, from which it can readily dart upon its prey. Spawning takes place in April and May, and in Pennsylvania continues until June. Favorite spawning places are on sandy bars in shallow water. The period of hatching varies from about fourteen to thirty days, depending upon the temperature of the water. The eggs vary from about seventeen to twenty-five to the inch, and a single female has been estimated to contain from two hundred thousand to three hundred thousand. In a state of nature only a small percentage of the eggs are hatched out; the greater portion are driven upon the lake shores by storms and devoured by fishes upon the spawning beds. The number of pike-perch annually hatched by artificial methods is enormous. This advance is due to improvements in the treatment of adhesive eggs. Formerly these were hatched by placing them on glass plates, to which they readily adhere. Recently it has been found that the sticky substance can be washed off the eggs, after which they are placed in jars and hatched like eggs of the shad and white fish. Iowa has distributed a large number of pike-perch throughout the State.

Stizostedion canadense Smith.

The Sauger.

The sauger is known also as sand pike, gray pike and green pike, pickering, pickerel and horse fish. It is found in the St. Lawrence river and the Great Lake region, the upper Mississippi and Missouri rivers and in the Ohio, where it is said to have been introduced from the lakes through canals.

This is a small fish, seldom exceeding eighteen inches in length, and embraces several varieties only one of which is found in Pennsylvania, the one called gray pike. It is a very common fish in the Great Lakes and is abundant in the Ohio river. It is doubtful whether it is native to Ohio or introduced. It is very extensively used for food but is not equal to the pike perch.

Family SERRANIDAE.

Genus ROCCUS Mitchell.

Roccus chrysops Rafinesque.

The White Bass.

The white bass is sometimes called striped bass, and is probably the silver bass of Canada. Its center of abundance is the Great Lake region, but it is also widely distributed over the Ohio and Mississippi valleys. In Iowa the species is found in the Mississippi and its tributaries. The white bass weighs from one to three pounds, and its flesh

is considered almost, if not equally, as good as that of the black bass. It prefers the deeper parts of rivers and thrives best in lakes and ponds. In April and May they leave the deeper waters and go in near shore or to the mouths of rivers, where they spawn. The spawning period is in May and June.

The white bass feeds upon minnows, crawfish, and other fresh water crustaceans, also minute mollusks or shell fish, and is said to devour many young white fish upon the spawning grounds of that species. It is a game fish and affords good sport to the angler.

Morone interrupta Gill.

The Yellow Bass.

The yellow bass appears to have no other common name. It inhabits the lower Mississippi valley, extending northward to southern Indiana and Illinois. The species grows to the length of one foot. Nothing is recorded about its habits, which are supposed to resemble those of the white perch.

Family SCIAENIDÆ (The Drums).

Genus APLODINOTUS Rafinesque.

Aplodinotus grunniens Rafinesque.

The Fresh Water Drum.

The fresh water drum has received a great number of common names. In the Ohio valley and south it is known as the white perch; in the Great Lake region it is called sheepshead or fresh water drum, on account of its resemblance to the salt-water drum. At Buffalo and Barcelona, New York, it is known as sheepshead. The name crocus used on lakes of northern Indiana, is a corruption of croaker, a name of a marine fish of the same family. In the southern states the name drum is generally applied to the species, and in addition the terms thunder pumper, gaspergou and jewel-head are used. Gaspergou is a term used in Arkansas, Louisiana and Texas. The names drum, croaker and thunder pumper have reference to certain sounds produced by the fish either by means of its air bladder or by grinding together the large molar-like teeth in the pharynx. The name jewel-head probably refers to the otoliths or earbones, frequently called lucky stones, which are found in the skull of this species. In Texas, adjacent to Mexican territory, occurs the name gaspagie, a variation of the name gaspergou.

The fresh-water drum is widely distributed. It occurs in Lake Champlain and the entire Great Lake region, the Ohio and Mississippi valleys southward to Texas. It is found principally in large streams and lakes, and rarely enters creeks and small rivers. In western Texas the species is rare.

This species is usually found on the bottom, where it feeds chiefly on crustaceans and mollusks, and sometimes small fishes. It is especially fond of crawfish and small shells, such as *Cyclas* and *Paludina*. Mr. Turpe mentions water plants as forming part of its food, and states that it will take a hook baited with worms or small minnows.

The fresh-water drum grows to a length of four feet and a weight of sixty pounds, but the average market specimens rarely exceed two feet in length, and in many parts of the west much smaller ones are preferred. Nothing is recorded about the breeding habits of this species, and as to its edible qualities there is the greatest difference of opinion. Some writers claim that its flesh is tough and coarse, with a disagreeable odor, especially in the Great Lakes.

Family COTTIDAE (The Sculpins).

Genus URANIDEA DeKay.

Uranidea Richardsoni Girard.

The Miller's Thumb.

Bull head, blob and muffle-jaws are names applied to the miller s thumb, which has been associated with Richardson's name.

The typical Richardson's miller's thumb is found in the upper Great Lakes. The typical form ranges from Canada and the Great Lakes to Georgia and Arkansas. It is most abundant in stony brooks, cold lakes, caves and springs. It is extremely variable in size, color and length of fins and number of rays.

This species grows to a length of seven inches under favorable conditions and is one of the most destructive enemies of the eggs and young of brook trout and other members of the salmon family.

TO PROTECT FISH.

[Chapter 34, Laws of 1890.]

AN ACT for the Protection and Preservation of Fish and Repealing Sections 1, 2, 3, 4, 6, 7, 8, 9, 10 and 11 of Chapter 50, Acts of the Fifteenth General Assembly, Chapter 70, Acts of the Sixteenth General Assembly, Sections 3, 5, 6, 7 and 8 of Chapter 80, Acts of the Seventeenth General Assembly, Chapter 92, Acts of the Eighteenth General Assembly, and Chapter 9, Acts of the Twentieth General Assembly.

Be it enacted by the General Assembly of the State of Iowa:

SECTION 1. That sections 1, 2, 3, 4, 6, 7, 8, 9, 10 and 11 of Chapter 50, of the Acts of the Fifteenth General Assembly, Chapter 70, Acts of the Sixteenth General Assembly, sections 3, 5, 6, 7 and 8 of Chapter 80, Acts of the Seventeenth General Assembly, Chapter 92, Acts of the Eighteenth General Assembly, and Chapter 9, Acts of the Twentieth General Assembly, be and the same are hereby repealed and the following enacted in lieu thereof.

SEC 2. It shall be unlawful for any person to take from any of the waters of the State any fish in any manner except by hook and line, except that it shall be lawful for any person to take minnows for bait with a seine that does not exceed five yards in length. Also that it shall be lawful to take buffalo and suckers by spearing between the first day of November and the first day of March following. The word minnows, as used herein, does not include or apply to young bass, pike, croppies, salmon, or fry of any game fish, either native or foreign; and all such fish, either young or adult, so taken, shall be immediately returned to the waters whence taken. It shall be lawful for the State fish commissioner to take from any of the public waters in any manner any fish for the purpose of propagation or restocking other waters.

SEC. 3. It shall be unlawful for any person to catch or take from any of the waters of the State, any salmon or trout, between the first day of November and the first day of April following, or any bass, pike, croppies or any other game fish between the first day of November and the fifteenth day of May following, in each year, in any manner whatsoever.

SEC. 4. It shall be unlawful for any person, company or corporation to buy, sell or offer for sale, or have in his or their possession for sale or transportation, any fish which shall have been taken in violation of sections 2 and 3 of this act.

SEC. 5. Any person found guilty of a violation of the preceding sections of this act shall, upon conviction before any justice of the peace, mayor of any incorporated town or city, or any court of record within the county in which such offense is committed, be fined not less than ten nor more than fifty dollars, and stand committed until such fine and costs are paid.

SEC. 6. No person shall place, erect, or cause to be placed or erected, in or across any of the rivers, creeks, lakes or ponds, or any outlets or inlets thereto any trawl line, seine, net, weir, trap, dam or other obstruction in such manner as to hinder or obstruct the free passage of fish up, down or through such water course for the purpose of taking or catching fish, unless the same shall be done under the supervision of the fish commissioner, except minnows as provided in section 2 of this act.

SEC. 7. No person shall place in any of the waters of the State any lime, ashes, drug, or medicated bait, or shoot any gun or use any dynamite, gun cotton, giant powder or other explosive, or any electrical machine or device with the intent thereby to kill, injure, poison, stupify or catch fish.

SEC. 8. Any person found guilty of a violation of sections 6 or 7 of this act shall, upon conviction before any justice of the peace, mayor of any incorporated town or city, or any court of record in the county in which such offense is committed, be fined not less than twenty-five dollars nor more than one hundred dollars, and stand committed until such fine is paid. And any seine, net, trap or other device used in violation of sections 6 or 7 of this act may be seized and destroyed by order of the court before whom such action may be brought.

SEC. 9. In all prosecutions under sections 2, 3, 4, 5 and 13 of this act the person filing the information shall be entitled to a fee of five dollars, which shall be taxed as costs against the person, company or corporation so convicted, and in all prosecutions under sections 6, 7 and 8 of this act the persons filing the information shall be entitled to a fee of ten dollars, which shall be taxed as costs, as above provided, but in no case shall the fee of the informant be paid out of the county treasury. Any fish found in the possession of any person, company or corporation taken in violation of the preceding sections shall be seized and sold for the purpose of paying the costs in the case.

SEC. 10. Persons raising or propagating fish on their own premises or owning premises on which there are waters having no natural outlet or inlet through which such waters may become stocked or replenished with fish from public waters, shall absolutely own such fish as they may contain, and any person taking or attempting to take any fish therefrom, without the consent of the owner or his agent, shall be deemed guilty of a misdemeanor, and, upon conviction thereof, shall be fined not less than five dollars nor more than twenty-five dollars, or imprisoned in the county jail not more than thirty days, and shall be liable to the owner of the fish in damages, in double the amount of damages sustained, the same to be recovered in civil action before any court having jurisdiction over the same.

SEC. 11. Nothing herein contained shall be held to apply to fishing in the Mississippi, the Missouri or the Big Sioux rivers, nor so much of the Des Moines river as forms the boundary between the States of Missouri and Iowa.

SEC. 12. It shall be the duty of the fish commissioner to see that the provisions of this act are enforced, and, for that purpose, he shall have the right to call to his assistance any prosecuting attorney to prosecute all violations of this act in the county where such violations occur.

When requested by the fish commissioner, the attorney-general shall give his opinion in writing upon all questions of law pertaining to his office. Nothing in this act shall be construed as prohibiting any citizen from instituting legal proceedings for the enforcement of any provisions hereof.

SEC. 13. It shall be unlawful for any person to fish for or catch in any manner any fish in any stream in this State which has been stocked with breeding trout—

one or two years old—by this State or the United States fish commissioner for one year from date of said stocking, provided notice of said stocking is posted by authority of the State fish commissioner whenever a public highway crosses such stream.

Any violation of this section shall be subject to the penalties prescribed in section 5 of this act.

SEC. 14. All acts or parts of acts, inconsistent or in conflict herewith are hereby repealed.

SEC. 15. This act being deemed of immediate importance shall be in force and take effect from and after its publication in the "Iowa State Register" and "Des Moines Leader," newspapers published in Des Moines, Iowa.

Approved April 1, 1890.

EIGHTH ANNUAL REPORT

OF THE

STATE VETERINARY SURGEON

OF THE

STATE OF IOWA,

FOR THE

YEAR ENDING JUNE 30, 1892.

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