

REPORT

The Honorable Theodore F. Blanding, Governor of the State of New Jersey

FIRST ANNUAL REPORT
OF THE
COMMISSIONERS OF FISHERIES
OF THE
State of New Jersey.
1871.

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To His Excellency, Theodore F. Randolph, Governor of the State of New Jersey.

SIR:—We, the undersigned, appointed as Commissioners of Fisheries of the State of New Jersey, under and by virtue of an act entitled “An Act for the appointment of Commissioners for the better protection of the Fishing Interests of the State of New Jersey,” would respectfully report:

That, feeling the magnitude and importance of the duties assigned them, and knowing that without concurrent legislation from the State of Pennsylvania all action in regard to the river Delaware, to which, as the largest and most valuable of the fish-producing rivers of the State, they determined to devote their attention for the first year, would be useless,—they, with the approval of Col. James Worrall, Commissioner of Fisheries of the State of Pennsylvania, called at once a Joint Convention of the Commissioners of Fisheries of the two States.

This convention was held at Woodbury, May 17, 1870; others were held at Troutdale, November 15, and at Philadelphia, January 12, 1871. At these meetings much important business was transacted, though chiefly connected with the working business of the commission, and consequently of no special interest. Such matters of public interest as transpired will be noticed in their appropriate places in the report. To Commissioner Slack was allotted the task of obtaining all possible information concerning that portion of the river between Burlington and the northern boundary of the State, while Commissioner Howell agreed to perform the same duties in connection with the lower portion.

For the purpose of gaining information, the commissioners have used every means in their power. The following circular and questions were sent to every fisherman upon the Delaware river whose name and address they were able to ascertain.

—, 1870.

SIR:—Being desirous of obtaining all possible information concern

ing the fisheries of the Delaware river, we submit to you the following questions: In your answer the questions need not be repeated; the number only need be appended.

Hoping that you will respond with promptness and accuracy, we remain,

Yours respectfully,

B. P. HOWELL, M. D.,
J. H. SLACK, M. D.,

Commissioners of Fisheries of the State of New Jersey.

1. Kind of net used, whether shore or drift?
2. Number of nets used in any one fishing pool?
3. Size of net used—length and depth?
4. Number and varieties of fishes taken during the season?
5. Number of hands employed?
6. Expenses of the year, including taxes?
7. Gross receipts?
8. Average number of hauls or drifts per diem?
9. Date of first haul or drift?
10. Date of last haul or drift?
11. Time occupied by each haul or drift?
12. Names of proprietors of any other fisheries in your vicinity?

Please send answer to

Commissioners of Fisheries of the State of New Jersey.

Whenever practicable, personal interviews were held with the fishermen, and much important information was thus gained. In nearly every case they have met with ready responses, and the kindest treatment, though instances have occurred in which their requests were met with refusal and insolence; happily such cases have been rare, the fishermen understanding that the commissioners were appointed in their interest. Letters containing important information and suggestions have also been received in many cases from individuals personally unknown to the commissioners. To the press of both Pennsylvania and New Jersey, and especially to the *State Gazette* of Trenton and the *Free Press* of Easton, they beg leave to tender their sincere thanks.

Fish baskets, dams, race-ways, and, in fact, all real or supposed obstacles to the ascent and descent of migratory fishes, have been personally visited and thoroughly examined. In one case, (that of Scudder's Falls) by the joint commission, and will be found noticed in their proper places.

Upon the approach of spring commences the periodical return of those migratory fishes from the sea, which, in obedience to a law of

their nature, seek in the clear quick waters of the Atlantic rivers an appropriate depository for their spawn and a congenial nursery for their young.

This usually occurs in the Delaware river about the middle of March, though in very early seasons a few make their appearance in the upper portion of Delaware Bay during the month of February. These migratory fishes are the shad, herring, rock-fish and sturgeon; we have no certain knowledge that salmon ever frequented the waters; they are not known to have been found further south than the Hudson. Inasmuch as the waters of the Delaware would seem to afford a suitable habitat for them, presenting the usual characteristics of salmon rivers, measures are about being taken, at the expense of the commissioners, to place in the Delaware near its head waters one thousand young salmon, hatched by the artificial process. Success has attended similar experiments, a remarkable and interesting instance having occurred in Scotland. Loch-Shin is situated at the head of a famous salmon river—the Shin; four small rivers feed the lake, yet neither into the lake nor its tributaries were salmon ever known to ascend from the river. In the autumn of 1836 ripe salmon of both sexes were placed in the four tributary streams, since which period they have all become stocked. The salmon must have made their regular periodical visits to the sea and returned, passing through both the river and Loch-Shin, proving conclusively the correctness of the generally received opinion that salmon, at least, and most probably all migratory fishes return, not only to the same rivers, but actually to the same spawning-ground upon which they themselves were hatched. Interesting instances are noted of salmon inhabiting different streams debouching into the same estuary having been marked; and in no case, when re-taken, have they been found in any other than the stream in which they were originally captured.

It has long been the opinion of observant and intelligent fishermen, and also of naturalists, and of late been confirmed by the experiments of fish-culturists that salmon and shad spawn in the clear running waters, above the reach of the tide. The necessary conditions being clear, shallow water, rapidly running over a stony or rocky bottom. With salmon, as with brook trout, it is well known that they pair, seek a suitable spot, and work out a bed, the female depositing her ova and the male disseminating his milt over them, then by means of their tails the fishes mutually assist one another in covering them over with gravel.

The ova of the shad having a specific gravity but slightly greater than that of water, barely sink, falling into the cavities or eddies formed by the inequalities of the stony bottom, experiments have proven that shallow clear water and constant though gentle motion is essential for their incubation.

The manner in which shad and alewives (herring) spawn has been ascertained by direct observation. Of the shad, it is said: "Gathered

in close schools, the males and females circle about, often with the dorsal-fin out of water; suddenly, as if by an electric shock, they make a dart, and immediately clouds of spawn and milt are shot into the water. Where there is only a single pair of shad, they swim slowly in circles, the male keeping his head close to the pectoral-fins of the female."—*Report of Massachusetts Commissioners' of Fisheries*, 1870, p. 17.

The habits of the herring during the process of spawning appear to differ materially from those of the shad. An interesting account of the spawning of the herring is contained in the report of the Commissioner of Fisheries of the State of Maine, which we feel constrained to quote:

"From Mr. John Brown, of Bowdoinham, we have learned the following facts in relation to the spawning of alewives (herring). In the month of June, in shallow water, over weedy flats and along the edge of the channel, they may be seen and heard rising repeatedly to the surface, making a great swirl in the water, and disappearing. On observing closely, it was found that several alewives, sometimes as many as six or eight of both sexes, rose together, and the eggs and milt could be distinctly seen falling to the bottom. To make certain, some of them were caught in the act, and search at low water revealed at a little depth multitudes of eggs among the weeds on the bottom in the same spot where the fish had been observed. The operation is performed oftener at night. It has accurately been observed in a wier, where the eggs dropped upon a board floor. About the middle of June begin to be seen in the water of the bay around Abagadasset Point myriads of pairs of eyes, each pair with a tail. Whether these were shad or alewives (herring) the observers were unable to determine, but since the experiments at Holyoke indicate that the young shad seek the centre of the river, it is probable that they were alewives."—*Report for 1867*, p. 13-14.

Neither shad nor alewives are carnivorous, it has not as yet been ascertained on what they subsist, they have been taken with the fly, both artificial and natural, and also with the live minnow at Trenton and Fairmount Dam, but such instances are excessively rare. The stomachs of shad captured in the Delaware river, one hundred miles from the sea, are frequently found filled with a green slimy mass, which is proved, by microscopic examination, to be composed of half digested fragments of the *ulva latissima*, a well known marine aquatic plant, common on our coasts. In one, examined by the commissioners May 16, 1870, at Howell's Fisheries, located at Fancy Hill, six miles below Philadelphia, the entire stomach was filled with a soft, pultaceous, salmon-colored, unknown substance.

The rock fish or striped bass are captured in the Delaware in immense numbers. At Milford, thirty-five miles above Trenton, thousands have been captured during the past season by the illegal method of brush-damming the river, a flagrant violation of our river

laws, which, we hope, will not be repeated. The fish here captured were small, few having been taken of over four pounds weight, though in the lower Delaware they attain an enormous size; one captured at Howell's a few years since having attained the enormous weight of eighty pounds. They spawn in tidal creeks near the mouth of the river during the late spring or early summer months; they have been found in the month of June distended with spawn not yet ripe. They are taken at all seasons of the year, and it is a strange and unexplained fact, that they are now (January 1) being captured on the New Jersey coast of the same size as those taken in early spring. It was formerly believed that this fish ascended our rivers for the purpose of depositing its spawn, but it is now ascertained that its object is solely to obtain food, which is afforded in immense quantity by the young fry of the shad. A dozen rock fishes were purchased in October last from the fishery at Upper Black's Eddy; of these, the stomachs of nine were found to contain young shad of from two to three and a half inches in length.

Until within a few years the sturgeon were taken at the shore fisheries in great numbers, one hundred and seventeen having been captured by a single haul of the seine at Fancy Hill, to the great annoyance of the fishermen and injury to the seine.

At that period they were in but little demand except as food for swine. Of late years, since the price of shad has risen from six to sixteen dollars per hundred in the lower, and to thirty-five in the upper portion of the river, and all other kinds of animal food in proportion; a demand has arisen for their flesh, which, under the name of "Albany beef," is now habitually sold in our markets. Few are now captured at the upper fisheries, though the newspapers of Easton, during the past summer, mentioned the fact that two of these fishes were to be seen for over a week in the Delaware at that place.

They are, however, captured in great numbers in the upper part of the bay and lower portion of the river by gilling seines, constructed for the purpose, in length from one hundred to one hundred and fifty fathoms, and a mesh of between twelve and thirteen inches. They are thus taken, not only during their ascent of the river in the spring, but also during their descent in the autumn. The period of their arrival in our rivers is later than that of the shad. They may sometimes be seen leaping their entire length out of water, sometimes to the peril of persons in small boats. Their food, like that of the shad, has not as yet been ascertained, they are certainly not carnivorous; from the position and conformation of their mouths it is presumable that their aliment, whatever it may be, is obtained near the bottom of the stream. That they swim deep may likewise be inferred from their leaps, to perform which they must evidently start from near the bottom, and where there is considerable depth of water. That they, at times, lie close to the bottom is proven by the fact that the shore

seines sometimes fail to capture them even when they have been seen leaping within their enclosures.

The flesh of the fish is indeed not to be despised as an article of food. In England it is held in high estimation, being a royal dish, every sturgeon captured in the British Islands being the property of Her Majesty. Pickled, it has often been mistaken for salmon, and, when properly cooked, can scarcely be distinguished from veal. From its roe, caviare, the national dish of Russia, is prepared, and it is stated that a manufactory of *imported* Russian caviare has lately been established at Hoboken. The demand for sturgeon-meat has increased to such an extent that, independent of the vast quantities sold in the Philadelphia markets, hucksters as well as farmers eagerly seek them at the shore-fisheries, by them it is carted through the country and sold by the pound as regularly as meat by the butchers.

Shad and herring swim in schools or shoals; the former, except very early in spring, when owing to the higher temperature of the water, a few are taken in coves and small tributaries, are found in the deep water of the channel, heading against or stemming the current, as proved by the drift-nets, taking them at each set of the tide on the side toward which the net is drifting. Their destination is the running water above the influence of the tide. That their spawning-beds are there located, is proved by the fact that in proportion as they are debarred from entering the upper portions of the river, as by impassable dams, they decrease in numbers.

The Schuylkill was formerly a famous resort of the shad. William Penn, in one of his letters, mentions that "six hundred shad had been taken with one sweep of the seine," and, in fact, maintained its reputation until the erection of the Fairmount Dam rendered it almost barren of shad between the dam and its confluence with the Delaware, a distance of eight miles. It has been the fashion to ascribe this result to the defilement of its waters by the refuse from the city gas-works, but it occurred within three or four years after the erection of the dam in 1820-21, whereas, the gas-works were not constructed till about 1830.

The successive runs of shad continue from about the middle of March to the last of June or early part of July, they having been sold during the past year in Bucks County, Pennsylvania, on July 4th. They are few in number until the middle of April, from this time to the middle of May comes what is known among fishermen as the great run, after that their number rapidly diminishes. The same phenomena are observable in the downward course of the fry to the sea. Those early spawned, few in number, are descending, while adults are still ascending the stream. Young shad, two and a half inches long, were observed June 8, 1869, at Howell's Fishery by one of your commissioners.

Dropping slowly down stream, those which escape their numerous enemies, both animate and inanimate, finally all reach the salt water

by the end of November. The young were observed November 12, 1869, at Easton.

And now arises the question, what becomes of the shad between the time of their departure from their natal waters in the summer and autumn, and their return during the following or some future spring? for the prevailing opinion of naturalists is that they neither reach their full growth, nor return to fresh water till they are two or three years old.

Unlike migratory birds, whose flight can be readily traced, and their destination accurately determined, as, for instance, the swallow to Honduras, and the bobolink or reed bird to the rice-fields of the Southern States or the West Indies, the shad, when once in the trackless deep, are lost sight of entirely. This, though an interesting subject of inquiry, has, however, thus far proved a fruitless one. With a view, however, to its solution, the New England Commissioners of Fisheries have solicited the assistance of the Superintendent of the United States Coast Survey, which will doubtless be afforded.

It is the opinion of some that the shad lie in the deep waters off the mouths of their native rivers; of others that they move in one continuous body along our coast to the south, and that when the winter is over, they head about and return, and, as they pass, give off, at each river, its respective detachment. In the prosecution of these inquiries, it might be well to reflect for a moment upon the well-known habit of this fish to seek and stem the current. They are emphatically a "current-fish." They enter our rivers in the spring and take their departure in autumn, when the rivers are swollen by equinoctial rains. How far seaward to the sensitive organs of fishes the fresh water may be perceptible, we know not; crabs, sharks and porpoises are decided salt-water fishes, yet during severe drouths they have been met with in the Delaware above Philadelphia, where the water is perfectly fresh, though at the same time it was brackish at Marcus Hook, some fifteen miles below. Keeping in view, therefore, the habit of the shad to stem the current, would it not be well to extend our researches to that "river in the ocean," the Gulf Stream, whose waters, being of a higher temperature than those of the adjacent ocean, may, on this account, be their resort in winter? Its waters may also abound in that appropriate, though as yet unknown aliment, on which their rapid growth during their absence, and excellent condition upon their return, must depend.

The supposition that these fishes may not linger near the coast, nor yet lie off the mouths of river, but may make extensive journeys, derives some support from the habits of the cod, whose spawning-grounds are said to be the Lofoden Banks off the northwestern coast of Norway, within the Arctic circle. Leaving these banks in April and May, they reach those of New Foundland in June, in a very poor condition, here feeding upon herring and other small fishes, they rapidly fatten, and about October again depart for their Arctic spawn-

ing-grounds. May we not infer that in these extended journeys to and fro, that the cod are guided by that portion of the Gulf Stream which passes between Iceland and England to the Arctic circle? While having under consideration the shad in their sojourn in the ocean, and taking it for granted that they do not return to fresh water until they are two or three years old, the following statement from the report of the Commissioners of Fisheries of Maine (1867, page 11), may not be devoid of interest:

"There comes into the salt and brackish tide-waters a school of 'sea-shad' that are not breeding, and are in much better condition than the breeders. Their average size is less than the latter, but they range from the size of an alewife to that of a full-grown shad. Mr. Brown, of Bowdoinham, suggests that these sea-shad are mostly those that have not arrived at the breeding-age, and that those as large as alewives are yearlings."

A similar phenomenon, it is said, occurs in the inlets along the New Jersey coasts. Schools of shad which do not run to fresh water ("sea-shad") are there caught, while the others ("breeding-shad") are in the fresh-water rivers.

The Delaware river, the special subject of our report, has long been, and, in a measure, still continues unrivalled for the abundance and excellence of its shad and herring. Taking its rise in the mountains of New York, it descends by a pretty rapid flow over a stony and rocky bed, for two hundred miles to fresh tide-water at Trenton, New Jersey, at which point it is one-third of a mile in width; thence gradually expanding at a distance of one hundred miles it is three miles in width, and is soon lost in that broad expanse, Delaware Bay. The latter third of its course, unlike the upper portion, is through a level country; its western strand, for the most part being an alluvial accretion, while on the eastern side is a narrow sandy or gravelly beach. The river bottom in the vicinity of Trenton is rocky, and in some places composed of fine sand, of excellent quality for building, for which purpose it is extensively used. For the remainder of its length it is smooth and mostly soft. The depth in the main channel is, at low water, from two to eight fathoms, with a mean tidal-rise of six and a half feet, the rapidity of the current is from two to three miles per hour.

Islands and bars divide it into numerous channels, and its principal tributaries are navigable for vessels of light draught.

The diversity in the character of this stream, with its broad bay sixty miles in length, its one hundred miles of deep, fresh tidal water, and its two hundred miles of clear, rapid running water, passing over a rocky or stony bottom, with numerous rapids, render it a favorite resort for migratory fishes.

The titles of owners of lands riparian to the river Delaware and its tributaries, extend to low-water mark, with the exclusive right of fishery in the waters in the front thereof. Until the concurrent acts of

Pennsylvania and New Jersey of 1822-23, allowed the use of gilling or drift-nets, sweeping or shore seines had alone been used from the earliest colonial period. These shore-fisheries, as they are called, were formerly much more numerous than at the present time; there are now about thirty from the head of Delaware Bay to Trenton, and from the latter point to the New York State line about eighty. In ordinary seasons operations commence at these fisheries about the tenth of April, and *should* terminate, according to law, below Trenton Falls, June 10, and above, June 15.

Fishing in front of a prescribed length of shore, the sweeps of these seines are necessarily limited within circumscribed bounds, termed pools or fishing places, and most of them on the tidal portion of the stream, only at certain stages of the tide; while some during the flood, others during the ebb only. There are others, and these are the most extensive, which can sweep only at the turn of the tide, making what are termed "slack-water hauls." The former make from eight to twelve sweeps, and the latter three or at most four in twenty-four hours.

As the shad and herring swim in schools and in the deep water of the channel, the seines to reach them, vary greatly in length and depth; with a pulling line attached to each end of the seine, in length corresponding to the distance the channel may be from the shore. By means of these lines, the crew, when the seine has been laid off in the stream, draw it to shore, either by hand or with the assistance of capstans. The crews vary according to the size of the net, from twelve to fifty in number. The form of the net when first laid off from the seine-boat is that of a crescent, it swings some distance with the tide gathering in the fishes, but the crew steadily pulling upon the lines soon drag the ends of the seine toward the beach, when it of course ceases to gather the fishes. This usually occupies, the time of course depending upon the length of the seine, from twenty to thirty minutes, the remainder of the time, sometimes an hour or an hour and a half, when the net must be withdrawn over extensive flats, is occupied merely in getting the seine ashore. The fishes are then dipped into small boats, and after the local demand has been satisfied are sent to the city or adjacent towns.

There are about seven hundred men employed in the shore fisheries below Trenton; they are paid by the month, with board. In the upper Delaware the number of hands employed, is perhaps, eight hundred.

The operations of the fisheries are much interrupted by storms, and below Philadelphia particularly, by vessels running aground, or anchoring or passing over the fishing grounds at the particular time when the tide suits for laying off the seine. The latter interruption is particularly obnoxious to those fisheries whose fishing can only be done at the turn of the tide. For instance, at the two fisheries at Fancy Hill an accurate tide-table is kept, and it is found that owing to these contingencies, only one hundred and thirty hauls were made by each seine,

in the fifty-one days elapsing between April 13th and June 10th, 1870, both days included; an average of about two and a half per diem.

Before the owner or occupier of a shore fishery enters upon the same, he is required by law to file with the Clerk of the Court of Common Pleas, a description in writing, of his pool or fishing place, the length of shore used, and the number of men employed; and to enter into bonds, with sufficient surety in the penal sum of five hundred dollars, for the payment of all fines and penalties for any infraction of the law. The fishery is also taxed like other real estate.

The value and importance of this species of property was early recognized and fostered by salutary legislation. The compact of 1783, between Pennsylvania and New Jersey, for the partition of the islands and the settlement of the jurisdiction of the river Delaware, distinctly recognizes the right of "several fishery," and while it in express terms declares the river to be a common highway, provides, nevertheless, that the Legislature of each State shall guard and regulate the fisheries annexed to their respective shores, in such manner that they shall not be unnecessarily interrupted by vessels riding at anchor on the fishing-grounds during the season of taking shad, or by persons fishing under a claim of common right.

COMMISSIONERS' OF FISHERIES REPORT. 1193

The following list comprises all that has thus far been ascertained concerning the fisheries of the lower Delaware, under which term is included those below Trenton Falls :

NAME OF FISHERY.	STATE.	FISHED BY	NUMBER OF MEN EMPLOYED.	LENGTH OF SEINE IN FATHOMS.
Headley.....	New Jersey.	.....	20	.....
Badger.....	Pennsylvania.	Dewire.	25	200
Frog Pond.....	Pennsylvania.	Shubert.	15	125
Duck Island.....	New Jersey.	W. Forsyth.	.....	100?
Biddle's Island.....	New Jersey.	F. E. N. Black.	.....	100?
Hayes'.....	New Jersey.	M. E. S. Hayes.	12	100?
Emley's Island.....	New Jersey.	.....	.....	100?
Long Bar.....	New Jersey.	E. J. Grant.	.....	100?
Smith's Island.....	New Jersey.	.....	.....	100?
Rancocas.....	New Jersey.	Higby C. Delks.	12 to 157	150
Wright's Point.....	New Jersey.	Gosser.	20	175
Plum Point.....	New Jersey.	Haines.	12	150
Pennypack.....	Pennsylvania.	P. Gosser.	20	175
Cinnamaxon.....	New Jersey.	Rice.	25	180
Cramp Creek.....	Pennsylvania.	.....	20	120
Meekle's.....	New Jersey.	J. Faunce.	.....	200?
Hugg and Howell's.....	New Jersey.	Rice.	53	480
Howell's (Fancy Hill)....	New Jersey.	B. P. Howell.	35	475
Howell's (West Point)....	New Jersey.	B. P. Howell.	35	475
Reeves' (Eagle Point)....	New Jersey.	J. Bakeoven.	28	180
Reeves' (Woodbury Pt.)..	New Jersey.	Cramp.	35	480
Mantua Creek.....	New Jersey.	C. Faunce.	35	450
Paul's Point.....	New Jersey.	Baker.	25	180
Clonmell.....	New Jersey.	Bennett.	35	400
Tinnicum Island.....	Pennsylvania.	Faunce.	25	150
Tinnicum Island.....	Pennsylvania.	Baker.	18	150
Kelley's Island.....	New Jersey.	Collier.	18	.....
Kearney's Point.....	New Jersey.	Cramp C. Collier.	15 and horse	600
Lazaretto.....	Pennsylvania.	Faunce.	15	150
Hill's Fishery.....	Pennsylvania.	Hugh E. Hill.	11	125
.....	Pennsylvania.	Jona Vandevere.	10	150
Burton's.....	.....	A. Barton.	8	116
Total.....	.....	.....	585	6,636
Giving thus an average.....			22 3-26	214 2-31

From the large number of small fisheries in the upper Delaware, it has been impossible in the limited time since the appointment of the Commissioners (only nine months), to obtain positive lists. The following approximation will most probably prove nearly correct :

Average number of hands..... 7.
 Average length of seine..... 55 fathoms.

About fifty years since, gilling-seines (as previously stated) were introduced into the Delaware river and their use allowed by law under certain restrictions, these restrictions were, however, entirely disregarded; finally a law was passed in 1852, permitting them to be used in any part of the river, save within the bounds of the shore-pool or fishery. They have of late years, both in numbers and length greatly increased. Mr. Benjamin Wilkins, now eighty-three years of age, remembers when there were but fifteen gilling-seines on the river, and these were only from forty to forty-five fathoms in length, managed with a small boat at *each extremity* to keep them across the current. The number, of late years, in operation between Trenton and Cohansy Creek, a distance of about one hundred miles, has been variously estimated at from five hundred to two thousand. In the opinion of your commissioners there are at least five hundred. Their length varies between one hundred and eight hundred fathoms, and they will average perhaps three hundred, an enormous sum total is reached of three hundred thousand yards, over one hundred and seventy miles. The largest of these require but one light skiff, with two, or at most, but three men to manage them. Being constructed of fine twine they are almost imperceptible to the fishes in the turbid tide-waters, when later in the season the water becomes clear greater execution is done on this account by fishing at night. The mesh, according to the statement of Mr. Wilkins, was formerly six and one-fourth inches, it is now reduced to five and one-fourth, and even less, sufficiently large, however, to admit of the shad getting its head so far through the mesh that it is fastened by the gills, hence the term gill-net.

These seines have both a lead and a cork-line, by which they are held in a vertical position as they drift with the current. With the treble view of economy of material, the prevention of injury by vessels of light draught in passing over them, and to enable the same net to be used with facility in either deep or shoal water, the upper margin of the net is supported by long and slender cords of from five to seven feet in length, to the free ends of which corks or wooden-floats are attached. The seine thus constructed is laid upon the stern of the skiff, one or two men, according to its size, row the boat across the current, while another standing on the stern carefully casts the net into the water. This done, it is suffered to drift with the tide, direction being given it by the boat to which one end remains attached. After the net has drifted a sufficient length of time the fishes are removed from it, either by under-running it or by replacing it upon the stern of the boat, again to be cast into the water. Immediately upon the appearance of the shad in the upper portion of the bay, ordinarily in March, the longest of these seines are there placed to interrupt them. Fishing continues from Fort Delaware southward till about the first of May, when the sturgeon become numerous and troublesome, and the shad having pushed their way further upward, the gilling-seines are shortened, and for the remainder

of the season keep pace with the shad as they ascend the river. It is not to be supposed from the above, that drift-net fishing is confined to the head of the bay, or lower portion of the river; on the contrary, from Trenton all the way down, the current is literally fenced across at short intervals by these seines.

From Trenton to a considerable distance down the stream, wherever the depth of water will permit it, and also at certain points upon the upper Delaware, a very objectionable practice prevails; the net is stretched across the channel and there staked or anchored for a considerable time, after which it is loosed and allowed to drift.

It has been stated by reliable persons engaged in gill-fishing, that in fair weather from two to three "slacks" are taken daily, the nets laid off on the flood-tide an hour or two before high water and fished till two or three hours after high water. So, too, on the ebb, the net being laid off two or three hours before low-water, and taken out an hour or two after ebb-tide. Thus on an average, over twelve hours out of the twenty-four are occupied in fishing. The longer portion of time fished is during the ebb-tide, the effect is, of course, to backen the schools of shad down stream longer and further than they drive them up with the flood.

The shad when thus caught are placed on board large sail-boats of sufficient capacity to contain the catch of many nets; the carrier obtaining a commission on the sales, as his share of the profits. Mr. B. Wilkins with two others, constituting a company, carried and sold the product of sixty-three nets. He pursued this business for some thirteen years prior to 1840. From his statements it appears that at the present time no single seine approaches in the number of its catch to the quantity formerly obtained, though the length of the nets have been greatly increased. He instanced the case of one gilling-seine of 200 fathoms, used in the vicinity of Fort Delaware, as having taken while he was "carrying" for them, eight hundred and fifty shad in one drift; at no time during the past five years have over two hundred been taken in the same time, and one hundred would perhaps be a high average. Great diminution in the quantity of fishes taken has also been experienced at the shore fisheries, indeed, to such an extent has it reached, that many have been entirely abandoned as unprofitable. In evidence of this, we might state that until 1820, which was probably the most productive year for the shore-fisheries ever known, there was no appreciable diminution in the numbers or size of shad. It was in that year that the great haul of ten thousand eight hundred shad was made at Fancy Hill, the largest haul by several thousand fishes ever made upon the river Delaware.

Besides diminishing in numbers, the shad of late years have fallen off greatly in size and weight. Few, if any, taken during the past season exceeding six and a half or seven pounds. Mr. Wilkins says he once saw one of fourteen and a half and was informed by a reliable person of another weighing sixteen and a half pounds! He says that

shad of eight, nine, ten and even twelve pounds were formerly quite common, their average being about seven; such also, was the estimate made by the late Samuel L. Howell, M. D.*

Mr. John Mickle, of Woodbury, now seventy-nine years of age, and also the late Mr. Isaac Reeves, of the same place, both formerly owners or connected with fisheries, have borne concurrent testimony to the truth of this statement. How has this great change been effected save by the excessive and indiscriminate fishing with gilling-seines of small mesh in the lower, and the construction of wires interfering with the return of the young shad in the upper portion of our river; the latter cause cannot, however, affect the size, but only the quantity of the fishes.

The shore-nets cannot be accused of having contributed to this most unfortunate result, as they scoop out, as it were, a small portion only of a school embracing all sizes, and leaving the remainder free to pass. They are engaged in circling around and gathering the shad, at most, half an hour at each haul, though the whole process of hauling the seine to the shore may occupy two hours; while the drift-seines, one following immediately after another, drift for several hours and over many miles of water, and being stretched directly across the current, must actually screen every school of shad which ascends the stream. The female fish heavy with spawn and sluggish in their movements, pushing for their spawning-grounds, become an easy prey, or are so debarred from ascending the stream that they are obliged to spawn in the deep turbid waters of the tide, conditions utterly unsuited to the hatching of their ova.

Besides the great numbers taken by these seines, many are so injured that they die, and sink to the bottom, where they are devoured by eels and other carnivorous fishes; at almost every haul made at a shore-fishery shad are taken bearing unmistakable evidence on their scaled and excoriated bodies of the injuries received in their struggles through the meshes of the gilling-seines.

Injurious and obstructive as this method of fishing is known to be, for rapid depletion has followed the introduction of the gilling-seines in every stream upon our coast, they have become an established and legalized fact; and while there is no disposition on the part of any class of our citizens to deny to them their fair proportion of the annual catch of migratory fishes, it is wrong that they should be allowed as they have been, to disregard with impunity the legal restrictions imposed for the common good, by fishing during the close-time, from sunset on Saturday till twelve o'clock on Sunday night, and for several weeks after the expiration of the time at which by law all shad-fisheries should cease their operations. Nor is there any valid reason why they should not make some return to the State for the great priv-

* *Vide* Shad and Shad Fisheries of the River Delaware.—*American Journal of Natural Science*, 1837.

ileges they enjoy. It is certainly making an invidious and unjust distinction to permit the gill-seine fishermen to pursue their avocations *untaxed*, while the owner of a shore-fishery is required not only to *pay a tax*, as for other real estate, but to *give bonds* for the observance of the laws.

The fact is notorious that the majority of the gill-net proprietors fish, not only on Saturday nights and Sundays, but during the entire month of June, and some even into July. Indeed, so soon as the shore-seines are withdrawn, on the last day of the legal season (June 10), scores and scores of gill-seines at once sweep their fishing-grounds. The abuse of this great privilege has assumed such proportions that a strong public sentiment has begun to be excited against it, and many of the more reflecting portion of the gill men have expressed a desire that some effective steps be taken toward a strict enforcement of the law. An ordinance of the city of Philadelphia prohibits the exposure of shad for sale in that city after June 12. By order of the joint commission of Pennsylvania and New Jersey, the secretary addressed a note to Mayor Fox, calling his attention to the ordinance, and asking that the same be strictly enforced. A notice signed by the chief of police calling the attention of fish dealers to the fact of the existence of the ordinance, was published in the city papers; but as the gilling-seines pursued their avocations as usual until July, it is probable that no further steps were taken for its enforcement.

In the upper Delaware during the past few years, owing to the great improvement which has taken place in the moral tone of the community, but little fishing has been done upon the Sabbath. Careful inquiry has proven, that at most, if not all of the regular fisheries, the day of rest is strictly observed, the seine is occasionally used on this day by amateur fishermen, but the strong feeling of the community is against them. Saturday night fishing is, however, common, and shad, as has been previously mentioned, are caught and sold until the first of July; this is a flagrant breach of the law, and should be punished.

It has been alleged that those who fish for the commoner fishes after the expiration of the shad season, cause by their small meshed nets, great destruction of the young shad while en route to the sea. This is denied, and we believe with truth, by those against whom the allegation is made. They admit that vast shoals of young shad are seen playing within their seines, but that they pass through the meshes. One of your commissioners has visited and inspected the catch of one of the largest small mesh fisheries upon the upper Delaware, and can bear witness to the truth of the above from ocular inspection. There is no prohibitory statute against the use of small meshed seines, on the contrary, the law to prohibit shad-fishing after a fixed period, expressly forbids the use of a seine of a *larger* mesh than three inches, below Trenton Falls, and one of a *larger* mesh than two and a half inches *above* said falls. It has also been stated that where channels run bare at low-water, nets of very small mesh are used to shut off these chan-

nels, and when great numbers of all indigenous varieties of fishes are exposed, those of sufficient size to be valuable for market are taken, while the fry of the shad and other fishes are left to perish.

As a proof of the constant and persistent decrease in the number of shad captured by the shore-fisheries, we would submit accurate statistics of the number of shad caught at two of the principal shore-fisheries of our State.* We have divided these into three cycles of five years each, the first 1818 to 1822, being prior to the introduction of the gill-nets; the second 1845 to 1849, when the gill-nets were fairly established; and the third 1865 to 1869, after they had assumed their present gigantic proportions:

* Howell's.

COMMISSIONERS' OF FISHERIES REPORT. 1199

Season of 1818.....	111,492	shad.
“ “ 1819.....	159,864	“
“ “ 1820.....	170,505	“
“ “ 1821.....	107,091	“
“ “ 1822.....	107,194	“
	<hr/>	
	656,146	
Average.....	131,229	per annum.
Each.....	75,614	
Season of 1845.....	90,540	shad.
“ “ 1846.....	125,659	“
“ “ 1847.....	59,949	“
“ “ 1848.....	17,304	“
“ “ 1849.....	38,998	“
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	334,450	
Average.....	66,890	per annum.
Each.....	33,445	
Season of 1865.....	64,925	shad.
“ “ 1866.....	59,550	“
“ “ 1867.....	98,000	“
“ “ 1868.....	43,950	“
“ “ 1869.....	37,274	“
	<hr/>	
	303,699	
Average.....	60,739	per annum.
Each.....	30,269	
Season of 1870.....	52,759	
Each.....	26,379	

The Expenses of these fisheries, for 1870, were as follows:

Wages.....	\$4,200	00
Taxes.....	100	80
Repairs, etc.....	2,528	50
	<hr/>	
Total.....	6,839	30
Total Receipts.....	\$8,804	65.
Profits.....	\$1,965	35.

Above tide-water, in the great spawning-ground of our migratory fishes, another great and serious evil is met with. Of all pieces of apparatus which human ingenuity has ever devised for the wanton and persistent destruction of young shad, the palm must be awarded to the eel weir, or, as it is more frequently called, the fish basket. With wings of stone or brush, extending, in many cases, entirely across the river, or placed at the foot of rapids, or below the lumber shoots of dams, it is strange that any of the young shad can escape uninjured. From Titusville to the State line, wherever the bed of the river is favorable for the purpose, they are to be found, and their number is immense. In many cases, as at Bull's Island, they are to be found two abreast, while in other cases one will take in the entire river. Their ostensible objects are the capture of rock-fish and eels, and large numbers of the latter are taken during their downward passage towards the sea for the purpose of depositing their spawn; of the former but few are taken. That these weirs or baskets may be a source of profit to their proprietors your commissioners cannot deny; but they consider that this is far over-balanced by the immense amount of damage inflicted by them upon the shad-fishing interests of the river. The young shad destroyed by them may be estimated at millions. Letters, calling the attention of your commissioners to their evil effects, have been received from various points along the river. In a letter received from Dr. J. M. Paul, a well known citizen of Belvidere, it is stated that in one fish basket near that town, Dr. P. has seen *a cart-load of young shad taken in one day, all dead*, and that this was a matter of frequent occurrence. Mr. Isaac Scarborough, son of Mr. Hiram Scarborough, the proprietor of the most extensive fisheries upon the upper Delaware, informed me that on the afternoon and evening of October 11, 1870, he saw bushels of dead young shad in the fish baskets at Bull's Island and Centre Bridge. Persons watching the fish baskets at night are frequently obliged to clear them from the young shad by means of scoop-shovels; a few are taken to feed poultry, but the majority are thrown into the water. We would most respectfully urge that laws, directing the total abolition of these eel baskets or weirs, be passed, and means taken to secure their enforcement. In other States a partial remedy has been sought by regulating the distance between the slats which compose the floor of the weir, and by having these slats beveled off upon their upper surfaces, the object being to allow the passage of young fishes through them without injury. This, in practice, has been found to result in no permanent benefit; by the swelling of the wood, of which they are composed, and the entanglement of brush in their interstices, the distance between them is speedily reduced to a minimum or entirely closed.

The young shad is perhaps the most susceptible of injury of any of our fishes, the loss of a single scale seems to entail certain death, and the slightest knock against the sides of the slats will as assuredly kill

them as a blow from a sledge-hammer. In the humble opinion of your commissioners, no means can be taken to modify their evil results. Total abolition is necessary.

Your commissioners propose introducing, during the coming spring, the land-locked salmon of the St. Croix river, at their own expense. The eggs are now in the hatching-house of a member of the commission, and are rapidly progressing. This, in our opinion, is the most suitable fish for introduction into the rivers of our State. Of exquisite flavor and rapid growth, reaching, it is stated, the weight of twelve and even fifteen pounds, and possessing both to the sportsman and the epicure the qualities of the true salmon, it is pre-eminently the fish best suited for the purpose. Its native habitat is the great lakes of Maine and their tributaries; but the spawn has been obtained and is now in process of incubation. Unlike the true salmon, they never visit tide water, and they, therefore, will not be endangered by the gill-nets; their market value far exceeds that of any fishes at present found in our State, the trout alone excepted. Your commissioners have also obtained about two hundred ova of the true salmon, which, when hatched, will also be placed in the Delaware, without expense to the State. Of the success of this last experiment great doubts have been entertained; time alone can decide. The experiment is, however, most certainly worth trying.

In October a number of the southern bass were placed in the Delaware river, at Phillipsburg, at the expense of a number of Philadelphia and Easton gentlemen. Much controversy took place concerning this movement, in which the name of one of your commissioners frequently appeared. No action was or could be taken by them officially upon the subject under provision of the act by which they were appointed. Whatever statements were made were simply made as private individuals. As we have now in our river two introduced fishes, it is suggested that laws be enacted tending to their immediate protection, until their first progeny shall have had time to arrive at maturity.

Instances having come under our notice of the introduction of pike or pickerel into various trout-streams by ignorant or malicious persons, it is recommended that measures be taken to protect in future, as far as may be possible, the trout-streams of our State. The trout which formerly abounded in all the mountain streams of our State are rapidly passing away, and all possible means should be taken for their preservation and protection.

In the present state of our law, the robbery of a private fish-pond is held but as a trespass; were legal means taken to render it a crime, the sense of security of proprietors would be much greater. Fish-culture is no longer an experiment, but a recognized and wide-spread branch of industry, and many thousands of dollars are now being invested in it in our State. Additional legal security will bring with it additional value of property.

Perhaps the largest and most complete establishment for the purposes of fish-culture in the United States is situated in the State of New Jersey.

The result of the recent prosecution of the Trenton Water Power Company for obstructing the navigation and interfering with the ascent and descent of the migratory fishes of the Delaware river, has been to draw the attention of the public to the dams erected upon the Delaware for the improvement of navigation, or the supplying of water for manufacturing purposes. A careful and thorough examination has been made of these structures, and the following information obtained:

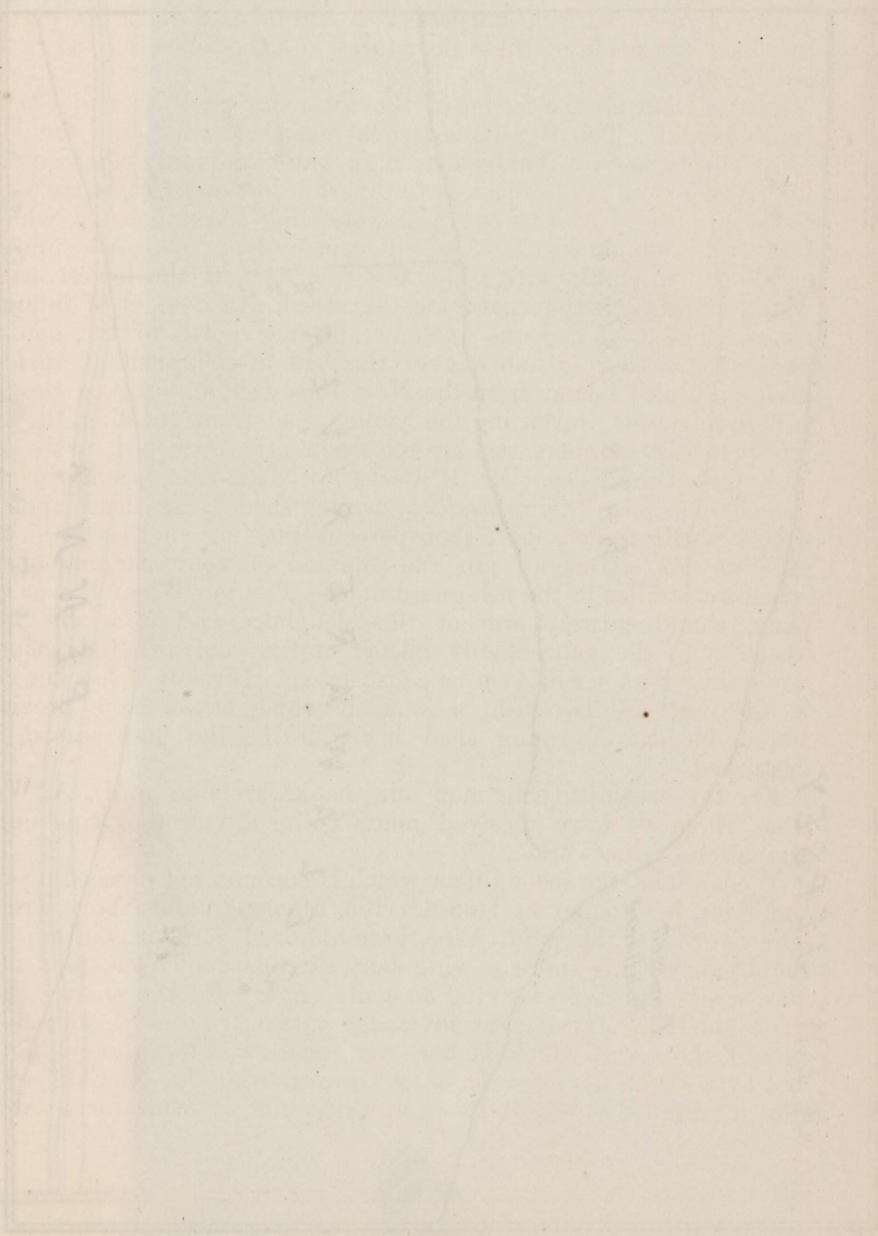
First—Dam for the feeder of the Delaware and Raritan Canal, at Bull's Island. This is what is termed a cricket-dam, being temporary in its effects, as it is removed at high water and only replaced when the river is low. Its object is to divert a portion of the water of the river into the feeder of the Delaware and Raritan Canal, which is here at its summit level. Near the centre of the dam is a sluice-way eighty feet in width, with a depth of four feet at the lowest stage of water, affording ample space for the ascent and descent of migratory fishes. The feeder opens at some distance north of the dam, and passes for a short distance over the bed of a branch of the river dividing Bull's Island from the New Jersey shore. As no provision is here made for preventing the young shad from entering, they pass into it in vast numbers, and are too frequently destroyed by the swirl of waters at the locks. Mr. E. Parker, of Titusville, has informed me that he has seen "winrows" of young shad lying dead upon the shores of the feeder, and other persons residing in the vicinity corroborate his statement. In the opinion of your commissioners a structure, similar to the fish-guard of the Trenton Water Power Company, would entirely prevent this slaughter, and from the known liberality of the gentlemanly officers of the company, they have no doubt but that it will soon be constructed. Directly below the sluice in the dam are two fish baskets, in which, as we have previously stated, bushels of young shad have, during the past season, been destroyed.

For the accompanying map our thanks are due to Mr. A. Welsh, from whom we have received much polite attention during our examination of the works.

Wells' Falls, the second dam which is encountered proceeding down the river, is situated at Lambertville, fifteen (?) miles above Trenton. The river is, at this point, over three hundred yards in width. From the Pennsylvania shore a wing-dam extends about one-third of the way across the river, forming an acute angle with the shore. While upon the New Jersey side advantage is taken of the peculiar formation of the river, which is here very shallow, with a rocky bottom, and by a slight dam the water is thrown from the New Jersey side into a channel which, at its narrowest point, is over thirty yards in

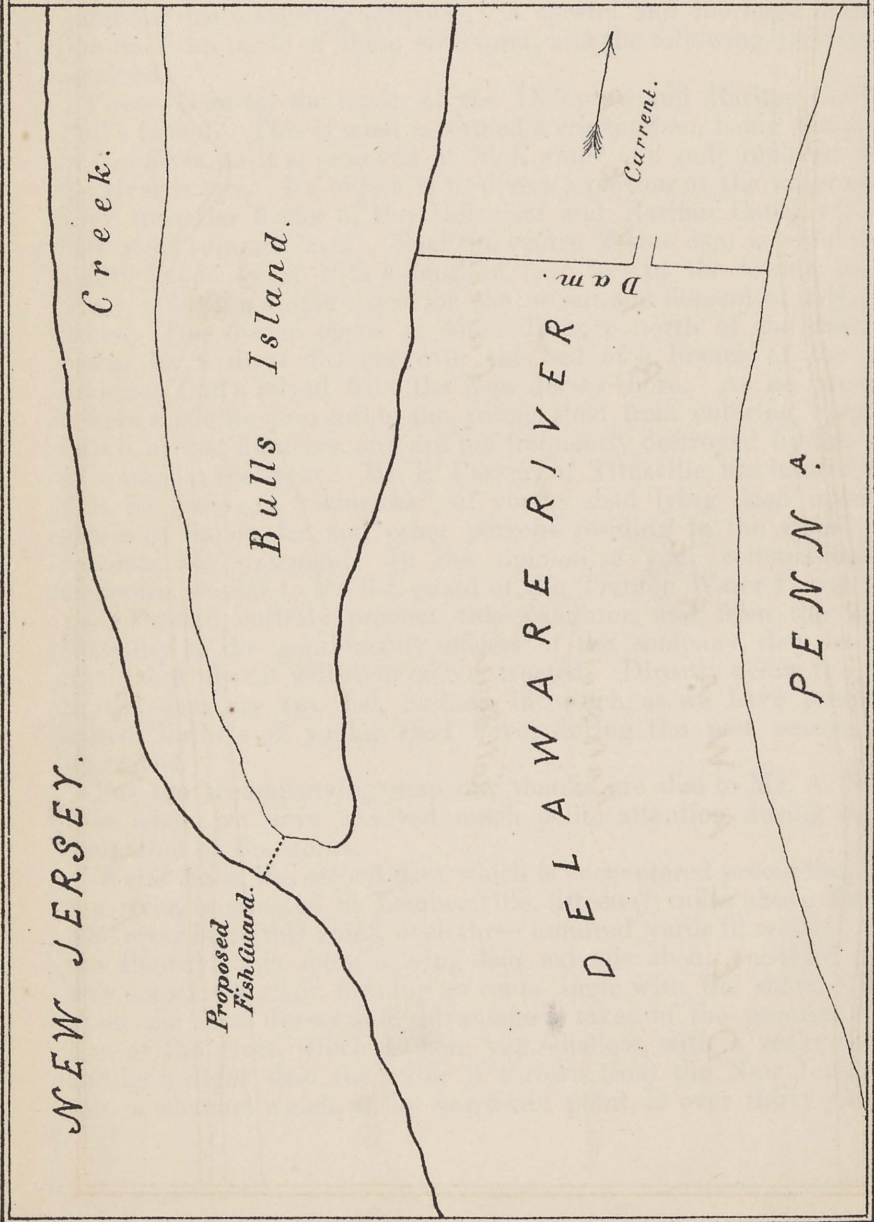
PLAN FOR SUPPLYING
the feeder of the
DELAWARE AND BAYTOWN CANAL
at BULLOCKS

As shown in the plan



DAM FOR SUPPLYING
the feeder of the
DELAWARE AND RARITAN CANAL
AT BULLS ISLAND.

Finished by Mr. A. Welsh.

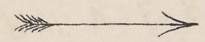


NEW JERSEY.

DELAWARE RIVER.

Raft Shute

Raft Shute

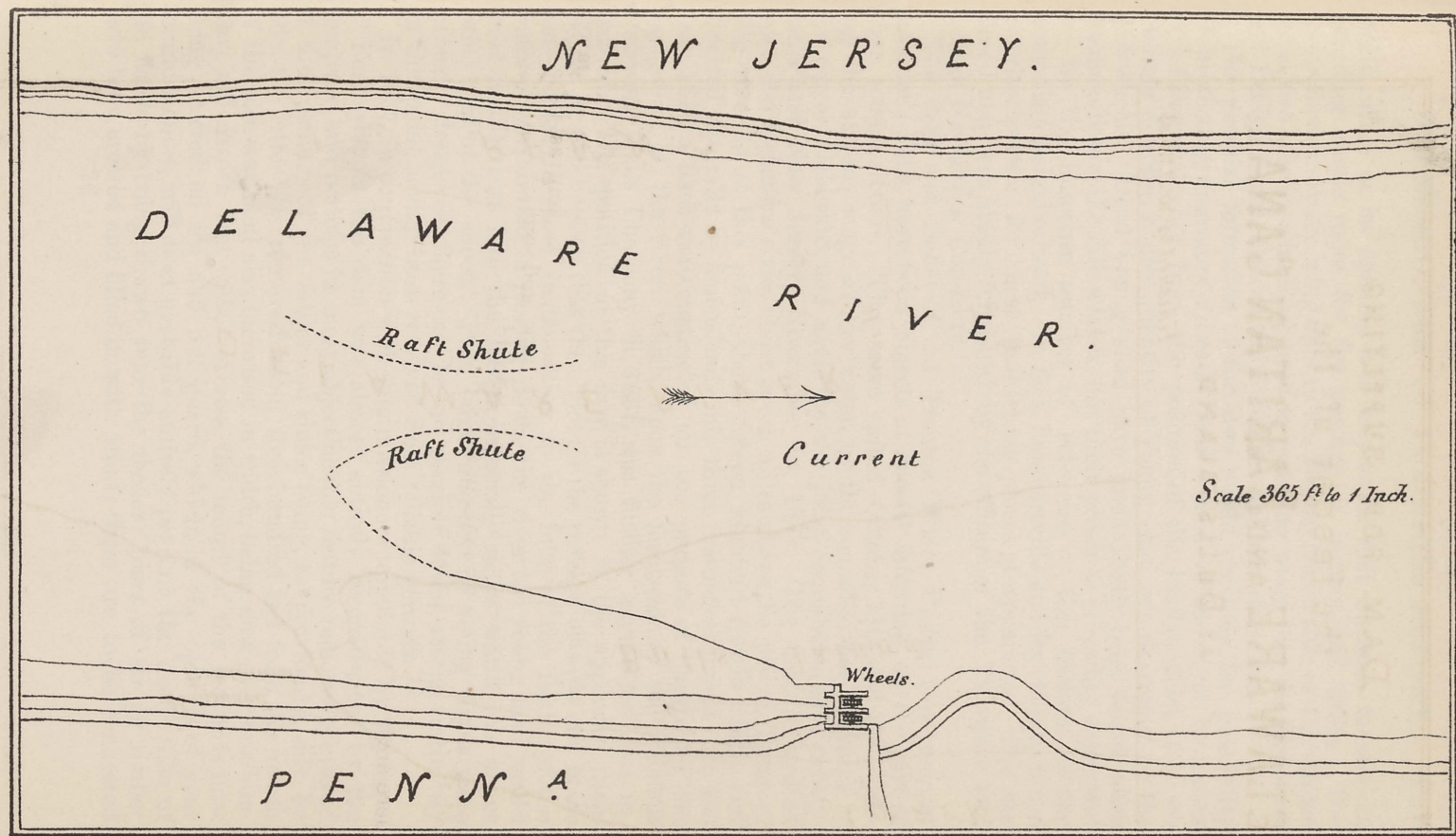


Current

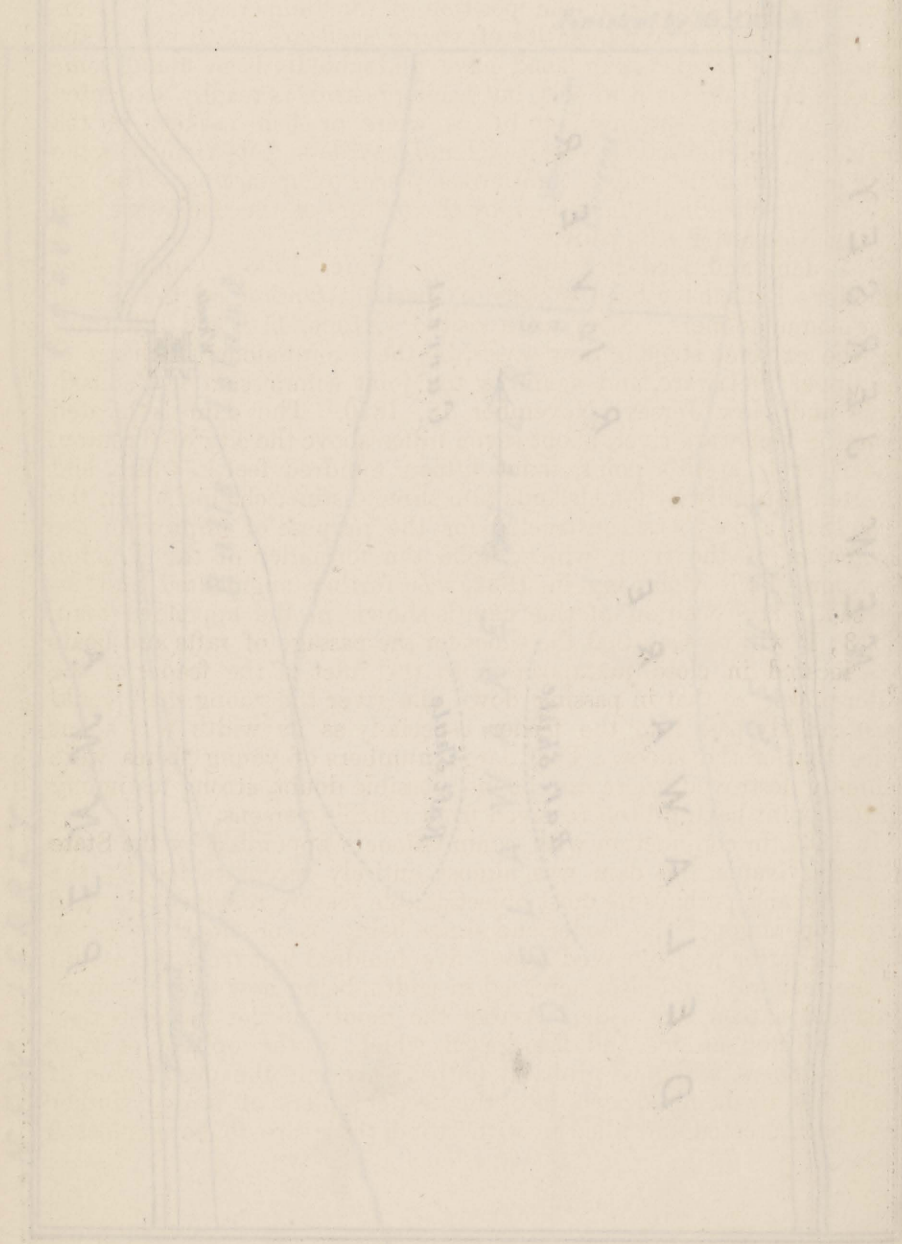
Scale 365 ft to 1 Inch.

Wheels.

PENNA.



DAM FOR IMPROVING
THE FOOT OF THE
DELAWARE AND MARITAN CANAL
AT BELLEVILLE



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width, while at its opening it is fully twice that distance in section, affording ample room for the passage of lumber and fishes. The water thrown by the wing-dam to the Pennsylvania side of the stream turns two wheels, which are used in pumping water into the Delaware and Lehigh Canal, besides supplying several manufactories.

The peculiar formation of the dam would preclude the possibility of protecting migratory fishes in their descent of the river by means of a fish-guard; but from the position of the lumber-shoot it is extremely doubtful if any quantity of young shad are destroyed by the mill-wheels. Dead young shad have undoubtedly been found some distance below the mill-wheels, but their presence is readily accounted for by the immense number of eel-weirs or fish baskets in the immediate neighborhood. In fact, Lambertville and its vicinity is the favorite location for these murderous pieces of apparatus. The enclosed map was kindly furnished by the officers of the Delaware and Lehigh Navigation Company.

The dam and feeder of the Trenton Water Power Company, at Scudder's Falls, have been objects of special attention on the part of your commissioners. They were visited October 11th and 12th, during the extreme stage of low water, by the commissioner in charge of the upper Delaware, and again by the joint commission of Pennsylvania and New Jersey, November 18, 1870. The dam is located upon the Delaware river, about seven miles above the city of Trenton. The river is, at this point, about fifteen hundred feet in width, and diverted naturally by four islands into three distinct channels. In the year 1818 a dam was constructed for the purpose of improving the navigation of the river, which, upon the formation of the Trenton Delaware Falls Company in 1831, was further augmented and increased. The position of this dam is shown in the appended map, No. 3; it will be seen that the shoot for the passage of rafts and boats was located in close juxtaposition to the inlet of the feeder of the water-power, so that in passing down the river the young shad would most readily pass into the feeder, especially as its width was about twice that of the shoot. That large numbers of young fishes were annually destroyed, there can be no possible doubt, strong testimony on this point having been received from reliable persons.

In 1867, in conjunction with commissioners appointed by the State of Pennsylvania, the dam was almost entirely reconstructed by the company, and perhaps its most objectionable feature removed; instead of the openings of the feeder and sluice being, as previously, side by side, the latter was removed about five hundred feet from the mouth of the race-way, and also increased in width, being now over one hundred and sixteen feet wide. Across the mouth of the feeder is now being erected an ice and fish guard, which, in the opinion of your commissioners, will most probably entirely prevent the destruction of the fishes by being drawn into the feeder; piers of strong timber have been erected and filled in with stone, these are to be connected

by massive timbers, running horizontally, upon which heavy planks will be secured, forming a tight bulk-head running entirely across the mouth of the feeder, and extending about one foot below the surface of the water at its lowest stage. The bulk-head has as yet not been completed; but the number of young shad seen during the past season has been fully seventy-five per cent. less than those observed during any previous autumn. The young shad, it has been proved, swim near the surface during their descent to the sea, and, it is expected, will be diverted from the feeder, and pass downward through the sluice. The following resolution, passed by the joint convention November 18, 1870, will fully explain the opinions of the commissioners:

Resolved, That after a careful examination of the dam and race-way of the Trenton Water Power Company, at Scudder's Falls, this convention is of the unanimous opinion that the said works, when the contemplated improvements are completed, will not present any serious impediment to the passage of migratory fishes up and down the river at that point; and, in fact, the works are less objectionable in those respects than any single ordinary fish-basket.

That fishes can readily ascend these falls will be denied by no unprejudiced person. The capacity of the sluice during the lowest water is at least thirty-five times that of the fish-way erected by Col. James Worrall, Commissioner of Fisheries of Pennsylvania, in the dam upon the Susquehanna river, at Columbia, which has been such a marked success; besides in high-water the fishes can readily ascend the back channel between Harvey and Duer's islands and the Pennsylvania shore.

It is acknowledged by all the upper Delaware fishermen that the catch of shad in that portion of the river has greatly increased during the past three seasons, while no improvement has taken place at the tide-water fisheries. Shad have been seen in large numbers at Deposit, Delaware County, New York, and at places much further up the river Delaware, in localities from which they had for a long time previously entirely disappeared. It is, at least, a curious coincidence that the appearance of the shad in these distant places, and the increase in the catch at the upper fisheries, should have taken place immediately after the great changes were made in the dam at Scudder's Falls. The result of this increased number of adults is naturally an increase in the number of young; these have been seen during the past autumn in numbers not equalled during the past ten years. To Messrs. Cooper, Hewitt & Co. we would return our sincere thanks for the accompanying maps, representing the falls before and after the change in the location of the shoot was made.

Your commissioners have heard with great pleasure that a project is on foot to add to the number of shad in the river by means of artificial propagation. This is a private undertaking, and is to be done without expense to the State. This project has our hearty approval,

and will receive such assistance as our limited powers will enable us to give it.

For the proper enforcement of our laws connected with the fishing interests, it is suggested that in all counties bordering upon or enclosing any portion of our navigable rivers, water-bailiffs be appointed, whose duty it shall be to take cognizance of any infraction of the fishing laws, and prosecute the offenders. It is more than probable that the fines obtained in this manner would be more than sufficient for the defraying of all additional expenses; and were the powers conferred upon one of the constables of the county, the additional expense would be but trifling.

The number of shad captured in the Delaware river during the past season could not have been less than two and a half millions, and there is no doubt but that with a rigid enforcement of the present laws, and such as have been suggested in our report, the number could in a few years be quadrupled; thus placing within the reach of all, at a low price, the Delaware shad—the finest of American fishes.

We are, sir, respectfully yours,

B. P. HOWELL, M. D.,
J. H. SLACK, M. D.,

Commissioners' of Fisheries of the State of New Jersey.

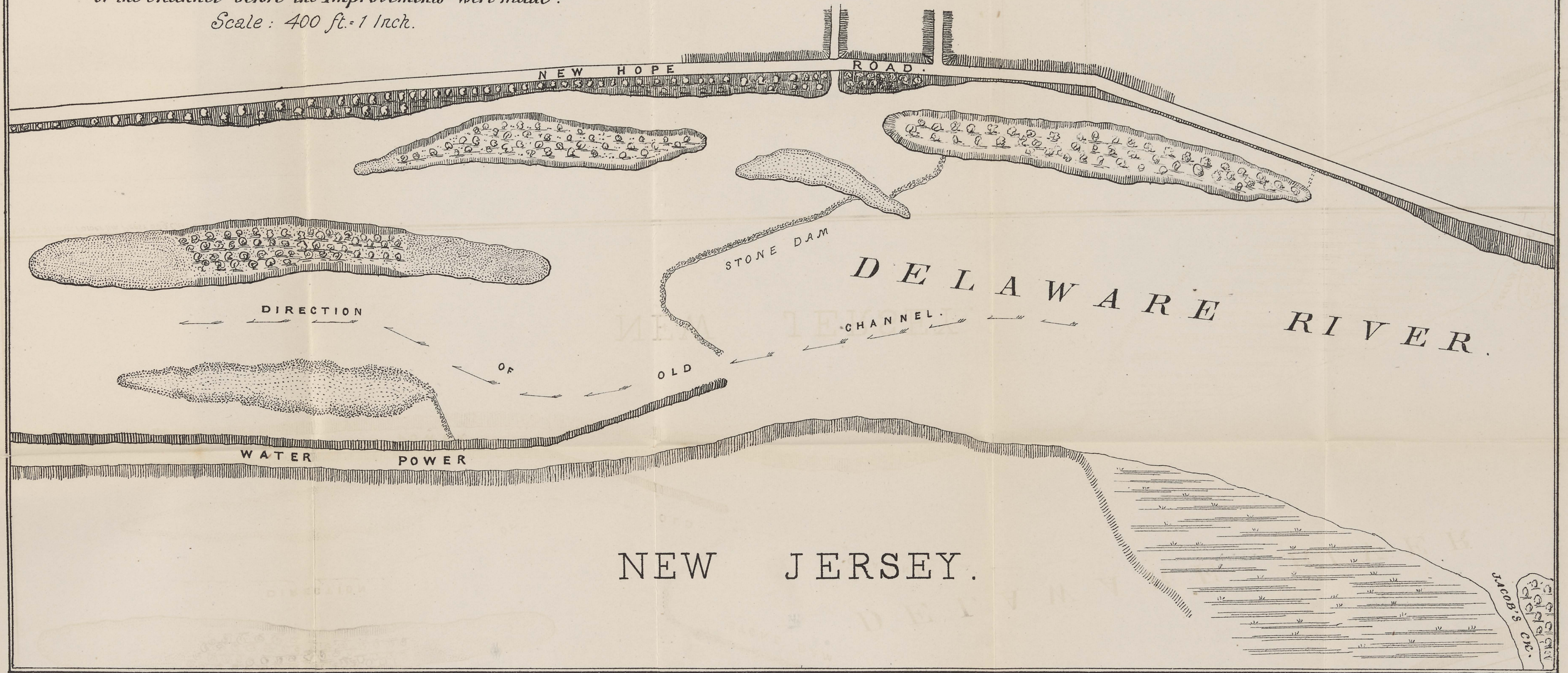
MAP OF THE
DELAWARE RIVER.

AT SGUDDERS FALLS.

PENN A

*Showing the Dam, also the Direction & Position
of the Channel before the Improvements were made.*

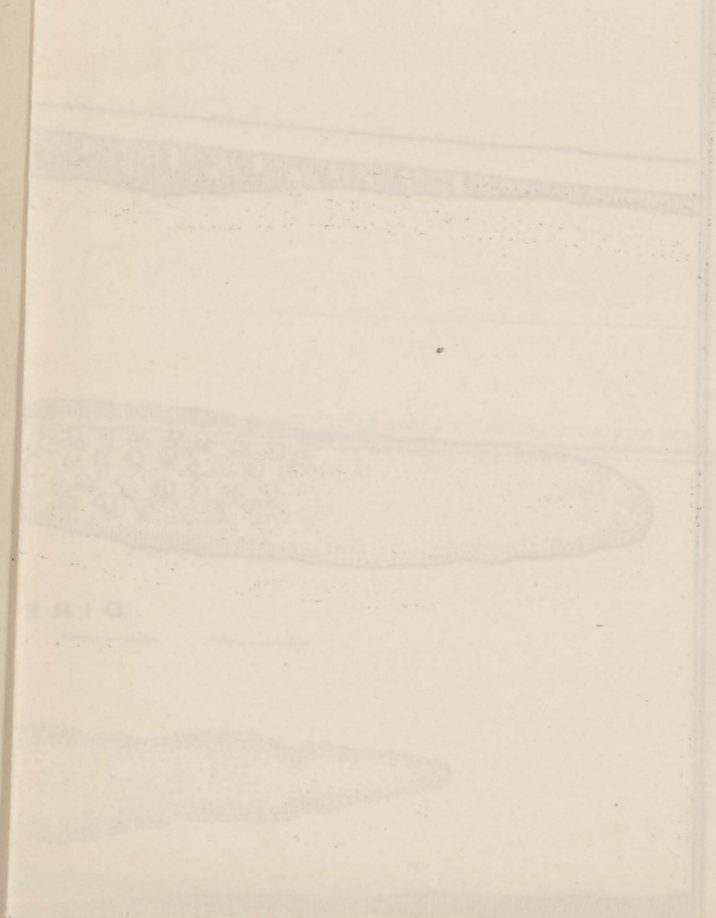
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MAP OF
DELAWARE

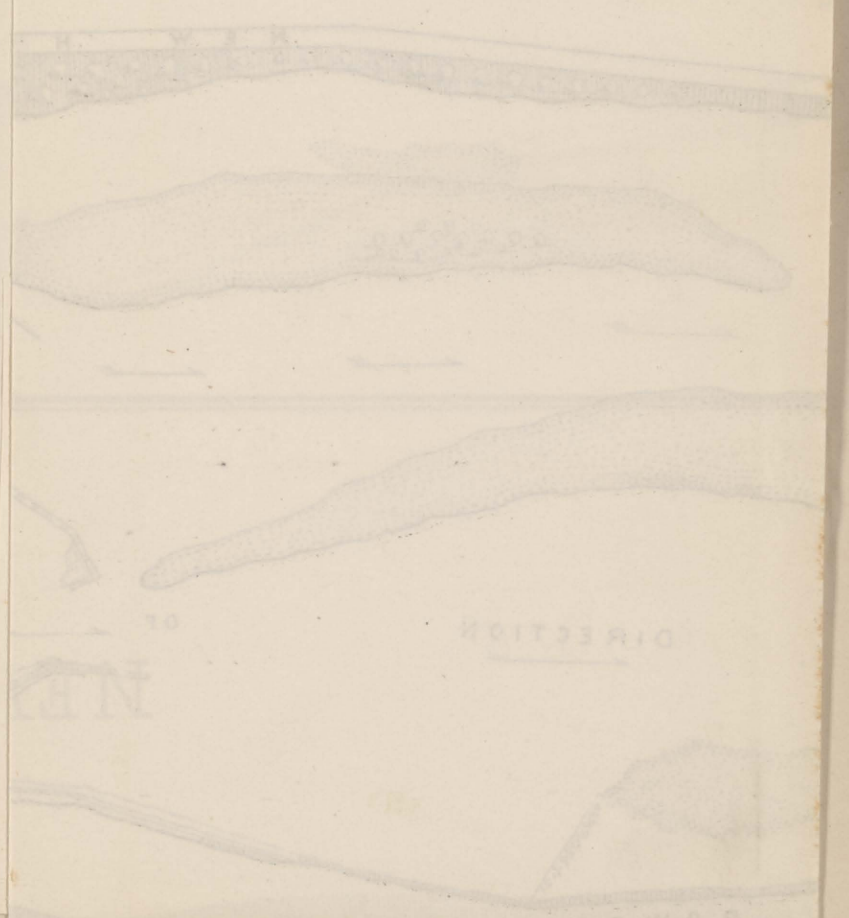
AT SCOTTS

Showing the form and
of the Channel before
the year 1810



THE
RIVER

at
the year 1810



MAP OF THE
DELAWARE RIVER.

AT SCUDDERS FALLS.

PENNA

*From Surdy's by
R.I. Sloan: Civ. Eng.
Trenton N. J.*

*Showing Position & Direction of
Channel in 1870.*

Scale: 400 ft. = 1 Inch.



NEW JERSEY.

JACOBS CR.