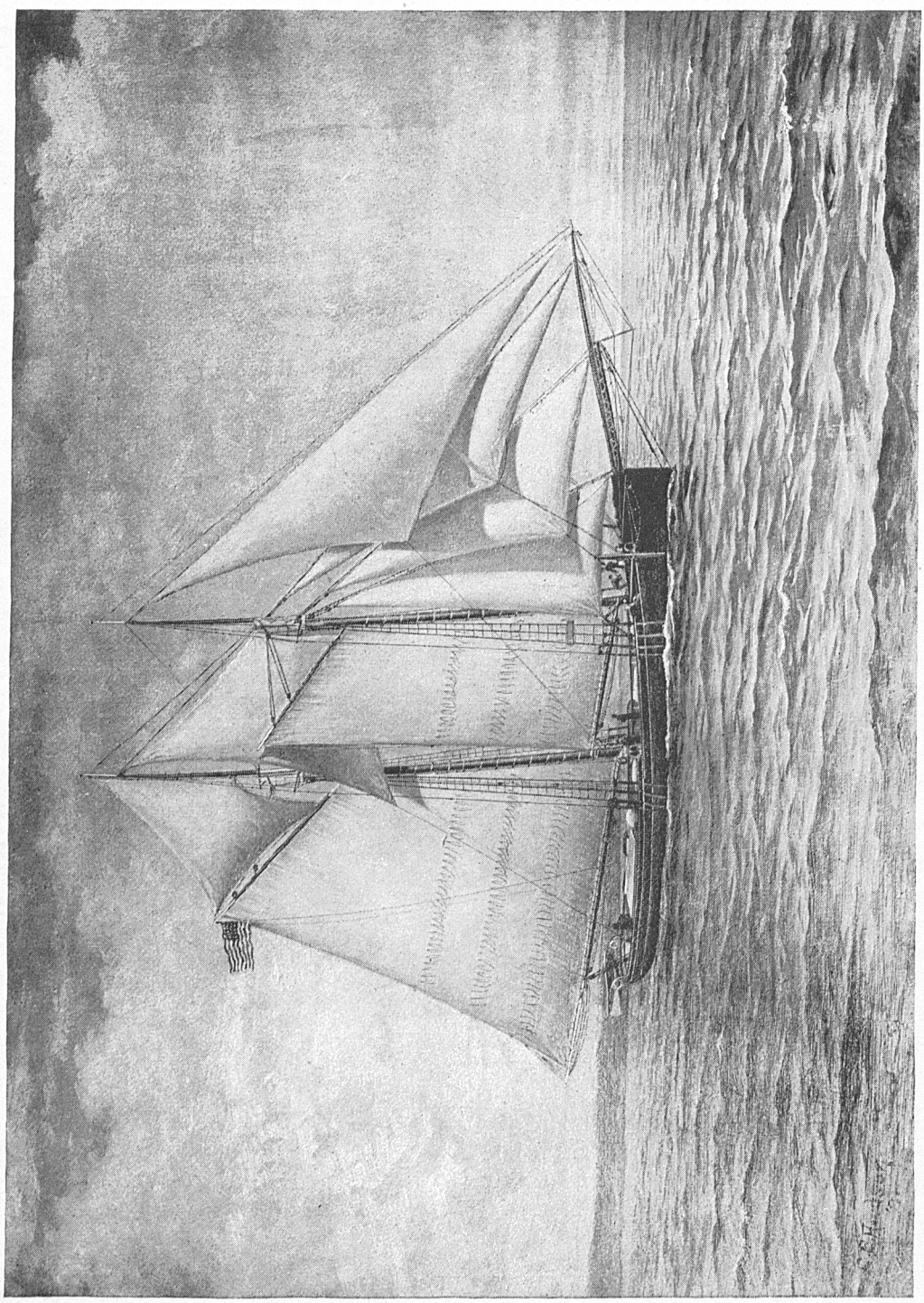


THE GRAMPUS UNDER SAIL.

21.—REPORT UPON A PHYSICAL INVESTIGATION OF THE WATERS OFF THE SOUTHERN COAST OF NEW ENGLAND, MADE DURING THE SUMMER OF 1889 BY THE U. S. FISH COMMISSION SCHOONER GRAMPUS.

BY WILLIAM LIBBEY, JR., SC. D.

Professor of Physical Geography, College of New Jersey, Princeton.

[Plates CXXIV-CLVIII and one text figure.]

PURPOSE AND PLAN OF THE INVESTIGATION.

During a part of the summer of 1889 the Fish Commission schooner *Grampus* was assigned to the investigation (under the direction of the writer) of certain problems relating to the waters lying off the coast of the New England and Middle States. The object of the expedition was to study the temperature relations between the cold wall of the Labrador current and the warm waters of the Gulf Stream, with the idea of establishing some connection between the changes in temperature in the waters and the migrations of the fish which inhabit them. That such a connection does exist has been shown by the researches of the Commissioner of Fisheries, Mr. M. McDonald, upon the shad, and of Prof. G. Brown Goode upon the menhaden. The attempt was now to be made to verify this upon a larger scale and in a systematic manner.

It is believed that in the seasonal variations of the hydro-isothermal lines will be found the key to explain the migrations and the geographical distribution of our important food species as well as of the food upon which they subsist, as both depend upon the temperature variations which determine the changes that occur in their location. It may also happen that while the changes in position of these areas of equal temperature will differ in succeeding seasons, they will, however, stand in some essential relation with the general meteorological conditions upon the land which are under constant observation and discussion. The data eventually obtained will undoubtedly lead to important generalizations bearing upon the questions of physical geography and biological physics, or the relation of marine species to their physical environment.

Our plan of operations was to start at a point south of Nantucket Island, and then running due south, to make a series of soundings, accompanied by a set of observations upon the temperature and specific gravity of the water at various depths. The observations were made by means of instruments attached to a steel-wire cable which was controlled upon the deck of the vessel. These serial-temperature and specific-

gravity observations were made as nearly as possible 10 minutes of latitude apart. To the westward of this first line, a series of such lines were run out from the shore well into the Gulf Stream, at intervals of 10 minutes of longitude. There were nine of these lines, four of which were afterwards duplicated, and upon each of these lines at right angles to the coast there were usually twelve or thirteen stations. Lack of time and the limitations of our craft (it being a sailing vessel) prevented the repetition of more of these lines, which we had intended doing. The position of the instruments upon the cable was determined experimentally, and we finally adopted the following depths: The instruments were placed upon the 5, 10, 15, 20, 25, 30, 40, 50, 75, 100, 150, 200, 250, 300, 400, and 500 fathom points, and thus, with the surface observation, seventeen observations in all were made at all the deep-sea stations; of course in shallower water fewer observations were made, but the intervals between the instruments remained the same.

It will be seen that the instruments were placed closer together near the surface where the changes of temperature were most rapid. By this means we sought to obtain a cross section, so to speak, of the water on each of the lines, which were from 120 to 130 miles long.

In case the work is continued next season, it would be advisable to establish an observing station upon the Nantucket New South Shoal Light-ship, in order that a systematic study may be made of the changes in temperature and specific gravity and also of the atmospheric conditions which accompany them. Such a series of observations is very much needed as a basis of comparison, and a series extending through a whole year and if possible for a longer period would be most useful in connection with the problem which we are studying. At the same time, many interesting observations might be recorded upon the tides, force of currents, etc., as well as upon the movements of the fish. Should it also be possible to obtain the coöperation of a Coast Survey steamer, as has been suggested, to work in conjunction with the *Grampus*, a larger area extending farther to the eastward could be marked out for investigation, but the observations should still conform to the same system of lines running outward from the coast at intervals of 10 miles. As many of these lines as it is possible to run in the course of one month should be completed by the steamer, which should then repeat the same lines during each succeeding month, while the *Grampus* might follow at intervals of about two weeks on some of the lines, perhaps 30 minutes apart, in this manner supplying intermediate series of observations.

In the work of the past summer I was assisted by William F. Magie, PH. D., Assistant Professor of Physics in Princeton College, C. G. Rockwood, jr., PH. D., Professor of Mathematics in Princeton College, and Malcolm McNeill, PH. D., Professor of Mathematics and Astronomy in Lake Forest University. Professor Magie remained with me during the entire season and Professor Rockwood during the first part of the summer, his place on the last trip of the *Grampus* being taken by Professor McNeill. It affords me great pleasure to acknowledge, in this connection, their conscientious performance of duty, their valuable advice and cheerful coöperation, to which is due much of the success of the expedition. I also take this occasion to refer to the valuable assistance rendered by Passed Asst. Engineer W. B. Bayley, U. S. Navy, and Mr. John Maxwell in connection with the fitting out of the vessel; the efficient aid of the officers and crew of the *Grampus*, and the ingenuity and skill of our two engineers, Mr. Lynch and Mr. Rogers.

I have embodied in this report a complete copy of our meteorological records upon the days when we were conducting deep-sea serial observations; the complete record of the series of deep-sea temperatures, together with the observations upon the specific gravity of the water at various depths. Accompanying the report are also a map showing the stations occupied during the cruise with the soundings obtained in each instance, and a series of profiles giving the plotted results of the deep-sea serial temperature observations, upon which the bathyisothermal lines of 50°, 60°, 65°, and 70° F. have been traced. In all 136 stations were occupied, 46 being in water over 100 fathoms deep. A total of over 1,600 observations of temperature of the sea water were made and, in addition to these, 360 meteorological observations were taken each day.

Besides the regular work of the party, Professor Magie took the opportunity of securing observations upon the electric conditions of the atmosphere. His report upon the subject is appended.

While upon the Gulf Stream, during calm weather, in the intervals between observations, the members of the party occupied themselves in collecting the various forms of surface life which floated past the vessel within reach of the dip nets. The material obtained in this manner was referred to Dr. W. K. Brooks, of Johns Hopkins University, whose report is also submitted herewith.

While the results of the past season's operations clearly indicate the importance of further investigations in the same direction, it is still too early to venture upon any extended generalizations. Further data are required to afford a substantial basis for deductions.

DESCRIPTION OF THE GRAMPUS.

The *Grampus* is a wooden, two-masted, keel schooner, built in 1886 especially for the service of the U. S. Fish Commission, being adapted to a wide range of practical and scientific work. Her length over all is 90 feet; width, 22 feet and 2 inches; depth in the hold, 10 feet. Although of comparatively limited dimensions, she is thoroughly seaworthy, and fitted to encounter the heaviest gales. She is capacious under deck, and a swift sailer, especially in fresh winds, having attained a speed of 13 knots and upwards during the past summer.

An idea of her appearance may be derived from the figure published herewith. In general terms, however, it may be stated that she has a sharp bow, with nearly straight vertical stem above the water, the bow closely resembling that of a typical American pilot-boat or British cutter. The midship section is rather full, with a slight "tumble-in" on the top side; she has a long, clean run, symmetrical sheer, and rather deep but gracefully formed elliptical stern. The long, low quarter-deck extends about 3 feet forward of the mainmast, and the waist, including the rails, is 27 inches high; the quarter-rail having the same height as the quarter-deck makes the depth of the waist uniform throughout the entire length of the vessel. A very noticeable feature is the "box well" amidships, in which there is a free circulation of sea water for keeping live fishes and other marine animals.

The arrangement on deck is as follows: A wooden pump-brake windlass, of the kind ordinarily used on fishing vessels of the same size, is located 3 feet forward of the foremast; the forecastle companion is immediately abaft the foremast; 6 feet aft of this is the main-hatch, over which is a booby-hatch or sort of companion entrance to the forehold. Between the main-hatch and the quarter-deck is the "curb" or deck-opening

to the well; immediately aft of the mainmast is the after-hatch, or entrance to the laboratory, which is also covered with a booby-hatch athwartships. On the after part of the quarter-deck is located the cabin trunk or "house," which is 28 inches high, 15 feet long, 12¼ feet wide at the after end, and 14⅓ feet wide at the forward end. The entrance to the cabin is on the port side, aft. The only other deck structure is the wheel-box, which incloses the rudder-head and steering machinery, with the exception of the wheel itself; this is located between the after end of the house and the taffrail.

The cabin is finished in hard wood, and is provided with four extension berths (two located in staterooms), writing desks, table for the cabin mess, etc. Underneath the cabin floor is a large water-tank, with a capacity of about 50 barrels.

Immediately forward of the cabin is the laboratory, which is fully equipped for scientific work and for the storage of specimens and apparatus. It also has a small medical dispensary and closets for the library. It communicates with the cabin through a doorway, and with the forecastle by means of passageways on each side of the well; the deck may be reached directly through the after-hatch, as mentioned above.

On each side of the well, forward of the laboratory, are two pens for the reception of fishing-gear and other accessories. Forward of these, on the port side, is a storeroom for provisions, a pantry-locker, and refrigerator, and on the starboard side a coal-pen. The well occupies the central after part of the hold, immediately forward of the laboratory. Beneath the floor of the forehold are two iron water-tanks, each with a capacity of about 225 gallons. Abaft of and adjoining the forecastle bulkhead are the chain-boxes, extending to the deck, for storing the chain cables.

The forecastle is the forward compartment of the vessel under deck. It is about 23 feet long fore and aft, and in width conforms with the shape of the vessel's bow. It is finished in hard wood, and contains a lavatory for the men, an adjustable table which folds around the mast when not in use, drawers, lockers, cupboards, etc.

The officers of the *Grampus* during the summer of 1889 were as follows: A. C. Adams, captain; E. E. Hahn, first mate; F. S. Conley, second mate; C. H. Wonson ship's writer; William H. Lynch, engineer; James B. Rogers, assistant engineer.

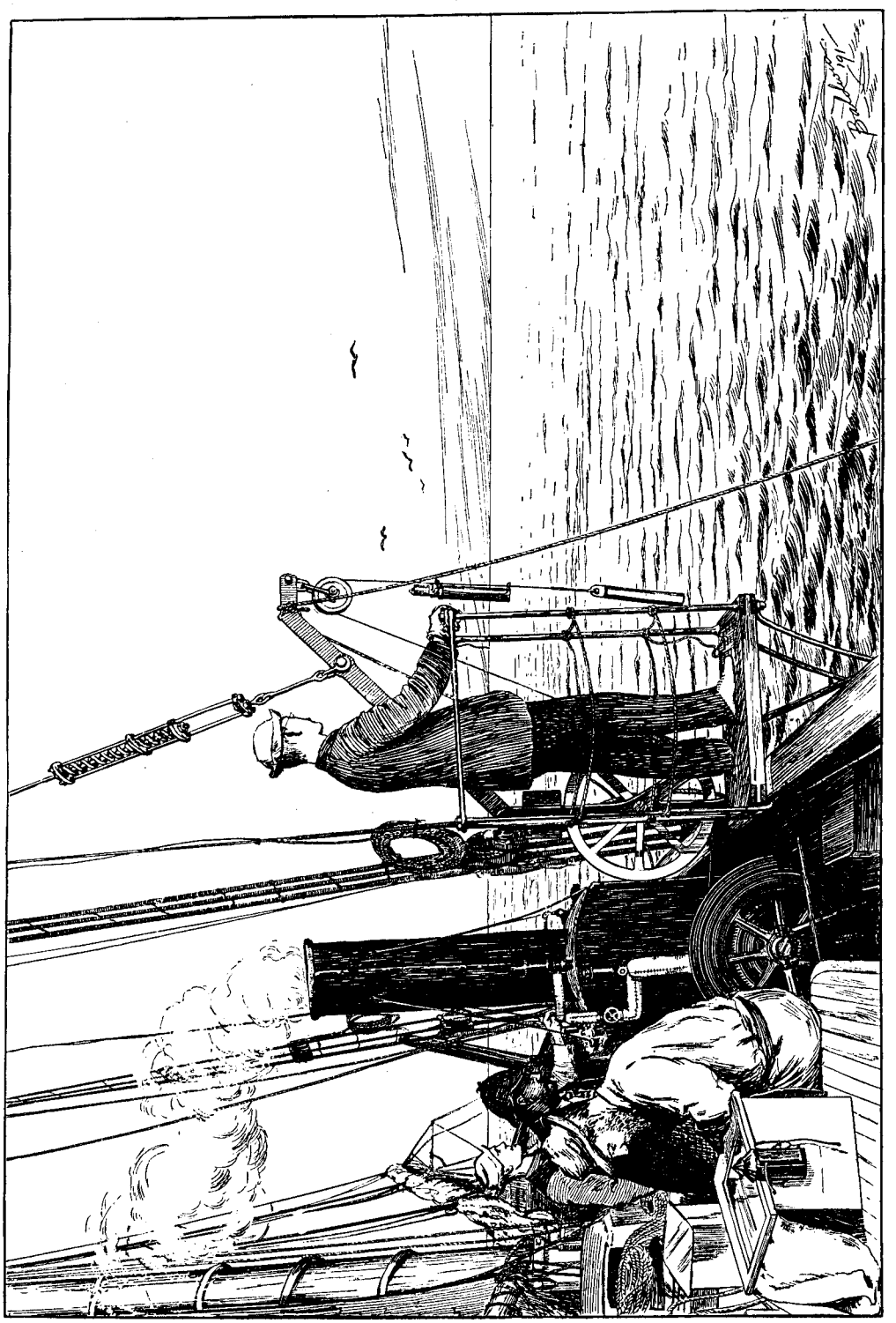
APPLIANCES USED IN THE WORK.

THE SOUNDING APPARATUS.

As a source of motive power, a 6-horse-power Walters reversing-pendulum engine, with a Walters tubular boiler, was used. The grate surface was 5½ square feet, the heating surface 108 square feet, giving a ratio of grate to heating surface of 1 to 19.7. A Wheeler surface condenser, with a Knowles combined air and circulating pump, was also attached, so that no salt water was used in the boiler. The engine and reel were geared together in the proportion of 1 to 2, by a pinion 6 inches in diameter on the engine shaft, and a spur gear 12 inches in diameter on the reel. The engine making two revolutions to one of the reel, the available power was therefore doubled.

The wire cable, one-eighth of an inch in diameter, was composed of 19 strands of No. 24 crucible-steel music wire, and had a breaking strain of 1,500 pounds. It was made especially for this work by Messrs. Washburn & Moen, of Worcester, Mass.

A weight was attached to this wire as a sinker, and the instruments were clamped upon it at various intervals as the wire passed down into the water. The wire led



SOUNDING APPARATUS IN OPERATION.

directly from the reel (containing 1,000 fathoms) to a sheave running between two standards located on the schooner's rail. This sheave had a diameter of 22.8 inches, and one revolution thus corresponded to 1 fathom of wire; attached to the axis of the sheave was a register which indicated the number of fathoms of wire out.

The wire passed from the registering sheave to a small sheave on the end of a davit, extending over the side of the vessel. The davit arm was attached to the standards containing the registering sheave by a pintle, which allowed the davit to be swung inboard or outboard, and also by a joint which permitted the davit to be raised or lowered, thus regulating the distance of the wire from the side of the ship. The outer end of the davit was hung from the main cross-trees by an accumulator consisting of two steel springs, one resisting a pressure of 300 pounds and the other 600 pounds, which served to relieve the strain upon the wire caused by the motion of the vessel.

Just abaft the standards of the davit, upon the rail of the vessel, a platform was built, where an observer stood to fasten the instruments upon the cable as it descended and take them from it and read their indications as it was reeled in.

The apparatus was all placed upon the starboard quarter-deck of the vessel.

METEOROLOGICAL INSTRUMENTS.

(1) *Barometer.*—The barometer used was of the ordinary marine form with the lower portion of the tube of a small diameter. It was graduated to read 0.002 inch. During the summer the instrument hung in the laboratory of the schooner, the cistern of the barometer being on a level with the water line of the vessel about midships.

(2) *Thermometers.*—(*a*) The thermometer used for the observation of the temperature of the air was an instrument constructed with the greatest care. It was placed upon an ivory frame, which was mounted so as to keep the instrument at a distance of 1½ inches from the board upon which it was hung. The position of the thermometer was horizontal.

(*b*) The temperature of the surface water was obtained by drawing a pail of water from over the side of the vessel, placing it in the shade, and allowing the thermometer to remain in the water from two to five minutes, dependent upon circumstances. During the trip we used the Wilder protected thermometers with brass scale and copper case. Our set at first consisted of three of these thermometers, one of which, No. 6795, was lost early in the trip.

(*c*) Dew-point thermometers: This set consisted of two thermometers mounted upon the same metal frame, one of which was supplied with water from a glass tube fastened to the back of the frame, as in Mason's hygrometer.

(*d*) The maximum and minimum thermometers were of the ordinary construction, the maximum being a mercurial thermometer in which a small part of the mercurial column was separated from the rest and served as an index. The minimum was an alcohol thermometer with a metallic index. In addition to these a Six's maximum and minimum thermometer was also used, but its indications were very unsatisfactory.

(*e*) Observations upon the rainfall and evaporation were made by means of a Symons rain gauge and an evaporating dish. The rain gauge had a 6-inch collecting funnel which led into a bottle strongly protected by a zinc casing, into which the funnel fitted as a cover. The evaporation dish was also 6 inches in diameter. It was 2 inches deep and was covered by a coarse wire network. These instruments were exposed at the stern of the vessel just above the gig.

(*f*) A solar radiation thermometer and a spirit minimum thermometer were also used in the open air. They were freely exposed to the sun and weather, suspended by cords in such a way as to be as free as possible from the effect of the motion of the vessel, and were placed between the davits of the gig at its stern.

(*g*) Two portable air meters were also used, one with a 5-inch opening and the other with a 3-inch opening. These were used when the vessel was hove to upon a station to observe the difference in velocity of the wind upon the deck and at various heights in the rigging.

(*h*) An ozonometer, consisting of a wire cage in which the prepared papers were exposed, was also utilized, but no observations were obtained which indicated the presence of ozone in the air, with the exception of one single day, on which the slightest tinge of purple was observed. This cage was exposed with the other instruments at the stern of the vessel.

All the above instruments, with the exception of the barometer and those included under the last four heads, were exposed in a case prepared especially for them, which served its purpose so well that a description of it is warranted and will be given below. The above instruments were all made by Mr. G. Tagliabue, of 302 Pearl street, New York City, and he exerted himself to the utmost to secure great accuracy in them, knowing the use to which they would be put.

Thermometer case.—This case was a strongly constructed box 3 feet long by 2 feet wide and 2½ feet high at the front and back; it had a ridged top or roof, which served to shed the rain, making the central portion of the box 3 feet high. The lower foot in height all around the box was closed, but the upper portion was composed of a lattice of louvre boards to allow a free circulation of the air. The box was secured firmly to the deck just aft the cabin deck house. From the center of the ridge on the inside of the pent house a board was suspended by gimbals, and on this board, but kept at a distance of 1½ inches from it by proper supports, the instruments were placed and secured by hooks. From the lower edge of the board directly below the gimbals a 10-pound weight was suspended. This device secured the instruments in a practically horizontal position, because none of the movements of the vessel affected them in the least.

INSTRUMENTS FOR SERIAL TEMPERATURE OBSERVATIONS.

The instruments used for this work were made by Negretti & Zambra, and were fitted with the Tanner deep-sea case and reversing apparatus. Our set consisted of twenty-five of these instruments, and they were placed in a strong pine box upon the deck, where they would be convenient to the observer when wanted. The box was constructed like a trunk, with two trays and an open bottom space the same size as one of the trays. These trays were divided into spaces by a series of strips, across which a piece of canvas was stretched in such a manner that it served as a support for the instruments. They were thus protected from all sudden jars, and were very accessible. In shallow water the upper tray, containing a water cup, a hydrometer, a salinometer cup with thermometer attached, and eight deep-sea thermometers (which were all that were necessary), was exposed by opening the box. In the deep soundings, and when serial observations were made extending to 500 fathoms, where sixteen thermometers and two water cups were used, the upper tray was removed when empty

and the necessary thermometers taken from the tray below. The bottom space was filled with thermometers held in reserve in case of accidents occurring, but it was never opened except to care for the thermometers.

INSTRUMENTS FOR SPECIFIC-GRAVITY OBSERVATIONS.

These observations were made with the Hilgard ocean salinometer. The specimens of water from the surface were obtained in the ordinary manner. The specimens from the bottom or from any desired depth were obtained by means of a Sigsbee water-cup.

INSTRUMENTAL CORRECTIONS, REDUCTION OF OBSERVATIONS, ETC.

The specific-gravity observations, made with the Hilgard salinometer, were reduced by means of the table given for that purpose in the original description of the instrument, as published in Appendix 16 of the U. S. Coast Survey Report for 1874, and found on page 155 of that volume. This table may also be found on page 78 of the Report on the U. S. Fish Commission steamer *Albatross* in the Annual Report of the Commissioner of Fish and Fisheries for 1883, and is again reproduced below with an alteration to be noticed immediately. It is based upon the observations of the expansibility of sea water made by Prof. J. S. Hubbard, U. S. Navy. In making use of this table Professor Rockwood's attention was at once attracted by the irregularity in the resulting corrections for temperature between 59° and 61°, and further examination led him to conclude that the tabular number for 60° was erroneous and should be 0.000125 instead of 0.000000. This conclusion being concurred in by Mr. O. H. Tittman, of the Bureau of Weights and Measures of the U. S. Coast and Geodetic Survey, the table as given differs from the original table by the substitution of $0 \mp .000125$ for $+0{,}000000$ as the tabular number for 60°, where the minus sign is to be used with temperatures below 60°. To facilitate the use of the table the following directions are given:

Record the actual observation of hydrometer and thermometer. From column II take the number corresponding to the observed temperature and multiply this number by the number of degrees and fractions of a degree that the observed temperature differs from 60°. Apply this product as a correction, with proper sign, to the reading of the salinometer and the result will be the reading of the salinometer at the standard temperature of 60° F.

Temp.	Correction for reduction to 60° F.	Temp.	Correction for reduction to 60° F.	Temp.	Correction for reduction to 60° F.	Temp.	Correction for reduction to 60° F.
I.	II.	I.	II.	I.	II.	I.	II.
°		°		°		°	
50	−0.000108	60	+0.000125	70	+0.000145	80	+0.000158
51	−0.000110	61	+0.000130	71	+0.000146	81	+0.000159
52	−0.000112	62	+0.000135	72	+0.000147	82	+0.000160
53	−0.000113	63	+0.000137	73	+0.000148	83	+0.000162
54	−0.000115	64	+0.000137	74	+0.000149	84	+0.000163
55	−0.000118	65	+0.000138	75	+0.000151	85	+0.000164
56	−0.000120	66	+0.000140	76	+0.000152	86	+0.000166
57	−0.000120	67	+0.000141	77	+0.000154	87	+0.000167
58	−0.000120	68	+0.000142	78	+0.000156	88	+0.000168
59	−0.000120	69	+0.000143	79	+0.000157	89	+0.000170

But as it was desired to employ 4° C. as the standard temperature instead of 60° F. and that the reductions be made to 15° C. in place of 60° F., a further correction was necessary. This correction is constant, and its amount as determined by Mr. O.

H. Tittman, of the U. S. Coast Survey, and adopted by both the Coast Survey and the Fish Commission, is —0.00082, which is therefore to be subtracted from each specific gravity determined by the above table and the result will be the specific gravity referred to a temperature of 4° C. as a standard.

Example: Station No. 1, at depth of 13 fathoms the reading of the salinometer was 1.0248, and the temperature 61.9° F.

Tabular number for 61.9°	0.0001345
Difference of temperature from 60°	1.9
	12105
	1345
Correction to 60° F	+0.00025555
Correction from 60° F. to 4° C	—0.00082
Total correction	—0.00056
Observed specific gravity	1.0248
Reduced specific gravity	1.02424

I am indebted to the kindness of Professor Rockwood for the reduction of all the specific-gravity records of this report; all other corrections or reductions are my own.

Negretti and Zambra's deep sea thermometers—corrections.

[These instruments were compared with the standard instruments of the U. S. Signal Service in May and June, 1889, with the corrections noted, with the exception of No. 52728, which was compared with the standard instruments of the Fish Commission on December 4, 1884.]

Number.	32°	42°	52°	62°	72°	Number.	32°	42°	52°	62°	72°
52728....	—.5	—.2	—.3	—.3	—.2	66661....	—.1	—.1	—.2	—.1	—.1
62365....	—.3	—.1	.0	+.1	.0	66663....	—.4	—.1	—.1	—.1	—.1
63911....	—.1	—.4	—.1	—.2	—.3	66664....	+.1	—.1	.0	—.1	—.2
63914...	+.1	+.1	+.1	.0	.0	66665....	.0	—.2	—.2	—.3	—.3
63916...	+.1	+.1	+.1	.0	+.2	66724....	+.1	+.1	.0	—.1	.0
63918....	.0	.0	+.1	.0	+.1	66726....	.0	—.1	—.2	—.1	+.1
63919....	+.1	.0	.0	.0	.0	66728....	+.1	.0	.0	.0	—.1
63920....	.0	—.2	—.1	.0	.0	66729....	.0	—.1	—.2	—.1	—.1
63921....	—.2	—.3	—.1	.0	+.1	66731....	—.1	—.1	—.2	—.1	.0
66656....	.0	—.3	—.2	—.1	—.3	66733....	.0	.0	—.1	—.1	—.1
66658....	+.1	—.2	—.2	.0	—.3	66734....	.0	.0	—.1	—.1	—.1
66659....	.0	—.3	—.3	—.2	—.1	66737....	.0	—.1	—.2	.0	.0
66660....	.0	—.4	—.3	—.1	.0						

Corrections for the set of meteorological instruments.

Standard.	1889.	1890.	1894.		1895.	1896.	Solar.
	Min.	Max.	Wet bulb.	Dry bulb.	Air.	Radiat.	
32°.....	.0	.0	.0	.0	.0	.0	.0
52°.....	—.1	.0	.0	.0	.0	.0	+.5
72°.....	.0	.0	—.1	—.1	.0	.0	.0
92°.....	.0	.0	.0	.0	.0	.0	+.2

The marine mercurial barometer which was used was tested on June 28, 1889, at the New York Branch of the Hydrographic Office and found correct.

The hydrometers used were carefully tested in the Physical Laboratory at Princeton by Professor Magie, and found correct, far within the limits of errors due to observation, and are thus regarded as giving correct data.

DISCUSSION OF THE RECORDS.

MANNER OF KEEPING THE RECORDS.

The observations were recorded in a book especially prepared for this work, in which four pages were allotted to each day's work. The first page was devoted to the meteorological record for the 24 hours and was divided as in the appended tables. The second page was devoted to the record of serial-temperature and density observations; the third page was reserved for general observations of a scientific nature, and the fourth contained an abstract of the log. This record book was placed in a box upon the top of the deck house, and the box was so arranged that observations could be recorded in the book at all hours and in all sorts of weather without exposing the records to the risk of blurring. The top of the box was glass and had a slight inclination away from the observer, in order to throw the rain in that direction. The side next to the observer (with the exception of a 2-inch strip of wood at the bottom) was canvas, with two holes in it opposite the center of each page in the record book. Through these the hand was passed in making the record. These openings were covered when the box was not in use by a flap of canvas which could be securely buttoned down over the end of the box. The glass top was also covered with a flap of canvas to protect the rulings of the book from the action of the sunlight. At night the interior of the box was illuminated by a lantern placed at the left end.

THE METEOROLOGICAL RECORDS.

July 24, 1889. (Table 1 and Plate 1.)—We commenced work upon line A, south of Nantucket. (See map.) The air curves (Plate 1) of the temperature of New York and Boston follow one another very well, the effect of more northerly latitude being seen in the much lower depression of the curve when there is a decline in the temperature.

The decrease in temperature on the *Grampus* in the a. m. is probably due to the influence of the water, as we were leaving shoal and inshore waters, which were warm, and passing through cold surface water until 11 a. m., when we reached much warmer water. This will be clearly seen from the curves on the same plate, which contrast the temperatures of the air and water for the same day.

The maximum air temperature on the *Grampus* is reached at 3 to 4 p. m., and seems to show an utter disregard for the disturbance which is going on upon the land. There is a long steady decline until 10 p. m. The sudden rise at this point can be again explained by reference to the curves of the air and water temperatures, the water curve being particularly instructive. After the lowest surface temperature was reached at 11 a. m., there was a rise in the water temperature of 4° F. each hour for 2 hours, a change which could hardly be due to the sun's influence in so short a time. Of course the air temperature was somewhat modified by this condition of the water. It will also be seen from the records that there was a decided increase in the specific gravity of the water (1.0241 to 1.0249 and 1.0253). The effect of the warm midday sun upon a body of water which originally had the same temperature is seen from the curve between 1 p. m. and 5 p. m., where its gradual cumulative influence is apparent, although the temperature of the air at the same time had commenced to fall, and the decrease in the surface temperature after 5 p. m. is probably due to the with-

drawal of this influence. At 22 hours (or 10 p. m.) a band of still warmer water was reached, which also had a high specific gravity, and its influence is instantly noticed in both air and water temperature curves. The temperature of the air, with a perfectly clear sky, would naturally have decreased at this time of the night had it not been for the increase of temperature in the water.

July 25, 1889. (Table 2 and Plate 2.)—From the point reached at midnight the temperature of the water increases in general until noon, from which time it decreases gradually. The effect of a heavy rain squall is noticed at 7 a. m. in the fall of the air curve, and also in the arrest of the upward tendency of the water-temperature curve. Two rainfalls in the p. m. keep the air curve well below that of the water. The same effect is noticeable in the contrasts of the three air curves for the p. m. Little was done in the forenoon of this day owing to an accident, but in the afternoon and evening, finding we had drifted to the westward, we started upon the line C, returning toward the shore.

July 26, 1889. (Table 3 and Plate 3.)—We were well upon our return trip on line C. The high temperature of the air was probably due to warm water, a heavily overcast sky, and almost no wind. These conditions were reversed at noon by a fog springing up, followed by a freshening breeze from the east. Similar conditions seem to have prevailed on the land, as shown by the air curves. The decrease in the temperature of the water as we left the warmer and more dense bands of water and approached the shore is quite evident.

The next few days were spent in Wood's Holl, making some changes in our apparatus which this trial trip had shown to be necessary.

August 1, 1889. (Table 4 and Plate 4.)—We started outward upon line F. The effect of strong wind currents is seen upon the maximum portions of all the curves. On the *Grampus* the wind was strong (5) at the hours 14, 17, and 19, and was from the SSW. Its result was naturally first evident upon the New York curve, and a little later upon both the curves of the *Grampus* and of Boston. The coincidence of the times and the directions in these latter curves is quite striking; the rebound in each temperature curve after the gust of wind had passed is a pronounced one in each case, particularly so in the Boston curve at 14 hours, where the land midday temperature reasserts itself most decidedly. The water curve shows an increase in temperature throughout the day and well into the night. The warmer temperature of the air can only be accountable for a small portion of the increase at midday.

August 2, 1889. (Table 5 and Plate 5.)—Early this a. m. (4 hours) the water became too rough to allow us to prosecute our regular work to advantage, so we headed for the shore, which we sighted about 10 o'clock. Then a line was commenced parallel with the coast towards Block Island, and four stations were made upon it before we ran into Block Island Harbor for the night.

I have failed to find an adequate cause for the decrease in the temperature of the water upon this line as we passed the entrance to Vineyard Sound and Buzzard's Bay (11 to 13 hours), and again as we passed across the entrance to Narragansett Bay towards Block Island (17 to 18 hours), unless the tides have some effect upon the local temperature through changes produced in position in water masses. In the first instance it was just high tide; and in the latter, low tide. The effect upon the air temperature, with an overcast sky, of strong gusty winds is seen at 11, 13, and 16 hours, and this curve is in marked contrast with the air curves at New York and Boston.

August 3, 1889, we were storm-staid in Block Island Harbor.

August 4, 1889. (Table 6 and Plate 6.)—We started another line to the eastward. The same depressions in the temperature curve of the water were noticed, although we were 10 miles further offshore than on August 2, and the temperatures were recorded in the p. m. on August 2 and in the a. m. to-day. When we started on this line it was high tide, and when we reached line G it was low tide, exactly the reverse conditions of August 2. These depressions will be noticed at 7 to 9 hours, as we crossed the entrance to Narragansett Bay, at 11 hours off Buzzard's Bay, and at 14 hours off Vineyard Sound. The temperature curve of the air does not show any marked differences from those of New York or Boston, except those due to the general influence of the ocean, which would naturally cause a lower temperature. At 18 hours we notice a depression in the water curve caused by our taking an outward course along line E and passing through colder water. After this was passed the temperature rose again as we reached warmer and denser water.

August 5, 1889. (Table 7 and Plate 7.)—On the *Grampus* the conditions of the water remained nearly unchanged until 9 a. m., when the wind commenced to blow strongly, and this was followed by a heavy rain. At 11 a. m. we were struck by a severe squall, which forced us to lie to under the mainsail. The sudden drop in the air curve will of itself explain why we headed for shore again. The fall in the water curve as we entered the cold band off the coast is clearly seen. The meteorological conditions at New York and Boston appear to have been decidedly mixed, and offer some explanation of our treatment upon the ocean between these points.

August 6, 1889. (Table 8 and Plate 8.)—The air temperature of the *Grampus* follows the curve at New York in the main. The Boston curve apparently was affected by some cause which may have hindered the full development of our curve in the a. m., and also may have hurried the descent of the curve in the p. m. We spent nearly the whole day "jogging" off Martha's Vineyard for lack of wind. The only break in the water-temperature curve which needs explanation occurred at 13 hours, when we had nearly reached the entrance to Muskeget Channel (Station D 1) just before high tide. The contrasts given in the air and water curves during the entire day can be taken to represent the effect of the sun upon the shoal water near the coast, since we hardly varied our position by more than 10 miles all day long. The sky was nearly covered with clouds all the a. m. and in the late p. m., but at 15 to 17 hours, when the clouds were least, the highest temperature was reached. The increase in temperature was soon overcome when the sky was covered again and the temperature of the water became the controlling element.

August 7, 1889. (Table 9 and Plate 9.)—In the early a. m. the same general conditions prevailed. During the day the *Grampus* air curve reached the same maximum as reached by the New York air curve. This was due to the high water temperature, clouded sky, and exceedingly light winds. It is noticeable that an increase in the water temperature took place quite early in the a. m. and the maximum was reached at 13 to 15 hours, when we had a light specific gravity (1.0251, Station D 3). The long continuance of the high temperature into the night hours at New York is noteworthy, and was probably due to westerly continental winds.

August 8, 1889. (Table 10 and Plate 10.)—A day of extraordinary changes in the air temperature. The *Grampus* air curve reached a higher point than the New York curve, the maximum occurring before noon. Unless this day's curves be taken

to represent easterly and northeasterly weather, as contrasted with the westerly weather which was shown in yesterday's curves, they are hard to explain. Even this explanation might not hold good for the conditions nearer the coast, because, as will be seen from the water curve, we were passing through a very distinctly warm band of water from 9 to 13 hours (73.4° F.), and the specific gravity was also high (Station D 9, sp. gr. 1.0260). This, taken with the fact that the wind was blowing with about a force of 4 from the northeast, complicates the problem very much.

August 9, 1889. (Table 11 and Plate 11.)—We completed line D in the a. m., but after starting line E with three stations the water became so choppy that we were forced to head for the shore after finishing Station E 11. The covered sky, warm water, and westerly winds account for the height of the air curve, which follows the curves of New York and Boston pretty well, the disturbance set up by the westerly wind being most strongly felt in New York, next on the *Grampus*, and last of all in Boston, as was natural. The rise in the water-temperature curve between 8 and 11 hours as we were moving westward in the Gulf Stream is interesting, although it was undoubtedly accentuated by the atmospheric conditions.

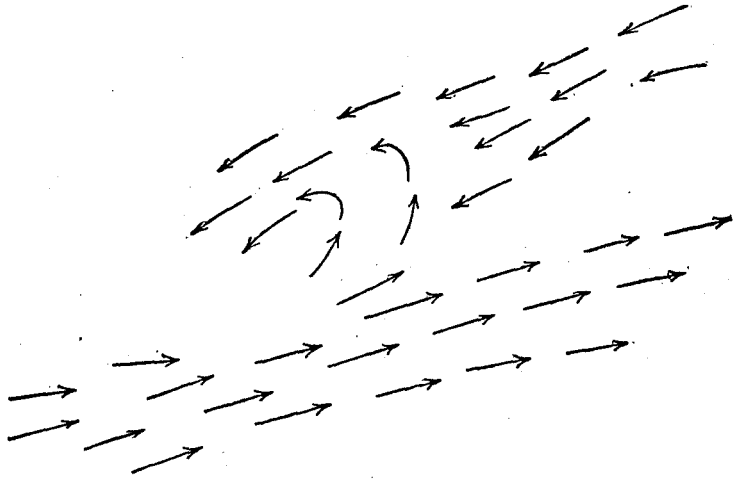
We went in to Wood's Holl, where we were detained 4 days by stormy weather.

August 17, 1889. (Table 12 and Plate 12.)—We left Wood's Holl on August 16, but were forced to put back into Tarpaulin Cove on account of rough water.

The wind was very light in the a. m. of August 17, and it took us until noon to reach Station G 2. We passed into warm water again between G 3 and G 4 at 15 hours, after which time the air and water curves follow one another very closely. In the contrast of air curves all is normal until 19 hours, when the air curve of the *Grampus* stops in its downward course and the influence of the warm water upon the air temperature places the curve in strong contrast to those of New York and Boston.

August 18, 1889. (Table 13 and Plate 13.)—The irregularities observable in the contrast of the air and water are partly accidental; for example, that at 8 hours was caused by the fact that our thermometer box was directly exposed to the strongest glare of the sun across the deck in the direction of the louvre openings in its sides. This condition was corrected upon noting the reading. Then there are two depressions, one at 8 hours and the other at 12 to 14 hours, which show the result of cloudless sky followed by clouds at these hours. The maximum water temperature was reached at 15 hours, station G 12 (74.5° F.) accompanied by a specific gravity of 1.0257. The air and water curves as contrasted in the p. m. show the result of heavy clouds upon the temperature of the air. The contrasts of the air curves upon the *Grampus* and those of New York and Boston are very nicely shown when allowance is made for the variations noted above. The *Grampus* curve would present a comparatively slight range, while the land curves would give most decided maxima and minima. It will be seen by a glance at the column containing the list of stations that we were still upon line G, in continuance of our work of the previous day. Upon comparing our plotted line (by log record) with our observed latitude of yesterday at 16 hours, station G 4, No. 61 (see also map of stations), we found that we had drifted to the westward. The wind force only enabled us to creep along and we were thus fully exposed to the action of the currents as we slowly worked across them. The drift to the westward was such as might have been expected, for we were undoubtedly in a part of the ocean where the cold current would take us in that direction, but we

were in a body of warm water (70.4° F.) with a high specific gravity (1.0250). The only explanation possible was that we were in some of the warm outer bands of the Gulf Stream, which after being separated from the main current had been overpowered by the cold current and were thus moving westward.



This state of affairs would be possible under the conditions which we found to exist, and which will be fully shown and discussed in connection with the section profiles of serial temperatures which accompany this report. These profiles indicate that the warm surface water of the Gulf Stream has been pushed farther inshore than is usual, for some reason or other, or perhaps a portion of it has been impelled over the surface of the cold current. Upon examination of the monthly maps of the Hydrographic Office since our return, I am convinced that this condition has been caused by long-continued winds from the southeast. Fortunately the same conditions, as far as wind was concerned, lasted long enough for us to test the matter slightly. At our next observation for latitude, station F 10, No. 67, was shown to be our position (see map), thus placing us to the eastward, as we would naturally expect to be when our course was so largely controlled by the currents of the main Gulf Stream. It is well to note that by the log record we were sailing a true south course all the time. This rather remarkable occurrence would not have been detected had not the conditions been so favorable, and further, from the fact that we were in a sailing vessel, which, of course, was completely at the mercy of the currents as long as we merely had wind enough to give us headway. These facts would never have been noticed in a steamer, unless especial pains had been taken to study the surface currents, and it is hoped that this mention of the subject will lead to a more careful study of those outlying streams of warm water, for it will be seen that if they exist under favorable conditions, or disappear under other conditions, they may cause the irregular distribution of the food which is followed up by the schools of fish. Our line had become so irregular that we decided to return on line J.

August 19, 1889. (Table 14 and Plate 14.)—If the wind had continued at the same rate it was our intention to have verified the explanation suggested above upon our return trip, but the wind increased in force and we were deprived of the opportunity. The water temperature, under an almost open sky, with moderate and steady

winds, freshening towards evening, gives a long, regular curve. The air curve shows the effect of the clouds of yesterday p. m. until 6 hours, when the same contrast with the New York and Boston curves appears as was shown in the case of yesterday.

August 20, 1889. (Table 15 and Plate 15.)—We reached the shore end of line J (J 3, No. 81) at 6 hours, went to the westward and commenced line K with K 3, No. 82, and then proceeded southward along that line. The fact that we were going inshore from warm to cold water and then out again from cold to warm water is well shown by the curves between 5 and 12 hours. The influence of the warm water upon the air after 12 hours is clearly shown, as it was intensified by a thick mist between 13 and 18 hours, during the time in which the elevation of the curve became so pronounced. The Boston curve is abnormal, but no explanation is at hand for this fact.

August 21, 1889. (Table 16 and Plate 16.)—The air and water curves follow one another very well except at 7 hours, where the sudden rise was due to the rays of the sun striking the side of the thermometer box directly. This was also the case between 10 and 18 hours, where the greatest increase in the temperature is noticed. Curiously enough this part of the air curve follows the New York curve closely. The water temperature was very high during all this time, reaching a maximum of 76.2° F. at 15 to 16 hours, while we were going eastward from line K to line H. At station K 12, No. 91, the specific gravity was 1.0259, and at station H 12, No. 92, it was 1.0258. An almost total lack of wind, the warm water, and the impossibility of protecting the thermometer box from the sun's rays while moving to the eastward is a sufficient explanation for this abnormal air curve.

August 22, 1889. (Table 17 and Plate 17.)—The sudden increase in the air temperature was again due to the sun's rays upon the thermometer box. From 8 hours onward we were surrounded by a thick haze, and from 12 hours onward we had no wind to speak of. From the fact that we supposed we were passing up line H (see map) and found that G 7 was our position at 9 hours this a. m., and then that the plotted log would not bring us far enough to the westward to reach the position we occupied in the p. m., we have reason to believe that there is some probability in the theory advanced in connection with the work of August 18. The descent in the water curve as we approach the cold waters of the shore is again apparent. We went into Wood's Holl to refit and replenish our stores and were there for three days. On August 27 we started again and were forced back to Newport by the rough water. We made two attempts to renew our work, but were not successful until August 31.

August 31, 1889. (Tables 18 and 19 and Plate 19.)—We made a beginning upon line K, but were forced to give it up and run back at midnight on account of the high wind and rough water. The long-continued heat, as shown by the New York curve, is noteworthy.

September 1, 1889. (Table 20 and Plate 20.)—The attempt this a. m. was made upon line J with the same result. Not enough work was done to make records of any value. The meteorological records and plates are given simply because of the stations recorded in the course of the work.

September 2, 1889. (Table 21.)—Nothing could be done until evening, when we started upon line H. We reached open water at 19 hours, and our meteorological record began at this time, giving too short a record to warrant a plate. The first station, H 1, No. 114, was reached at 23 hours.

September 3, 1889. (Table 22 and Plate 22.)—The air curve on the *Grampus* evidently participated in the general movement which was going on, as shown by the air curves. The increase in temperature, as shown by the water curve at 15 hours, is very sudden, although a general increase was noticeable all through the a. m. from 4 hours onward at station H 3.

September 4, 1889. (Table 23 and Plate 23.) —The sun's rays were on the box again at 14 hours, but this would not account for all of the midday elevations, as there was a decided rise in the temperature before this time. The great irregularity of the water curve is striking, though in general it is high, as is to be expected in this region. The great coincidence of all the air curves is rather remarkable.

September 5, 1889. (Table 24 and Plate 24.)—The sun was on the thermometer box from 10 to 17 hours, as we were sailing due north, and thus on this day the air curve eclipses those of both Boston and New York. There were no clouds except in the a. m., and this must have had some effect upon the water temperature, but it is hard to believe that it was as decided as indicated by the water curve between 12 and 18 hours, though it is possible.

September 6, 1889. (Table 25 and Plate 25.)—A cloudless day and with very little wind. The sun's rays were upon the thermometer box again from 8 to 12 hours, and the air curve once more follows the New York and Boston curves closely. The water curve commenced to go down last night, and the descent continued until station G 2, No. 136, was reached, when we were in shoal water offshore, and should expect a rise in temperature on such a hot day so near the shore.

We went into Wood's Holl after this, and severe storms prevented our making any more trips, thus closing the work for the season.

THE RECORDS OF SERIAL TEMPERATURES AND DENSITIES.

In the preparation of the plates which illustrate this portion of the report, only such of the lines were used as were completed within a reasonably short time of one another. It would not be right to place upon the same profile sheet observations made at intervals of several days, since changes produced in just such intervals were the subject of our study. We were able to complete but seven separate lines at right angles to the coast, within what seemed satisfactory time limits (36 to 48 hours). Two of these lines (G and H) were repeated under the same conditions, and hence only these nine profiles are given. Further, it would not be proper to compare too closely all of those charts with one another, because they were made at such wide intervals of time that the connection between them is broken through a change in season and other conditions. The most important series were those made along lines G, H, J, and K, which were completed between August 17 and September 6. During this period we were favored with good weather and were enabled to complete four lines and repeat two of them. The six profiles representing these lines are given first. The other three profiles represent the lines farther to the eastward and lose some of their interest from the fact that we were not able to repeat any of them during the season on account of the weather. Furthermore, while we were making these latter lines, we were experimenting upon the proper location, of the best intervals upon the wire, for our thermometers. It will be seen later on that we missed one very prominent feature in the temperature relations in our early work from this fact.

These six profiles, however, are worth all the summer's work—because they give us a fair outline of the subject in hand. They are very suggestive of inquiries to be pushed further; and, having these, more careful attention can be given to the study of the details of the temperature areas in another season.

In some respects we were working in the dark. We knew nothing except the general laws given by the study of isolated series of temperatures and densities. The relations which are supposed to exist between the cold current and the Gulf Stream are sufficiently vague to please or puzzle as the case may be. We have perhaps obtained clearer views upon this subject, but in any event, in spite of the lacunæ which have been developed in our work by the plotting and study of the data we collected, we have enough information to lead to profitable investigation in the coming summer. It is true we may not find the same distribution of temperature areas, and if we do not the further problem of why the changes have occurred will become a fruitful source of inquiry.

It will be noticed that our serial temperatures in deep water reached to a depth of 500 fathoms (see records). We were sure that at this depth we would be beyond the region of fluctuations, as the changes noticed below this point are very slight. The observations show that we could have stopped at 150 or 200 fathoms, and have been perfectly safe—but we were afraid of missing some element in the study of the temperatures, and preferred to drag a deep net rather than lose it. One thing would have been desirable, viz, a more systematic and extended study of the specific gravities at the various depths, particularly at the edge of the continental platform. We had no reason to suspect the existence of certain facts which struck us as peculiar when our work developed towards the latter part of the summer, and if we had been able to give a little more time to the work we should have tested these conditions more carefully. One more line out and back would have been a great consolation to us, but it could not be; and it was well that we did not attempt this last trip, as it is doubtful whether the results obtained in such bad weather as was experienced after our work closed would have been of much value.

It will be seen by reference to the map of stations occupied by the *Grampus* during the summer that many other parts of lines were made, but these were not of sufficient length to give any additional light upon the subject, and hence have been omitted. They do not influence the results one way or the other. If they had crossed the edge of the continental platform they would have been interesting, but they are generally fragments at one end or the other of lines, and sometimes these portions, even if they happened to be upon the same line, were made at dates too widely separated to be of any value for our purpose; their omission is therefore no great loss.

The scale adopted, about 1 in 350, may seem excessive, but after many experiments it was chosen because the features of the temperature curves were best shown by it.

The profiles do not give the temperatures or specific gravities below 150 fathoms, as these will be seen from the records to vary but little below this depth. All the data collected, however, have been published in tabular form in the records, for future reference.

In the profiles the bathyisothermal lines of 70°, 65°, 60°, and 50° have been given in the first four charts, and in the others only those of 70°, 60°, and 50°, as these lines develop the principal features of the temperatures in each instance.

In every chart the rather remarkable curvature of the 50° line downward off the continental platform will be instantly noticed.

In the first charts this line extends seaward from the edge of the continent for some distance, then returns toward it again, follows it downward for some distance, and then passes out toward the main body of the ocean. It would be interesting to notice whether it returns toward the surface of the ocean again at some point farther along the line. This body of comparatively warm water has an average depth of about 50 fathoms and has a most peculiar shape, as will be seen from a comparison of the several charts. We refer now particularly to the first five, since our data were not sufficiently numerous in the other charts to enable us to verify the existence of this same form of the body of water referred to in the earlier lines. The modifications in the outline of this mass of water take place in its upper portion, particularly in the upper part lying opposite to the continental edge. Where the slope of the platform is slight, as in charts 1 and 2, it is gradually rounded in this portion, but in charts 3 and 4, where the slope is more abrupt, this rounded part is broken into and the water massed to a greater height beyond it farther seaward. This does not hold good of chart 6, where local influences may produce a different result. Just why this is so we are not able to state, because no perfect lines were made directly to the eastward of this line.

The peculiar shape of this curve would seem to point to a mechanical intrusion of cold water from the surface of the continental platform, which may be reinforced by the specific gravity of the water, as would appear from a study of some of the observations made, notably the specific gravities at the 100-fathom line in charts 2 and 3.

The existence of this body of warm water off the continental edge may offer an explanation of the richness of this particular spot in all forms of marine life, as shown by the successful dredging of the *Albatross* upon it.

The curves of 70° in the first four charts, if studied in succession, remembering that they were made at intervals of 10 minutes of longitude to the eastward of one another, show very nicely the gradual breaking up of a broad belt of warm water in chart 1 into several distinct smaller bands in chart 4. The proximity of the northernmost end of this line to the coast on charts 1, 2, 3, and 4 points very strongly to the influence of long-continued winds in driving this body of water toward the coast. The contrast in the position of the shore end of this line in charts 5 and 6 is very striking. These lines are a repetition of the lines of charts 3 and 4, made two weeks later, after an interval during which strong northerly winds were constantly blowing. The first-mentioned charts (Nos. 1, 2, 3, and 4) were made after the winds from the south, which had been at work nearly all summer, had about reached the maximum of their influence.

Further than this in the interpretation of our data we dare not go at present. Enough has been said to call attention to the interesting nature of the problem we are working upon, which has not yet been solved. The facts pointed out warrant further investigation, and it is hoped that the work of the coming year may bring us one step nearer the accomplishment of our wish.

REPORT UPON ATMOSPHERIC ELECTRICITY.

BY W. F. MAGIE, PH. D.

Professor of Physics in the College of New Jersey, Princeton.

The observations on atmospheric electricity presented in the following report were made by the author during the summer of 1889 on board the U. S. Fish Commission schooner *Grampus*, while he was engaged in assisting Professor Libbey in the investigation of ocean temperatures. The duties of the regular work were so exacting that no systematic record of the atmospheric electricity was kept; but the observations were made to decide whether such a record would be valuable. On this point the observations, few as they are, leave no question. It is stated by Exner, in his elaborate paper, Ueber die Ursache und die Gesetze der Atmosphärischen Elektricität, Wien. Sitzber., Bd. XCIII, Abth. II, 1886, that useful observations on the normal electrical state of the atmosphere during the summer months are frequently rendered impossible by reason of the disturbances caused by dust particles in the air. The clouds of flying dust often change the normal potential of the air, which increases from the earth's surface upwards, to a negative potential, and even when this reversal of potential does not occur, must materially affect the amount of the positive increase. No such disturbances could be traced in the potentials observed at sea. They were invariably positive. Observations at sea are free also from any constant error, such as affects those made on land, due to irregularities in the configuration of the earth's surface and to the presence of buildings and trees. The effect due to the vessel can be determined by a special observation and allowed for in all subsequent work. It is only necessary to make simultaneous observations on the vessel and in a boat at some distance from it, to obtain data for reducing all potentials observed on the vessel to the true potentials at the sea level and referred to the earth's sphere. Hence, if we adopt Exner's view that the earth is negatively charged and that its charge is a cosmical constant which can be determined by observation of the rate of change of potential at the earth's surface, the data from which this charge can be most accurately calculated must be those obtained at sea. Observations at sea are also very well adapted to test the relation between the potential and the humidity of the atmosphere and offer exceptional facilities for the study of the effect of clouds.

The observations were made with a Thomson's portable electrometer, which was found to be much more sensitive and accurate than the portable gold-leaf electrometer used by Exner. The motion of the vessel did not interfere in any way with the accuracy of the readings. It was easy to repeat a setting of the attracting plate to within one division of the micrometer head. This insured an accuracy of measurement far greater than is necessary in this class of observations, in which so many unexplained fluctuations are constantly occurring. The instrument was charged

negatively by the use of a rubber electrophorus excited with gun cotton, so that a positive charge on the attracting plate made it necessary to raise it to bring the aluminium balance into the sighted position. A higher reading of the micrometer thus indicates a positive potential of the attracting plate. The constant of the instrument was determined in the physical laboratory of Princeton College by the use of a storage battery of 48 cells, of which the electromotive force was accurately known. It was taken as 2.5 volts for each division of the micrometer head.

The collector was constructed on the plan recommended by Exner. A short metal chimney was made, mounted on an ebonite rod. It held a candle, in the flame of which stood the end of a short copper wire, joined to the attracting plate of the electrometer, when desired, by a fine silk-covered copper wire. When an observation was made, this collector was held at heights above the deck of two, three, and four metres, and the respective settings of the micrometer were taken. Ground readings were made at the beginning and end of the set. It was found to be indifferent whether the ground contact was made by the finger of the observer or by a copper wire making connection with the water. The collector was held as far out over the rail as possible on the weather quarter of the vessel.

In the following table are collected the observations thus made and an approximate value of the rate of change of potential with the vertical height of the collector. This change is expressed in volts per metre and appears in the column headed $\frac{dv}{dn}$. It was always positive.

Date.	Time.	Potentials at—			
		2 metres.	3 metres.	4 metres.	$\frac{dv}{dn}$
Aug. 4	13 0	107	172	275	100
6	10 50	8	.....	22	7
	16 0	60	.....	110	25
7	9 10	85	107	135	28
	14 0	30	70	145	75
	15 20	47	102	162	60
	19 15	67	.....	107	20
8	8 45	97	155	200	45
	13 20	120	130	142	12
18	11 30	50	70	97	27
	16 30	82	117	150	33
20	13 45	120	.....	222	50
21	16 30	.....	.....	100	.....
Sept. 4	13 45	92	130	150	20
5	10 0	62	.....	112	25

The values of $\frac{dv}{dn}$ were taken, when practicable, from the potentials at the distances 3 and 4 metres above the deck, since it was thought that the disturbing effect of the vessel would be less for them than for those taken at the lower points.

In one or two cases there appeared to be no change of potential. This was believed to be due to defective insulation, and the observations are not included in the table. No negative potentials were observed.

In connection with the electrometer observations the readings of the dry and wet bulb thermometers were taken, and from them were obtained the relative humidity

and the weight in grammes of the water vapor in the air, or the actual humidity. The clouds and the state of the atmosphere were also recorded. The following table contains the rate of change of potential $\frac{dv}{dn}$, the temperature T in centigrade degrees, the relative humidity R. H., the water vapor W. in grammes, and the estimated clouds.

$\frac{dv}{dn}$	T.	R. H.	W.	Cloud.	
100	24.5	70.8	15.70	0	
7	19.7	84.2	14.15	4	
25	23.9	76.8	16.47	3	
28	20.3	83.5	14.57	2	
75	25.0	60.8	13.88	5	
60	25.0	56.2	12.83	2	
20	22.0	70.2	13.51	1	Clear overhead.
45	22.7	71.1	14.23	¼	
12	21.6	71.2	13.40	.....	Haze overhead.
27	21.8	74.2	14.11	.....	Light stratus overhead.
33	22.1	75.7	14.66	.....	Do.
50	23.4	90.3	18.71	.....	Light stratus; clear overhead.
20	27.2	59.0	15.23	.....	Light cirrus just forming.
25	24.4	91.1	20.12	¼	Clear overhead.

In this table there does not appear any simple relation between the potential changes and the humidity. According to Exner the water vapor passes into the atmosphere negatively charged, and as it is present in greater or less amount the normal rate of rise of potential is more or less diminished. Arrhenius considers the free negative charges which lower the potential to reside on small dust or water particles floating in the air, which have become charged by electrolytic conduction through the air of electricity from the earth. To test between these views, a large number of observations should be made in fine cloudless weather. No conclusion in favor of either of them can be drawn from these observations. There seems to be a relation between the rise of potential and the clearness of the sky, although there are some marked exceptions to the rule that the clearer sky accompanies the greater rise of potential.

The observations here given were not reduced to the sea level by auxiliary measurements made at a distance from the vessel. The collector was held as far away as practicable from the sails and standing rigging. When the collector was held at a height of 4 metres and close to the mainsail there could not be detected any difference of potential between the collector and the ground. This is in accord with the experiments of Exner on the electrical state near buildings and high cliffs. The equipotential surface of zero potential passes over all bodies on the earth's surface, unless they are especially and carefully insulated. It is not unlikely that some of the inconsistencies noticed in the observations were due to the different positions of the mainsail at the times that they were taken. In future observations it would be advisable to use a water-dropper collector lashed in the main shrouds on the weather side of the vessel. If such a collector were fitted with a long dropping tube it would be practically independent of any ordinary changes in the vessel's trim.

REPORT UPON THE ZOOLOGICAL COLLECTIONS.

BY W. K. BROOKS, PH. D.,

Professor of Morphology, Johns Hopkins University.

The following surface animals were collected by the *Grampus:*

SALPA CABOTI.—More than 1,000 specimens each of the chain and solitary forms.

SALPA CLOTHO.—About 100 specimens of the chain and 20 of the solitary form.

SALPA, n. sp.—A few mutilated specimens of what seems to be a new species were brought up on the thermometer tubes.

SALPA, n. sp.—A single specimen of a species which has not yet been identified.

SALPA PINNATA.—One of the most remarkable results of the explorations made by the *Grampus* is the discovery of this species in great abundance along our coast. Two specimens were obtained in 1888 and more than 100 in 1889, and as it is a large and conspicuous species the fact that its occurrence in our waters has never been recorded is noteworthy. The collection contains great numbers of specimens of the chain form at all stages of development and four specimens of the solitary form with stolons.

The fact that this species is generally distinct from the ordinary *Salpa* has already been pointed out, and Herdman has proposed for it the generic name *Cyclosalpa*. My own study of its structure and development shows that it is a primitive type, midway between *Pyrosoma* and *Salpa*, and it is therefore peculiarly adapted for the intelligent study of the process of budding, upon the history and origin of which it gives most conclusive evidence.

Part 4 of vol. XXIII of the *Jenaische Zeitschrift* contains a most thorough and exhaustive memoir by Seeliger on the development of Pyrosoma (Zur Entwicklungsgeschichte der Pyrosomen, mit tafeln XXX–XXXVII), in which the author confirms, in all essential particulars, the accounts which Huxley and Kowalevsky have given us of the process of budding in Pyrosoma. Seeliger's account is much more minute and detailed than the older papers, and is a most valuable contribution to our knowledge of the subject, and in fact it appears to be so complete as to leave nothing more to be done, but it shows also that the older accounts were perfectly accurate, although they were less exhaustive than Seeliger's researches.

In a paper which I published in 1886, in vol. III of the "Studies from the Biological Laboratory of the Johns Hopkins University," on "The Anatomy and Development of the Salpa Chain," I showed that, after the secondary complications due to crowding and pressure are allowed for, the process of budding in Salpa is strictly comparable in every essential particular with that which had been described in Pyrosoma by Huxley and Kowalevsky; that "the Salpa chain is a single series of animals like the Pyrosoma stolon; the middle plane of the stolon the same as those of the Salpæ; that the right halves of all the bodies arise on the right half of the stolon, and their left halves on its left, and that they are not formed by budding from its walls but by the direct conversion of its tissues and cavities into those of the Salpa, and that the process is directly comparable, in every particular, with the published accounts of what occurs in Pyrosoma." (Page 472.)

My reason for publishing the paper was, as I then stated, the appearance of Seeliger's paper on the budding of Salpa (Die Knospung der Salpen, von Oswald Seeliger, *Jen. Zeitschrift*, XIX, 1885), and I showed that this author, like all the others

who had written on the subject, had gone hopelessly astray in the interpretation of his sections, and that his account of the process of budding in Salpa is of no more value than those given by earlier writers.

I am pleased to learn from his new memoir on Pyrosoma that Seeliger now holds the view which I have advocated, as to the essential similarity between the Salpa-stolon and that of Pyrosoma, but I am surprised to find that the only reference to my work on the subject is the statement that I have "emphasized" this resemblance:

"Die Umbildung der einzelnen Segmente des Stolo (of Pyrosoma) zu einer vollständigen Pyrosoma verläuft, wie schon Brooks betonen konnte, sehr ähnlich mit den Vorgängen in der Salpen entwicklung." (Page 613.)

It seems to me that this is a very inadequate recognition of the fact that I pointed out the resemblance in detail, in contradiction of Seeliger's own statement of the case, and in opposition to all other published accounts.

During the last year I have been studying the Salpæ which were collected by the *Albatross*, and those collected by Professor Libbey on the *Grampus*, and as these collections furnish material for the comparative study of the process of budding, I have been able to amplify and complete my work on the subject, and to illustrate it by comparisons between different species. I am now preparing the illustrations for a memoir on the budding of Salpa, which will be ready for publication this fall. Two species, collected by the *Grampus*, are peculiarly favorable for studying the minute details of the process. One of them, which was brought up on the thermometer tubes of the *Grampus*, is very similar to if not identical with *S. pinnata* of the Mediterranean. It is not a true Salpa, as it differs from the ordinary species of this genus in many structural features. It is especially valuable for the study of the process of budding, as the Salpæ gradually increase in size from the base to the tip of the stolon, and it is therefore peculiarly valuable for studying the histology of the process of budding, and for tracing the development of the various organs.

A second species, also collected by the *Grampus* (*S. clotho*), is peculiarly favorable for studying the anatomy of the chain, since the secondary complications which are brought about by crowding are more easily intelligible than in any other species I have studied. This is due to the fact that the young Salpæ attain to a larger size and to more perfect development before crowding takes place than they do in other species.

The study of these two species and of Seeliger's beautiful figures of Pyrosoma show that the resemblance between Salpa and Pyrosoma is even more perfect and complete than I had supposed, as it extends to all the details of structure.

DOLIOLUM, n. sp.—Great quantities of young specimens of a species of *Doliolum* in the stage with a ventral stolon.

RHIZOPHYSA.—5 specimens of a *Rhizophysa* which is probably *R. gracilis* Fewkes.

SIPHONOPHORÆ.—A number of specimens of *Abyles*, *Diphyes*, and fragments of other Siphonophores.

PTEROPODA.—10 specimens of *Clio* (*Cresis*) *virgula;* 150 young specimens of the same; 16 of *Cavolina tridentata*, 1 of *Cymbuliopsis calceola.*

HETEROPODA.—200 specimens of *Atlanta;* 3 of *Firolidia desmaresti;* 1 of *Carinaria cymbium* with shell; 8 larvæ with coiled shells, possibly *Firolidia* larvæ.

MEDUSÆ.—*Pelagia cyanella; Margelis*, sp.

CTENOPHORÆ.—*Idyopsis; Beroe*, young.

About 30 young pelagic fishes.

Record of Serial Temperatures and Densities.

Depth (fath.)	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced	Cup No.
Station No. 1 (A 2). Lat. 41° 7′ 00″ N.; Long. 70° 00′ 00″ W. July 24, 1889, 8 a. m.							
Surface.	61.9	61.9	6795	1.0248	61.0	1.02411	.....
13.....	61.8	61.8	66737	1.0248	61.9	1.02424	7
Station No. 2 (A 3). Lat. 40° 56′ 00″ N.; Long. 70° 00′ 00″ W. July 24, 1889, 10 a. m.							
Surface.	59.4	59.4	6795	1.0250	59.0	1.02406	.....
14.....	57.3	57.2	66737	1.0254	59.0	1.02446	7
Station No. 3 (A 4). Lat. 40° 46′ 39″ N.; Long. 70° 00′ 00″ W. July 24, 1889, 12 m.							
Surface.	62.8	62.8	6795	1.0252	62.0	1.02465	.....
24.....	50.0	49.2	66737	1.0262	58.8	1.02524	7
Station No. 4 (A 5). Lat. 40° 35′ 00″ N.; Long. 70° 00′ 00″ W. July 24, 1889, 2 p. m.							
Surface.	66.9	66.9	6795	1.0249	66.0	1.02492	.....
14.....	51.0	50.9	66661	.....	.....	.....	.....
24.....	47.0	46.7	52728	.....	.....	.....	.....
34.....	46.3	46.2	66737	1.0264	57.0	1.02522	6
Station No. 5 (A 6). Lat. 40° 24′ 00″ N.; Long. 70° 00′ 00″ W. July 24, 1889, 5 p. m.							
Surface.	67.5	67.5	6795	1.0251	67.5	1.02534	.....
9.....	65.5	65.4	66724	.....	.....	.....	.....
14.....	52.0	51.8	66731	.....	.....	.....	.....
19.....	48.5	48.4	66664	.....	.....	.....	.....
24.....	46.1	46.0	62365	.....	.....	.....	.....
29.....	45.6	45.2	63911	.....	.....	.....	.....
34.....	45.2	45.1	66737	.....	.....	.....	.....
39.....	46.0	45.7	52728	.....	.....	.....	.....
44.....	45.3	45.2	66661	1.0263	56.3	1.02504	7
Station No. 6 (A 7). Lat. 40° 13′ 00″ N.; Long. 70° 2′ 00″ W. July 24, 1889, 7 p. m.							
Surface.	66.8	66.8	6795	1.0249	66.0	1.02492	.....
10.....	65.0	64.8	66659	.....	.....	.....	.....
15.....	67.0	66.7	*66665	.....	.....	.....	.....
20.....	64.3	64.2	66661	.....	.....	.....	.....
25.....	64.9	64.5	52728	.....	.....	.....	.....
30.....	45.7	45.6	66737	.....	.....	.....	.....
35.....	45.2	44.8	63911	.....	.....	.....	.....
40	45.8	45.6	66663	.....	.....	.....	.....
45.....	50.2	50.0	66731	.....	.....	.....	.....
50.....	45.4	45.3	66664	.....	.....	.....	.....
54.	44.0	44.1	66724	1.0265	55.0	1.02509	6
Station No. 7 (A 8). Lat. 40° 2′ 00″ N.; Long. 70° 3′ 00″ W. July 24, 1889, 9 p. m.							
Surface.	66.5	66.5	6795	.....	.....	.....	.....
10.....	66.0	65.9	66731	.....	.....	.....	.....
15.....	66.0	66.1	62365	.....	.....	.....	.....
20.....	48.8	48.7	63911	.....	.....	.....	.....
30.....	47.0	46.9	66737	.....	.....	.....	.....
40.....	46.0	45.7	52728	.....	.....	.....	.....
50.....	46.8	46 7	66661	.....	.....	.....	.....
60.....	48.0	47.8	66665	.....	.....	.....	.....
70.....	47.7	47.4	66659	1.0278	57.0	1.02662	6

Depth (fath.)	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced	Cup No.
Station No. 8 (A 9). Lat. 39° 51′ 00″ N.; Long. 70° 4′ 00″ W. July 24, 1889, 11 p. m.							
Surface.	68.2	68.2	6795	1.0249	68.0	1.02522	.....
25	56.0	55.8	66661	.....	.....	.....	.....
50.....	52.0	51.7	52728	.....	.....	.....	.....
75.....	53.8	53.6	66737	.....	.....	.....	.....
125	48.0	47.6	63911	.....	.....	.....	.....
175	43.0	42.9	62365	.....	.....	.....	.....
225.....	41.8	41.7	66731	.....	.....	.....	.....
230.....	.....	.....	.....	1.0262	62.8	1.02576	6
Station No. 9 (A 10). Lat. 39° 40′ 00″ N.; Long. 70° 6′ 00″ W. July 25, 1889, 1 a. m.							
Surface.	69.0	69.0	6795	.....	.....	.....	.....
25.....	56.0	56.0	62365	.....	.....	.....	.....
50.....	55.4	55.3	63911	.....	.....	.....	.....
75.....	52.4	52.2	66737	.....	.....	.....	.....
175.....	45.0	44.7	52728	.....	.....	.....	.....
275.....	41.2	41.1	66661	.....	.....	.....	.....
950.....	.....	.....	6795	1.0286	58.0	1.02754	6
Station No. 10 (B 12). Lat. 39° 27′ 00″ N.; Long. 70° 9′ 00″ W. July 25, 1889, 1 p. m.							
Surface.	72.6	72.6	6795	1.0245	72.6	1.02554	.....
10.....	72.5	72.6	66726	.....	.....	.....	.....
25.....	69.5	69.4	66724	.....	.....	.....	.....
50.....	54.0	54.0	66664	.....	.....	.....	.....
75	54.0	53.7	66659	.....	.....	.....	.....
100.....	52.2	52.0	66665	.....	.....	.....	.....
150	48.0	47.8	66731	.....	.....	.....	.....
200	45.1	45.0	66661	.....	.....	.....	.....
250	47.6	47.3	52728	.....	.....	.....	.....
300.....	44.4	44.3	66737	.....	.....	.....	.....
400.....	43.9	43.5	63911	.....	.....	.....	.....
500.....	40.0	39.9	62365	1.0282	63.5	1.02786	6
Station No. 11 (C 11). Lat. 39° 34′ 00″ N.; Long. 70° 21′ 00″ W. July 25, 1889, 4 p. m.							
Surface.	71.3	71.3	6795	1.0258	71.0	1.02659	.....
15.....	71.3	71.4	66726	.....	.....	.....	.....
30.....	55.8	55.8	66724	.....	.....	.....	.....
50	55.8	55.8	66664	.....	.....	.....	.....
75.....	53.7	53.4	66659	.....	.....	.....	.....
100.....	53.7	53.5	66731	.....	.....	.....	.....
150.....	48.7	48.5	66661	.....	.....	.....	.....
200.....	46.8	46.5	52728	.....	.....	.....	.....
250.....	45.6	45.5	66737	.....	.....	.....	.....
300.....	45.5	45.4	63911	.....	.....	.....	.....
400	39.8	39.7	62365	1.0288	62.0	1.02825	6
Station No. 12 (C 10). Lat. 39° 44′ 00″ N.; Long. 70° 21′ 00″ W. July 25, 1889, 6 p. m.							
Surface.	70.2	70.2	6795	1.0260	70.0	1.02663	.....
15.....	65.0	64.9	66726	.....	.....	.....	.....
30.....	52.4	52.4	66724	.....	.....	.....	.....
50	53.5	53.5	66664	.....	.....	.....	.....
75.....	54.3	54.0	66659	.....	.....	.....	.....
100.....	52.4	52.2	66731	.....	.....	.....	.....
150.....	47.3	47.2	66661	.....	.....	.....	.....
200.....	45.8	45.5	52728	.....	.....	.....	.....
250.....	41.6	41.5	66737	.....	.....	.....	.....
300.....	44.2	43.8	63911	.....	.....	.....	.....
400	39.8	39.7	62365	1.0282	56.2	1.02692	6

* Thermometer did not reverse.

RECORD OF SERIAL TEMPERATURES AND DENSITIES—Continued.

Station No. 13 (C 9). Lat. 39° 54′ 00″ N.; Long. 70° 21′ 00″ W. July 25, 1889, 11 p. m.

Depth (fath.)	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface	69.0	69.0	6795				
25			*66664				
50	53.0	52.7	66659				
75	50.5	50.3	66731				
100	49.1	49.0	66661				
150	46.0	45.7	52728				
200	42.0	41.9	66737				
250	41.5	41.1	63911				
300	39.8	39.7	62365	1.0282	55.0	1.02679	6

Station No. 14 (C 8). Lat. 40° 4′ 00″ N.; Long. 70° 21′ 00″ W. July 26, 1889, 6 a. m.

Depth (fath.)	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	64.8	64.8	6795	1.0254	64.0	1.02513	
5			*66724				
10	58.4	58.4	66664				
20	46.3	46.0	66659				
30	45.0	44.9	66731				
40	46.0	45.9	66661				
45	47.4	47.1	52728				
50	49.0	48.9	66737				
60	49.7	49.3	63911				
70	48.4	48.4	62365				
76	45.4	45.3	66726	1.0280	59.2	1.02708	6

Station No. 15 (C 7). Lat. 40° 14′ 00″ N.; Long. 70° 21′ 00″ W. July 26, 1889, 9 a. m.

Depth (fath.)	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	67.0	67.0	6795	1.0251	67.0	1.02527	
10	57.0	56.9	66731				
15	51.3	51.1	66661				
20	47.4	47.1	52728				
30	45.7	45.6	66737				
40	45.6	45.2	63911				
50	42.6	42.5	62365	1.0268	55.0	1.02539	6

Station No. 16 (C 6). Lat. 40° 24′ 11″ N.; Long. 70° 21′ 00″ W. July 26, 1889, 11 a. m.

Depth (fath.)	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	68.0	68.0	6795	1.0250	68.0	1.02532	
8	60.0	59.6	52728				
13	49.2	49.0	66737				
23	49.1	49.0	63911				
34	46.2	46.2	62365				
37			5320	1.0266	56.5	1.02536	6

Station No. 17 (C 5). Lat. 40° 34′ 00″ N.; Long. 70° 21′ 00″ W. July 26, 1889, 1 p. m.

Depth (fath.)	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	68.5	68.5	6795	1.0252	68.5	1.02559	
8	62.2	62.1	66661				
13	55.4	55.0	52728				
18	53.0	52.8	66737				
23	54.6	54.5	63911				
28			5320	1.0270	56.5	1.02576	6

Station No. 18 (C 4). Lat 40° 44′ 00″ N.; Long. 70° 21′ 00″ W. July 26, 1889, 3 p. m.

Depth (fath.)	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	68.0	68.0	6795	1.0249	68.0	1.02522	
4	67.9	67.8	66661				
9	53.6	53.2	52728				
14	50.7	50.5	66737				
19			*63911				
24	50.6	50.6	62365				
25			5320	1.0267	55.8	1.02550	6

Station No. 19 (C 3). Lat. 40° 54′ 00″ N.; Long. 70° 21′ 00″ W. July 26, 1889, 5 p. m.

Depth (fath.)	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	65.4	65.4	6795	1.0250	65.0	1.02487	
5	62.3	62.3	66737				
10	53.8	53.4	52728				
15	52.3	52.1	66661				
20			*63914				
22			5320	1.0280	56.6	1.02677	6

Station No. 20 (C 2). Lat. 41° 4′ 00″ N.; Long. 70° 21′ 00″ W. July 26, 1889, 7 p. m.

Depth (fath.)	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	65.5	65.5	6795	1.0250	65.0	1.02487	
5	64.0	63.9	66661				
10	56.7	56.3	52728				
15	63.3	63.3	66737				
18			5320	1.0260	59.7	1.02514	6

Station No. 21 (F 1). Lat. 41° 12′ 00″ N.; Long. 70° 50′ 00″ W. August 1, 1889, 8 a. m.

Depth (fath.)	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	67.4	67.4	6795	1.0244	67.0	1.02457	
8	62.0	61.6	52728				
13	60.0	59.9	66661	1.0256	65.0	1.02547	6

Station No. 22 (F 2). Lat. 41° 2′ 00″ N.; Long. 70° 50′ 00″ W. August 1, 1889, 12 m.

Depth (fath.)	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	69.8	69.8	6795	1.0248	69.6	1.02536	
5	66.2	66.2	63914				
10	60.9	60.8	66661				
15	50.0	49.8	66737				
20	50.0	49.6	52728				
21			5320	1.0256	60.9	1.02488	6

Station No. 23 (F 3). Lat. 40° 52′ 00″ N.; Long. 70° 50′ 00″ W. August 1, 1889, 3 p. m.

Depth (fath.)	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	71.8	71.8	6795	1.0247	71.5	1.02556	
5	68.2	68.2	*62365				
10	68.0	68.0	*63914				
15	49.5	49.3	66661				
20	48.7	48.5	66737				
29	47.0	46.6	52728	1.0258	62.0	1.02525	6

Station No. 24 (F 4). Lat. 40° 42′ 00″ N.; Long. 70° 50′ 0 0″ W August 1, 1889, 6 p. m.

Depth (fath.)	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	73.2	73.2	6795	1.0242	73.0	1.02530	
5	72.0	72.0	66731				
10	70.7	70.7	62365				
15	63.7	63.7	63914				
20	64.0	63.9	66661				
25	47.6	47.4	66737				
34	46.3	45.9	52728	1.0264	59.6	1.02553	6

Station No. 25 (F 5). Lat. 40° 32′ 00″ N.; Long. 70° 50′ 00″ W. August 1, 1889, 9 p. m.

Depth (fath.)	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	72.8	72.8	6795	1.0242	72.6	1.02524	
10	71.6	71.6	66731				
15	71.0	71.0	62365				
20	49.2	49.3	63914				
25	62.0	61.9	66661				
30	48.7	48.5	66737				
37	50.5	50.1	52728				
38				(†)			6

* Thermometer did not reverse.

† No water.

RECORD OF SERIAL TEMPERATURES AND DENSITIES—Continued.

Station No. 26 (F 6). Lat. 40° 22′ 00″ N.; Long. 70° 50′ 00″ W. August 2, 1889, 1 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface	72.3	72.3	6795	1.0241	72.0	1.02504	.....
10	70.5	70.5	62365	.....	.....	.....	.....
15	69.4	69.4	63914	.....	.....	.....	.....
25	70.0	69.9	66661	.....	.....	.....	.....
35	60.5	60.5	66737	.....	.....	.....	.....
43	46.0	45.6	52728	1.0264	60.2	1.02560	6

Station No. 27 (F 7). Lat. 40° 12′ 00″ N.; Long. 70° 50′ 00″ W. August 2, 1889, 4 a. m.

Surface	72.0	72.0	6795	1.0243	72.0	1.02524	.....
10	69.2	69.2	62365	.....	.....	.....	.....
20	55.0	55.0	63916	.....	.....	.....	.....
30	54.0	53.8	66661	.....	.....	.....	.....
40	47.2	47.0	66737	.....	.....	.....	.....
55	46.8	46.4	52728	1.0268	58.0	1.02574	6

Station No. 28 (G 1). Lat. 41° 12′ 00″ N.; Long. 71° 00′ 00″ W. August 2, 1889, 12 m.

Surface	70.5	70.5	6795	1.0248	70.2	1.02546	.....
5	68.1	68.0	66661	.....	.....	.....	.....
10	58.6	58.6	63914	.....	.....	.....	.....
18	53.5	53.5	62365	.....	.....	.....	.....
19	.....	.....	5320	1.0258	60.4	1.02503	6

Station No. 29 (H 1). Lat. 41° 12′ 00″ N.; Long. 71° 10′ 00″ W. August 2, 1889, 2 p. m.

Surface	71.6	71.6	6795	1.0246	71.5	1.02546	.....
5	68.4	68.4	66737	.....	.....	.....	.....
10	58.6	58.5	66661	.....	.....	.....	.....
15	54.0	54.1	63914	.....	.....	.....	.....
19	51.5	51.5	62365	.....	.....	.....	.....
20	.....	.....	5320	1.0254	61.5	1.02478	6

Station No. 30 (J 1). Lat. 41° 12′ 00″ N.; Long. 71° 20′ 00″ W. August 2, 1889, 4 p. m.

Surface	72.7	72.7	6795	1.0238	72.6	1.02484	.....
5	70.4	70.2	52728	.....	.....	.....	.....
10	61.9	61.8	66661	.....	.....	.....	.....
15	52.9	53.0	63914	.....	.....	.....	.....
20	49.3	49.3	62365	.....	.....	.....	.....
22	.....	.....	5320	1.0252	56.2	1.02392	6

Station No. 31 (K 1). Lat. 41° 12′ 00″ N.; Long. 71° 30′ 00″ W. August 2, 1889, 6 p. m.

Surface	68.6	68.6	6795	1.0240	68.5	1.02439	.....
5	68.0	67.9	66661	.....	.....	.....	.....
10	66.1	66.1	63914	.....	.....	.....	.....
17	50.4	50.4	62365	.....	.....	.....	.....
18	.....	.....	5320	1.0252	58.2	1.02416	6

Station No. 32 (K 2). Lat. 41° 2′ 00″ N.; Long. 71° 30′ 00″ W. August 4, 1889, 8 a. m.

Surface	67.8	67.8	6795	1.0240	67.8	1.02429	.....
5	62.1	61.7	52728	.....	.....	.....	.....
10	52.0	51.8	66661	.....	.....	.....	.....
15	65.0	60.5	*63914	.....	.....	.....	.....
22	52.4	52.4	*62365	.....	.....	.....	.....
23	.....	.....	5320	1.0263	55.7	1.02497	6

Station No. 33 (J 2). Lat. 41° 2′ 00″ N.; Long. 71° 20′ 00″ W. August 4, 1889, 10 a. m.

Surface	70.7	70.7	6795	1.0238	70.5	1.02451	.....
5	59.2	58.8	52728	.....	.....	.....	.....
10	50.1	49.9	66661	.....	.....	.....	.....
15	49.3	49.4	63914	.....	.....	.....	.....
24	46.3	46.2	62365	.....	.....	.....	.....
25	.....	.....	5320	1.0261	55.5	1.02474	6

Station No. 34 (H 2). Lat. 41° 00′ 00″ N.; Long. 71° 10′ 00″ W. August 4, 1889, 12 m.

Surface	72.3	72.3	6795	1.0240	72.0	1.02494	.....
5	67.8	67.8	66731	.....	.....	.....	.....
10	53.0	52.6	52728	.....	.....	.....	.....
15	50.0	49.8	66661	.....	.....	.....	.....
20	46.6	46.7	63914	.....	.....	.....	.....
25	46.4	46.4	62365	.....	.....	.....	.....
26	.....	.....	5320	1.0259	58.4	1.02489	6

Station No. 35 (G 2). Lat. 41° 2′ 00″ N.; Long. 71° 00′ 00″ W. August 4, 1889, 2 p. m.

Surface	71.3	71.3	6795	1.0242	71.3	1.02503	.....
5	67.5	67.1	52728	.....	.....	.....	.....
10	52.2	51.8	52728	.....	.....	.....	.....
15	50.1	50.1	62365	.....	.....	.....	.....
21	48.0	48.0	62365	.....	.....	.....	.....
22	.....	.....	5320	1.0258	58.7	1.02482	6

Station No. 36 (E 1). Lat. 41° 12′ 00″ N.; Long. 70° 40′ 00″ W. August 4, 1889, 6 p. m.

Surface	69.3	69.3	6795	1.0244	69.1	1.02488	.....
5	68.0	68.0	63914	.....	.....	.....	.....
11	59.0	58.6	52728	.....	.....	.....	.....
17	57.9	58.0	62365	.....	.....	.....	.....
18	.....	.....	5320	1.0254	61.3	1.02475	6

Station No. 37 (E 2). Lat. 41° 2′ 00″ N.; Long. 70° 40′ 00″ W. August 4, 1889, 8 p. m.

Surface	67.6	67.6	6795	1.0250	69.0	1.02547	.....
5	.....	.....	*66656	.....	.....	.....	.....
10	53.4	53.2	66731	.....	.....	.....	.....
15	48.0	47.8	66661	.....	.....	.....	.....
20	47.0	47.1	63914	.....	.....	.....	.....
25	47.0	46.6	52728	.....	.....	.....	.....
26	.....	.....	5320	1.0262	56.5	1.02496	6

Station No. 38 (E 3). Lat. 40° 52′ 00″ N.; Long. 70° 40′ 00″ W. August 4, 1889, 11 p. m.

Surface	70.0	70.0	6795	1.0240	71.2	1.02482	.....
5	70.0	69.8	*66664	.....	.....	.....	.....
10	58.2	58.1	66731	.....	.....	.....	.....
15	48.3	48.4	63914	.....	.....	.....	.....
20	58.7	58.6	66661	.....	.....	.....	.....
31	51.5	51.1	52728	.....	.....	.....	.....
32	.....	.....	5320	1.0263	55.0	1.02489	6

* Thermometer did not reverse.

RECORD OF SERIAL TEMPERATURES AND DENSITIES—Continued.

Station No. 39 (E 4). Lat. 40° 42′ 00″ N.; Long. 70° 40′ 00″ W. August 5, 1889, 4 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface	71.4	71.4	6795	1.0240	73.0	1.02510	.....
5	71.8	71.7	66659	.....	.....	.....	.....
10	71.0	71.0	66737	.....	.....	.....	.....
15	70.5	70.3	66664	.....	.....	.....	.....
20	49.0	48.8	66731	.....	.....	.....	.....
25	46.7	46.8	63914	.....	.....	.....	.....
30	46.2	46.0	66661	.....	.....	.....	.....
34	45.9	45.5	52728	.....	.....	.....	.....
35	.....	.....	5320	1.0254	64.0	1.02513	6

Station No. 40 (E 5). Lat. 40° 32′ 00″ N.; Long. 70° 40′ 00″ W. August 5, 1889, 8 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface	72.3	72.3	6795	1.0241	73.4	1.02527	.....
5	72.7	72.6	66659	.....	.....	.....	.....
10	65.8	65.8	66737	.....	.....	.....	.....
15	49.7	49.5	66731	.....	.....	.....	.....
20	47.8	47.9	63914	.....	.....	.....	.....
25	46.1	45.9	66661	.....	.....	.....	.....
30	46.0	45.6	52728	.....	.....	.....	.....
39	45.0	44.9	66664	.....	.....	.....	.....
40	.....	.....	5320	1.0280	56.7	1.02678	6

Station No. 41 (F 5). Lat. 40° 31′ 00″ N.; Long. 70° 50′ 00″ W. August 5, 1889, 10 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface	72.2	72.2	6795	1.0240	73.6	1.02520	.....
5	72.3	72.2	66659	.....	.....	.....	.....
10	72.2	72.2	66731	.....	.....	.....	.....
15	57.3	57.4	63914	.....	.....	.....	.....
20	49.0	48.8	66661	.....	.....	.....	.....
25	58.5	58.1	52728	.....	.....	.....	.....
30	46.0	45.9	66664	.....	.....	.....	.....
40	44.9	44.8	66737	.....	.....	.....	.....
43	.....	.....	5320	1.0270	59.5	1.02612	6

Station No. 42 (G 3). Lat. 40° 52′ 00″ N.; Long. 71° 00′ 00″ W. August 5, 1889, 4 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface	69.4	69.4	6795	1.0240	70.6	1.02472	.....
5	69.2	69.2	66731	.....	.....	.....	.....
10	67.8	67.8	63914	.....	.....	.....	.....
15	48.1	47.9	66661	.....	.....	.....	.....
20	46.0	45.6	52728	.....	.....	.....	.....
25	45.0	44.9	66664	.....	.....	.....	.....
31	.....	...	*66737	.....	.....	.....	.....
32	.....	.....	5320	1.0260	58.4	1.02499	6

Station No. 43 (D 1). Lat. 41° 12′ 00″ N.; Long. 70° 30′ 00″ W. August 6, 1889, 6 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface	71.0	71.0	6795	1.0241	71.2	1.02492	.....
5	69.0	68.8	52728	.....	.....	.....	.....
10	66.9	66.9	66737	.....	.....	.....	.....
15	53.0	53.0	66664	.....	.....	.....	.....
22	51.5	51.3	66656	.....	.....	.....	.....
22	.....	.....	5320	1.0258	58.4	1.02479	6

Station No. 44 (D 2). Lat. 41° 2′ 00″ N.; Long. 70° 30′ 00″ W. August 7, 1889, 9 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface	71.2	71.2	6795	1.0240	71.8	1.02491	.....
5	70.5	70.2	66656	.....	.....	.....	.....
10	52.7	52.5	66661	.....	.....	.....	.....
15	48.9	48.6	52728	.....	.....	.....	.....
20	48.0	47.8	66737	.....	.....	.....	.....
25	48.0	48.0	66664	.....	.....	.....	.....
26	.....	.....	5320	1.0264	55.8	1.02508	6

Station No. 45 (D 3). Lat. 40° 51′ 47″ N.; Long. 70° 30′ 00″ W. August 7, 1889, 1 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface	74.6	74.6	6795	1.0234	76.8	1.02516	.....
5	71.4	71.1	66656	.....	.....	.....	.....
10	61.1	61.0	66664	.....	.....	.....	.....
15	67.8	67.7	66737	.....	.....	.....	.....
20	48.0	47.7	52728	.....	.....	.....	.....
27	47.4	47.2	66661	.....	.....	.....	.....
28	.....	.....	5320	1.0280	57.6	1.02689	6

Station No. 46 (D 4). Lat. 40° 42′ 00″ N.; Long. 70° 30′ 00″ W. August 7, 1889, 4 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface	73.6	73.6	6795	1.0238	75.6	1.02534	.....
5	72.0	71.7	66656	.....	.....	.....	.....
10	62.2	62.2	63914	.....	.....	.....	.....
15	51.1	50.9	66661	.....	.....	.....	.....
20	49.0	48.7	52728	.....	.....	.....	.....
25	46.8	46.6	66737	.....	.....	.....	.....
31	47.0	46.9	66664	.....	.....	.....	.....
32	.....	.....	5320	1.0264	56.6	1.02517	6

Station No. 47 (D 5). Lat. 40° 32′ 00″ N.; Long. 70° 30′ 00″ W. August 7, 1889, 7 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface	72.6	72.6	6795	1.0238	74.2	1.02510	.....
5	71.7	71.4	66656	.....	.....	.....	.....
10	58.3	58.2	66664	.....	.....	.....	.....
15	50.3	50.1	66737	.....	.....	.....	.....
20	49.6	49.3	52728	.....	.....	.....	.....
25	47.5	47.3	66661	.....	.....	.....	.....
33	46.2	46.3	63914	.....	.....	.....	.....
34	.....	.....	5320	1.0268	56.4	1.02555	6

Station No. 48 (D 6). Lat. 40° 22′ 00″ N.; Long. 70° 30′ 00″ W. August 7, 1889, 9 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface	71.5	71.5	6795	1.0240	72.0	1.02494	.....
5	71.7	71.4	66656	.....	.....	.....	.....
10	69.3	69.2	66731	.....	.....	.....	.....
15	69.0	69.0	63914	.....	.....	.....	.....
20	47.0	46.8	66661	.....	.....	.....	.....
25	46.5	46.2	52728	.....	.....	.....	.....
30	46.0	45.8	66737	.....	.....	.....	.....
40	45.0	44.9	66664	.....	.....	.....	.....
41	.....	.....	5320	1.0274	55.0	1.01599	6

Station No. 49 (D 7). Lat. 40° 12′ 00″ N.; Long. 70° 30′ 00″ W. August 7, 1889, 11 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface	70.0	70.0	6795	1.0245	70.8	1.02525	.....
4	70.2	69.9	66656	.....	.....	.....	.....
9	69.7	69.6	66659	.....	.....	.....	.....
14	55.3	55.1	66661	.....	.....	.....	.....
19	47.5	47.3	66737	.....	.....	.....	.....
24	47.2	46.9	52728	.....	.....	.....	.....
29	47.0	46.9	66661	.....	.....	.....	.....
39	46.7	46.8	63914	.....	.....	.....	.....
54	47.0	46.8	66731	.....	.....	.....	.....
55	.....	.....	5320	1.0276	56.5	1.02636	6

* Thermometer did not reverse.

RECORD OF SERIAL TEMPERATURES AND DENSITIES—Continued.

Station No. 50 (D 8). Lat. 40° 2′ 00″ N.; Long. 70° 30′ 00″ W. August 8, 1889, 7 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	70.3	70.3	6795	1.0246	72.2	1.02558	.....
5.....	70.4	70.1	66656	.....	.....	.....	.....
10.....	70.1	70.1	63920	.....	.....	.....	.....
15.....	69.1	69.2	63921	.....	.....	.....	.....
20.....	63.8	63.7	66663	.....	.....	.....	.....
25.....	60.4	60.5	62365	.....	.....	.....	.....
30.....	55.0	54.9	66665	.....	.....	.....	.....
40.....	54.3	54.1	66726	.....	.....	.....	.....
50.....	51.0	51.0	66724	.....	.....	.....	.....
60.....	53.2	53.0	66661	.....	.....	.....	.....
70.....	55.0	55.1	63914	.....	.....	.....	.....
80.....	52.7	52.5	66731	.....	.....	.....	.....
90.....	51.1	50.8	52728	.....	.....	.....	.....
100.....	48.4	48.6	66737	.....	.....	.....	.....
125.....	47.0	47.0	66664	.....	.....	.....	.....
150.....	45.0	44.7	66659	1.0283	53.2	1.02671	6

Station No. 51 (D 10). Lat. 39° 49′ 00″ N.; Long. 70° 30′ 00″ W. August 8, 1889, 9 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	72.9	72.9	6795	1.0246	74.8	1.02601	.....
5.....	72.2	72.1	66661	.....	.....	.....	.....
10.....	72.1	72.1	63914	.....	.....	.....	.....
15.....	60.0	59.9	66731	.....	.....	.....	.....
20.....	58.2	57.8	52728	.....	.....	.....	.....
25.....	54.5	54.3	66737	.....	.....	.....	.....
35.....	58.0	57.9	66664	.....	.....	.....	.....
50.....	57.8	57.8	66731	.....	.....	.....	.....
75.....	50.0	49.7	66659	.....	.....	.....	.....
100.....	57.5	57.1	52728	.....	.....	.....	.....
150.....	44.5	44.4	66737	.....	.....	.....	.....
250.....	41.1	41.0	66664	.....	.....	.....	.....
350.....	39.8	39.5	66659	1.0280	54.6	1.02654	6

Station No. 52 (D 10). Lat. 39° 42′ 00″ N.; Long. 70° 30′ 00″ W. August 8, 1889, 3 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	72.2	72.2	6795	1.0250	73.7	1.02622	.....
5.....	72.0	71.7	66656	.....	.....	.....	.....
10.....	71.0	71.1	66726	.....	.....	.....	.....
15.....	62.0	61.7	66665	.....	.....	.....	.....
20.....	48.0	48.0	62365	.....	.....	.....	.....
25.....	50.1	50.0	66663	.....	.....	.....	.....
30.....	51.0	50.9	63921	.....	.....	.....	.....
40.....	51.1	51.0	63920	.....	.....	.....	.....
50.....	54.0	53.8	66658	.....	.....	.....	.....
75.....	53.5	53.2	66659	.....	.....	.....	.....
100.....	49.9	49.9	66664	1.0280	62.8	1.02756	8
150.....	46.1	46.0	66737	.....	.....	.....	.....
200.....	43.1	42.8	52728	.....	.....	.....	.....
300.....	40.8	40.7	66731	.....	.....	.....	.....
400.....	39.9	40.0	63914	.....	.....	.....	.....
500.....	39.2	39.1	66661	1.0281	60.6	1.02736	6

Station No. 53 (D 11). Lat. 39° 32′ 00″ N.; Long. 70° 30′ 00″ W. August 8, 1889, 11 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	71.4	71.4	6795	1.0245	72.2	1.02548	.....
5.....	72.0	71.7	66656	.....	.....	.....	.....
10.....	70.6	70.5	66659	.....	.....	.....	.....
15.....	66.0	65.9	66664	.....	.....	.....	.....
20.....	65.3	65.2	66726	.....	.....	.....	.....
25.....	66.8	66.5	66665	.....	.....	.....	.....
30.....	58.8	58.8	66737	.....	.....	.....	.....
40.....	55.8	55.6	66661	.....	.....	.....	.....
50.....	54.0	54.1	63914	.....	.....	.....	.....
75.....	53.8	53.6	66731	.....	.....	.....	.....
100.....	51.2	50.8	52728	1.0276	64.2	1.02736	6
150.....	48.0	47.6	52728	.....	.....	.....	.....
200.....	45.2	45.1	66731	.....	.....	.....	.....
250.....	42.0	42.1	63914	.....	.....	.....	.....
300.....	40.6	40.5	66661	.....	.....	.....	.....
400.....	39.8	39.6	66665	.....	.....	.....	.....
500.....	39.2	39.1	66726	1.0279	60.0	1.02708	6

Station No. 54 (D 12). Lat. 39° 22′ 00″ N.; Long. 70° 30′ 00″ W. August 9, 1889, 3 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	71.9	71.9	6795	1.0250	72.6	1.02598	.....
5.....	72.1	71.8	66656	.....	.....	.....	.....
10.....	72.1	72.1	62365	.....	.....	.....	.....
15.....	64.6	64.5	66724	.....	.....	.....	.....
20.....	63.0	62.9	66726	.....	.....	.....	.....
25.....	51.3	51.1	66665	.....	.....	.....	.....
30.....	51.0	50.8	66737	.....	.....	.....	.....
40.....	54.1	53.9	66661	.....	.....	.....	.....
50.....	53.9	54.0	63914	.....	.....	.....	.....
75.....	52.9	52.7	66731	.....	.....	.....	.....
100.....	51.9	51.6	52728	1.0278	63.6	1.02747	6
150.....	49.4	49.2	66665	.....	.....	.....	.....
200.....	45.4	45.3	66737	.....	.....	.....	.....
250.....	43.1	43.0	66661	.....	.....	.....	.....
300.....	42.0	42.1	63914	.....	.....	.....	.....
400.....	40.0	39.9	66731	.....	.....	.....	.....
500.....	39.9	39.6	52728	1.0280	59.8	1.02715	6

Station No. 55 (D 13). Lat. 39° 12′ 00″ N.; Long. 70° 32′ 00″ W. August 9, 1889, 8 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	71.8	71.8	6795	1.0247	73.5	1.02588	.....
5.....	71.9	71.6	66656	.....	.....	.....	.....
10.....	67.0	67.1	62365	.....	.....	.....	.....
15.....	61.0	60.6	52728	.....	.....	.....	.....
20.....	56.1	56.1	66724	.....	.....	.....	.....
25.....	58.0	57.9	66726	.....	.....	.....	.....
30.....	55.0	54.8	66665	.....	.....	.....	.....
40.....	54.7	54.5	66737	.....	.....	.....	.....
50.....	55.4	55.2	66661	.....	.....	.....	.....
75.....	54.2	54.3	63914	.....	.....	.....	.....
100.....	50.6	50.4	66731	1.0282	60.3	1.02742	6
150.....	47.9	47.7	66726	.....	.....	.....	.....
200.....	45.2	45.0	66665	.....	.....	.....	.....
250.....	42.9	42.8	66737	.....	.....	.....	.....
300.....	41.3	41.2	66661	.....	.....	.....	.....
400.....	39.9	40.0	63914	.....	.....	.....	.....
500.....	39.4	39.3	66731	1.0283	57.2	1.02714	6

RECORD OF SERIAL TEMPERATURES AND DENSITIES—Continued.

Station No. 56 (E 13). Lat. 39° 14′ 00″ N.; Long. 70° 40′ 00″ W. August 9, 1889, 11 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	73.6	73.6	6795	1.0249	75.9	1.02650	.....
5.....	74.0	73.7	66656	.....	.....	.....	.....
10.....	73.6	73.6	62365	.....	.....	.....	.....
15.....	70.2	70.0	52728	.....	.....	.....	.....
20.....	67.0	66.7	66665	.....	.....	.....	.....
25.....	61.9	61.9	66737	.....	.....	.....	.....
30.....	53.3	53.1	66661	.....	.....	.....	.....
40.....	55.3	55.4	63914	.....	.....	.....	.....
50.....	56.0	55.9	66731	.....	.....	.....	.....
75.....	53.9	53.9	66724	.....	.....	.....	.....
100.....	51.9	51.7	66726	1.0278	63.2	1.02742	6
150.....	50.0	49.8	66665	.....	.....	.....	.....
200.....	46.9	46.8	66737	.....	.....	.....	.....
250.....	44.4	43.3	66661	.....	.....	.....	.....
300.....	42.1	42.2	63914	.....	.....	.....	.....
400.....	40.2	40.1	66731	.....	.....	.....	.....
500.....	39.3	39.4	66724	1.0277	60.6	1.02696	6

Station No. 57 (E 12). Lat. 39° 24′ 00″ N.; Long. 70° 40′ 00″ W. August 9, 1889, 1 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	72.8	72.8	6795	1.0245	74.8	1.02591	.....
5.....	75.1	75.8	66656	.....	.....	.....	.....
10.....	73.2	73.2	62365	.....	.....	.....	.....
15.....	63.2	62.9	66665	.....	.....	.....	.....
20.....	57.3	56.9	52728	.....	.....	.....	.....
25.....	51.0	50.8	66737	.....	.....	.....	.....
30.....	51.0	50.8	66661	.....	.....	.....	.....
40.....	51.8	51.9	63914	.....	.....	.....	.....
50.....	53.0	52.8	66731	.....	.....	.....	.....
75.....	54.1	54.1	66724	.....	.....	.....	.....
100.....	52.2	52.0	66726	1.0275	64.3	1.02727	6
150.....	50.5	50.3	66737	.....	.....	.....	.....
200.....	45.8	45.7	66661	.....	.....	.....	.....
250.....	45.4	45.5	63914	.....	.....	.....	.....
300.....	42.0	41.9	66731	.....	.....	.....	.....
400.....	40.6	40.7	66724	.....	.....	.....	.....
500.....	39.3	39.2	66726	1.0276	61.8	1.02702	6

Station No. 58 (E 11). Lat. 39° 34′ 00″ N.; Long. 70° 40′ 00″ W. August 9, 1889, 4 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	72.6	72.6	6795	1.0244	74.4	1.02574	.....
5.....	74.9	74.6	66656	.....	.....	.....	.....
10.....	72.3	72.2	66659	.....	.....	.....	.....
15.....	68.6	68.4	66664	.....	.....	.....	.....
20.....	64.0	63.6	52728	.....	.....	.....	.....
25.....	57.1	57.1	66737	.....	.....	.....	.....
30.....	54.2	54.0	66661	.....	.....	.....	.....
40.....	52.8	52.9	63914	.....	.....	.....	.....
50.....	54.1	53.9	66731	.....	.....	.....	.....
75.....	53.5	53.5	66724	.....	.....	.....	.....
100.....	51.2	51.0	66726	1.0278	64.0	1.02753	6
150.....	49.1	49.2	63914	.....	.....	.....	.....
200.....	45.0	44.9	66731	.....	.....	.....	.....
250.....	41.2	41.3	66724	.....	.....	.....	.....
300.....	40.4	40.3	66726	1.0278	59.3	1.02689	6

Station No. 59 (G 2). Lat. 41° 02′ 00″ N.; Long. 71° 00′ 00″ W. August 17, 1889, 12 m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	68.2	68.2	6795	1.0243	70.0	1.02493	.....
5.....	69.5	69.2	66656	.....	.....	.....	.....
10.....	50.0	49.8	66731	.....	.....	.....	.....
17.....	49.6	49.6	66724	.....	.....	.....	.....
18.....	.....	.....	5320	1.0273	57.0	1.02612	6

Station No. 60 (G 3). Lat. 40° 52′ 00″ N.; Long. 71° 00′ 00″ W. August 17, 1889, 2 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	69.3	69.3	6795	1.0243	71.4	1.02515	.....
5.....	69.0	68.7	66656	.....	.....	.....	.....
10.....	57.5	57.4	66661	.....	.....	.....	.....
15.....	48.2	48.3	63914	.....	.....	.....	.....
20.....	47.0	47.0	66724	.....	.....	.....	.....
29.....	.....	.....	5320	1.0273	57.3	1.02616	6

Station No. 61 (G 4). Lat. 40° 42′ 00″ N.; Long. 71° 3′ 00″ W. August 17, 1889, 4 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	70.4	70.4	6795	1.0240	72.0	1.02494	.....
5.....	70.5	70.2	66656	.....	.....	.....	.....
10.....	70.1	70.1	66737	.....	.....	.....	.....
15.....	52.2	52.0	66731	.....	.....	.....	.....
20.....	48.0	48.0	66724	.....	.....	.....	.....
25.....	45.3	45.4	63914	.....	.....	.....	.....
31.....	45.5	45.4	66661	1.0280	54.6	1.02655	6

Station No. 62 (G 5). Lat. 40° 32′ 00″ N.; Long. 71° 00′ 00″ W. August 17, 1889, 6 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	71.2	71.2	6795	1.0241	72.7	1.02516	.....
5.....	71.2	70.9	66656	.....	.....	.....	.....
10.....	63.2	62.8	52728	.....	.....	.....	.....
15.....	51.1	50.9	66661	.....	.....	.....	.....
20.....	47.7	47.8	63914	.....	.....	.....	.....
25.....	46.5	46.6	66724	.....	.....	.....	.....
30.....	46.0	45.9	66731	.....	.....	.....	.....
38.....	45.0	44.9	66737	1.0277	54.2	1.02621	6

Station No. 63 (G 6). Lat. 40° 22′ 00″ N.; Long. 71° 00′ 00″ W. August 17, 1889, 8 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	70.2	70.2	6812	1.0244	71.8	1.02531	.....
5.....	71.0	70.7	66656	.....	.....	.....	.....
10.....	70.6	70.4	*66664	.....	.....	.....	.....
15.....	58.3	58.3	63914	.....	.....	.....	.....
20.....	48.8	48.6	66661	.....	.....	.....	.....
25.....	59.7	59.6	66731	.....	.....	.....	.....
30.....	48.0	48.1	63914	.....	.....	.....	.....
40.....	46.7	46.6	66661	.....	.....	.....	.....
48.....	45.7	45.4	52728	1.0281	54.4	1.02663	6

Station No. 64 (G 7.) Lat. 40° 12″ 00″ N.; Long. 71° 00′ 00″ W. August 17, 1889, 10 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	70.0	70.0	6812	1.0242	70.8	1.02495	.....
5.....	69.8	69.5	66658	.....	.....	.....	.....
10.....	69.0	68.7	66656	.....	.....	.....	.....
15.....	66.0	65.9	66726	.....	.....	.....	.....
20.....	54.0	53.7	66659	.....	.....	.....	.....
25.....	50.5	50.5	66664	.....	.....	.....	.....
30.....	46.7	46.6	66731	.....	.....	.....	.....
40.....	46.5	46.4	66737	.....	.....	.....	.....
50.....	47.2	47.3	66724	.....	.....	.....	.....
60.....	46.8	46.9	63914	.....	.....	.....	.....
67.....	44.5	44.4	66661	1.0282	67.0	1.02837	6

* Thermometer did not reverse.

RECORD OF SERIAL TEMPERATURES AND DENSITIES—Continued.

Station No. 65 (G 8). Lat. 40° 2′ 00″ N.; Long. 71° 00′ 00″ W. August 17, 1889, 12 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	70.0	70.0	6812	1.0242	71.0	1.02499	.....
5	70.9	70.8	66663	.....	.....	.....	.....
10	70.9	70.6	66665	.....	.....	.....	.....
15	70.6	70.6	62365	.....	.....	.....	.....
20	55.0	54.7	66659	.....	.....	.....	.....
25	50.1	50.1	66664	.....	.....	.....	.....
30	46.7	46.8	66724	.....	.....	.....	.....
40	49.5	49.3	66737	.....	.....	.....	.....
50	52.0	52.0	66724	.....	.....	.....	.....
75	53.7	53.8	63914	.....	.....	.....	.....
90	51.2	51.0	66661	1.0284	60.4	1.02730	6

Station No. 66 (G 9). Lat. 39° 52′ 00″ N.; Long. 71° 00′ 00″ W. August 18, 1889, 3 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	70.4	70.4	6812	1.0250	71.3	1.02583	.....
5	70.2	70.2	66731	.....	.....	.....	.....
10	62.4	62.3	66726	.....	.....	.....	.....
15	50.1	49.8	66659	.....	.....	.....	.....
20	45.0	45.1	66724	.....	.....	.....	.....
25	45.2	45.1	66664	.....	.....	.....	.....
30	48.0	47.8	66661	.....	.....	.....	.....
40	48.9	49.0	63914	.....	.....	.....	.....
50	51.0	50.8	66737	.....	.....	.....	.....
75	53.6	53.3	52728	.....	.....	.....	.....
100	51.0	51.0	66664	1.0279	61.3	1.02725	6
150	46.0	45.9	66661	.....	.....	.....	.....
200	43.8	43.9	63914	.....	.....	.....	.....
250	41.0	40.9	66737	.....	.....	.....	.....
300	39.9	39.8	66731	.....	.....	.....	.....
335	.....	.....	5320	1.0290	56.2	1.02772	6

Station No. 67 (F 10). Lat. 39° 42′ 00″ N.; Long. 70° 54′ 00″ W. August 18, 1889, 8 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	71.3	71.3	6812	1.0247	72.5	1.02572	.....
5	70.6	70.7	66726	.....	.....	.....	.....
10	64.7	64.6	66656	.....	.....	.....	.....
15	49.3	49.1	66731	.....	.....	.....	.....
20	47.0	47.0	66664	.....	.....	.....	.....
25	46.0	46.8	66665	.....	.....	.....	.....
30	47.8	47.6	66737	.....	.....	.....	.....
40	50.2	50.3	63914	.....	.....	.....	.....
50	52.1	51.9	66661	.....	.....	.....	.....
75	53.7	53.7	66724	.....	.....	.....	.....
100	50.3	50.0	66659	1.0281	62.7	1.02765	6
150	46.7	46.4	66659	.....	.....	.....	.....
200	43.9	44.0	66724	.....	.....	.....	.....
250	41.7	41.6	66661	.....	.....	.....	.....
300	40.4	40.5	63914	.....	.....	.....	.....
400	39.6	39.5	66737	.....	.....	.....	.....
500	39.4	39.2	66665	1.0282	58.0	1.02714	6

Station No. 68 (F 11). Lat. 39° 30′ 00″ N.; Long. 70° 58′ 00″ W. August 18, 1889, 12 m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	73.2	73.2	6812	1.0244	74.3	1.02572	.....
5	72.1	71.8	66656	.....	.....	.....	.....
10	71.9	71.8	66663	.....	.....	.....	.....
15	56.5	56.5	62365	.....	.....	.....	.....
20	50.9	50.9	66664	.....	.....	.....	.....
25	46.5	46.3	66665	.....	.....	.....	.....
30	48.0	47.8	66737	.....	.....	.....	.....
40	48.1	48.2	63914	.....	.....	.....	.....
50	54.8	54.6	66661	.....	.....	.....	.....
75	54.6	54.6	66724	.....	.....	.....	.....
100	50.4	50.1	66659	1.0275	66.7	1.02762	6
150	47.0	46.9	66737	.....	.....	.....	.....
200	45.5	45.6	63914	.....	.....	.....	.....
300	40.6	40.5	66661	.....	.....	.....	.....
400	39.3	39.4	66724	.....	.....	.....	.....
500	39.2	38.9	66659	1.0280	58.4	1.02699	6

Station No. 69 (G 12). Lat. 39° 22′ 00″ N.; Long. 71° 4′ 00″ W. August 18, 1889, 4 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	73.2	73.2	6812	1.0243	74.8	1.02571	.....
5	71.3	71.0	66656	.....	.....	.....	.....
10	64.8	64.7	66724	.....	.....	.....	.....
15	58.0	57.8	66659	.....	.....	.....	.....
20	51.5	51.4	66663	.....	.....	.....	.....
25	51.0	50.8	66661	.....	.....	.....	.....
30	50.9	51.0	63914	.....	.....	.....	.....
40	53.0	52.8	66737	.....	.....	.....	.....
50	54.4	54.2	66665	.....	.....	.....	.....
75	53.5	53.5	66664	.....	.....	.....	.....
100	50.0	50.0	62365	1.0274	62.8	1.02696	6
150	45.3	45.4	63914	.....	.....	.....	.....
200	43.3	43.2	66737	.....	.....	.....	.....
250	41.9	41.7	66665	.....	.....	.....	.....
300	40.8	40.7	66664	.....	.....	.....	.....
400	39.6	39.5	62365	.....	.....	.....	.....
500	39.2	39.1	66663	1.0283	61.3	1.02765	6

Station No. 70 (H 13). Lat. 39° 12′ 00″ N.; Long. 71° 9′ 30″ W. August 18, 1889, 8 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	72.4	72.4	6812	1.0242	71.5	1.02506	.....
5	72.4	72.1	66656	.....	.....	.....	.....
10	71.1	71.0	66661	.....	.....	.....	.....
15	58.0	57.9	66724	.....	.....	.....	.....
20	47.1	47.0	66663	.....	.....	.....	.....
25	46.0	45.7	66659	.....	.....	.....	.....
30	46.0	46.1	63914	.....	.....	.....	.....
40	48.4	48.2	66737	.....	.....	.....	.....
50	52.0	51.8	66665	.....	.....	.....	.....
75	53.7	53.7	66664	.....	.....	.....	.....
100	51.1	51.1	62365	1.0274	64.3	1.02717	6
150	44.6	44.5	62365	.....	.....	.....	.....
200	43.7	43.6	66664	.....	.....	.....	.....
250	40.6	40.4	66665	.....	.....	.....	.....
300	39.9	39.8	66737	.....	.....	.....	.....
400	39.6	39.7	63914	.....	.....	.....	.....
500	39.2	39.0	66656	1.0280	58.8	1.02704	6

RECORD OF SERIAL TEMPERATURES AND DENSITIES—Continued.

Station No. 71 (J 13). Lat. 39° 12′ 00″ N.; Long. 71° 20′ 00″ W. August 19, 1889, 4 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	71.0	71.0	6812	1.0246	71.7	1.02550	.....
5.....	71.7	71.4	66656	.....	.....	.....	.....
10	62.0	61.9	66724	.....	.....	.....	.....
15.....	55.2	55.0	66661	.....	.....	.....	.....
20.....	49.9	49.8	66663	.....	.....	.....	.....
25.....	49.7	49.8	63914	.....	.....	.....	.....
30.....	49.9	49.7	66737	.....	.....	.....	.....
40.....	52.7	52.5	66665	.....	.....	.....	.....
50.. ...	53.2	53.2	66664	.....	.....	.....	.....
75.....	53.1	53.1	62365	.....	.....	.....	.....
100.....	49.6	49.3	66659	1.0288	62.8	1.02836	6
150.....	46.0	45.7	66659	.....	.....	.....	.....
200.....	44.1	44.2	63914	.....	.....	.....	.....
250.....	41.8	41.7	66737	.....	.....	.....	.....
300.....	40.2	40.0	66665	.....	.....	.....	.....
400.....	39.7	39.6	66664	.....	.....	.....	.....
500.....	39.3	39.2	62365	1.0295	60.4	1.02873	6

Station No. 72 (J 12). Lat. 39° 22′ 00″ N.; Long. 71° 22″ 00″ W. August 19, 1889, 7 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	71.5	71.5	6812	1.0244	71.8	1.02531	.....
5.....	71.9	71.6	66656	.....	.....	.....	.....
10.....	63.2	63.1	66661	.....	.....	.....	.....
15.....	58.7	58.6	66724	.....	.....	.....	.....
20.....	55.6	55.6	62365	.....	.....	.....	.....
25.....	55.0	55.0	66664	.....	.....	.....	.....
30.....	54.9	54.7	66665	.....	.....	.....	.....
40.....	53.2	53.0	66737	.....	.....	.....	.....
50.....	53.5	53.6	63914	.....	.....	.....	.....
75.....	53.3	53.2	66663	.....	.....	.....	.....
100.....	49.8	49.5	66659	1.0285	60.8	1.02778	6
150.....	44.7	44.6	62365	.....	.....	.....	.....
200.....	42.7	42.6	66664	.....	.....	.....	.....
250.....	42.0	41.8	66665	.....	.....	.....	.....
300.....	40.4	40.3	66737	.....	.....	.....	.....
400.....	39.3	39.4	63914	.....	.....	.....	.....
500.....	39.2	39.1	66663	1.0298	61.4	1.02916	6

Station No. 73 (J 11). Lat. 39° 30′ 20″ N.; Long. 71° 21′ 30″ W. August 19, 1889, 11 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	72.3	72.3	6812	1.0244	73.8	1.02563	.....
5.....	72.1	71.8	66656	.....	.....	.....	.....
10.....	64.7	64.6	66661	.....	.....	.....	.....
15.....	55.5	55.5	66724	.....	.....	.....	.....
20.....	52.0	51.7	66659	.....	.....	.....	.....
25.....	52.3	52.2	66663	.....	.....	.....	.....
30.....	51.8	51.9	63914	.....	.....	.....	.....
40.....	54.1	53.9	66737	.....	.....	.....	.....
50.....	54.5	54.3	66665	.....	.....	.....	.....
75.....	52.0	52.0	66664	.....	.....	.....	.....
100.....	49.4	49.4	62365	1.0295	61.0	1.02881	8
150.....	47.4	47.3	66663	.....	.....	.....	.....
200.....	44.6	44.7	63914	.....	.....	.....	.....
250.....	41.4	41.3	66737	.....	.....	.....	.....
300.....	40.7	40.5	66665	.....	.....	.....	.....
400.....	39.4	39.3	66664	.....	.....	.....	.....
500.....	39.2	39.1	62365	1.0296	63.8	1.02930	6

Station No. 74 (J 10). Lat. 39° 40′ 20″ N.; Long. 71° 21′ 30″ W. August 19, 1889, 2 p. m

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	72.0	72.0	6812	1.0243	74.0	1.02557	.....
5.....	71.5	71.2	66656	.....	.....	.....	.....
10.....	71.8	71.7	66661	.....	.....	.....	.....
15.....	52.0	52.0	66724	.....	.....	.....	.....
20.....	47.2	46.9	66659	.....	.....	.....	.....
25.....	47.2	47.1	66663	.....	.....	.....	.....
30.....	49.3	49.4	63914	.....	.....	.....	.....
40.....	52.0	51.8	66737	.....	.....	.....	.....
50.....	55.4	55.2	66665	.....	.....	.....	.....
75.....	53.9	53.9	66664	.....	.....	.....	.....
100.....	51.2	51.2	62365	1.0296	61.2	1.02894	8
150.....	47.2	47.1	66663	.....	.....	.....	.....
200.....	44.7	44.8	63914	.....	.....	.....	.....
250.....	42.1	42.0	66737	.....	.....	.....	.....
300.....	40.8	40.6	66665	.....	.....	.....	.....
400.....	39.6	39.5	66664	.....	.....	.....	.....
500.....	39.3	39.2	62365	1.0298	60.8	1.02908	8

Station No. 75 (J 9). Lat. 39° 52′ 00″ N.; Long. 71° 19′ 00″ W. August 19, 1889, 4 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	71.5	71.5	6812	1.0244	72.4	1.02541	.....
5.....	71.3	71.0	66656	.....	.....	.....	.....
10.....	65.0	64.9	66724	.....	.....	.....	.....
15.....	57.8	57.6	66659	.....	.....	.....	.....
20.....	47.5	47.4	66663	.....	.....	.....	.....
25.....	47.7	47.8	63914	.....	.....	.....	.....
30.....	48.4	48.2	66737	.....	.....	.....	.....
40.....	52.7	52.5	66665	.....	.....	.....	.....
50.....	53.5	53.5	66664	.....	.....	.....	.....
75.....	52.8	52.8	62365	.....	.....	.....	.....
100.....	52.5	52.2	66659	1.0296	56.8	1.02840	6
125.....	49.0	48.9	66663	.....	.....	.....	.....
150.....	53.1	53.2	63914	.....	.....	.....	.....
200.....	44.0	43.9	66737	.....	.....	.....	.....
250.....	42.0	41.8	66665	.....	.....	.....	.....
300.....	40.1	40.0	66664	.....	.....	.....	.....
350.....	39.7	39.6	62365	.....	.....	.....	.....
380.....	.....	.....	5320	1.0296	56.0	1.02830	6

Station No. 76 (J 8). Lat. 40° 2′ 00″ N.; Long. 71° 21′ 00″ W. August 19, 1889, 7 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	71.0	71.0	6812	1.0243	72.0	1.02525	.....
5.....	71.0	70.7	66656	.....	.....	.....	.....
10.....	71.1	71.2	66726	.....	.....	.....	.....
15.....	54.5	54.3	66731	.....	.....	.....	.....
20.....	57.4	57.5	62365	.....	.....	.....	.....
25.....	46.0	45.9	66664	.....	.....	.....	.....
30.....	46.0	45.8	66665	.....	.....	.....	.....
40.....	47.1	46.9	66737	.....	.....	.....	.....
50.....	50.8	50.9	63914	.....	.....	.....	.....
75.....	52.1	52.0	66663	.....	.....	.....	.....
100.....	50.1	49.8	66659	.....	.....	.....	.....
102.....	.....	.....	5320	1.0282	58.0	1.02714	6

Station No. 77 (J 7). Lat. 40° 12′ 00″ N.; Long. 71° 20′ 00″ W. August 19, 1889, 10 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	71.2	71.2	6812	1.0242	72.0	1.02514	.....
5.....	71.0	70.7	66656	.....	.....	.....	.....
10.....	67.4	67.3	66659	.....	.....	.....	.....
15.....	68.0	67.9	66663	.....	.....	.....	.....
20.....	54.1	54.2	63914	.....	.....	.....	.....
25.....	46.0	45.9	66737	.....	.....	.....	.....
30.....	47.0	46.8	66665	.....	.....	.....	.....
40.....	47.3	47.3	66664	.....	.....	.....	.....
50.....	47.2	47.2	62365	.....	.....	.....	.....
52.....	.....	.....	5320	1.0276	58.0	1.02654	8

RECORD OF SERIAL TEMPERATURES AND DENSITIES—Continued.

Station No. 78 (J 6). Lat. 40° 22′ 00″ N.; Long. 71° 20′ 00″ W. August 19, 1889, 12 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	71.0	71.0	6812	1.0240	71.6	1.02488	.....
5	71.0	70.7	66656	.....	.....	.....	.....
10	71.4	71.3	66663	.....	.....	.....	.....
15	71.0	71.0	*63914	.....	.....	.....	.....
20	48.4	48.2	66737	.....	.....	.....	.....
25	46.6	46.4	66665	.....	.....	.....	.....
30	46.0	45.9	66664	.....	.....	.....	.....
45	44.3	44.2	62365	.....	.....	.....	.....
46	.....	.....	5320	1.0276	55.5	1.02624	8

Station No. 79 (J 5). Lat. 40° 32′ 00″ N.; Long. 71° 20′ 00″ W. August 20, 1889, 1 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	71.2	71.2	6812	1.0242	72.7	1.02526	.....
5	71.2	70.9	66656	.....	.....	.....	.....
10	71.0	70.9	66663	.....	.....	.....	.....
15	60.0	60.0	63914	.....	.....	.....	.....
20	52.2	52.0	66737	.....	.....	.....	.....
25	48.0	47.8	66665	.....	.....	.....	.....
30	51.0	51.0	66664	.....	.....	.....	.....
40	44.6	44.5	62365	.....	.....	.....	.....
42	.....	.....	5320	1.0272	66.4	1.02799	8

Station No. 80 (J 4). Lat. 40° 42′ 00″ N.; Long. 71° 20′ 00″ W. August 20, 1889, 3 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	70.5	70.5	6812	1.0239	72.0	1.02484	.....
5	70.4	70.3	66663	.....	.....	.....	.....
10	70.0	69.7	66656	.....	.....	.....	.....
15	61.6	61.7	62365	.....	.....	.....	.....
20	50.2	50.2	66664	.....	.....	.....	.....
25	48.4	48.2	66665	.....	.....	.....	.....
30	48.0	47.8	66737	.....	.....	.....	.....
35	.....	.....	5320	1.0262	64.8	1.02604	8

Station No. 81 (J 3). Lat. 40° 52′ 00″ N.; Long. 71° 20′ 00″ W. August 20, 1889, 6 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	68.8	68.8	6812	1.0244	70.1	1.02505	.....
5	69.0	68.7	66656	.....	.....	.....	.....
10	52.3	52.3	62365	.....	.....	.....	.....
15	48.0	48.0	66664	.....	.....	.....	.....
20	47.0	46.8	66665	.....	.....	.....	.....
25	45.3	45.2	66737	.....	.....	.....	.....
34	45.2	45.1	66663	1.0270	54.5	1.02554	8

Station No. 82 (K 3). Lat. 40° 52′ 00″ N.; Long. 71° 30′ 00″ W. August 20, 1889, 10 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	69.2	69.2	6812	1.0243	70.3	1.02498	.....
5	69.7	69.4	66656	.....	.....	.....	.....
10	68.0	68.0	63914	.....	.....	.....	.....
15	67.2	67.0	66665	.....	.....	.....	.....
20	45.5	45.4	66664	.....	.....	.....	.....
25	45.4	45.3	62365	.....	.....	.....	.....
30	45.0	44.4	66663	.....	.....	.....	.....
34	44.8	44.7	66737	1.0272	57.9	1.02613	8

Station No. 83 (K 4). Lat. 40° 42′ 00″ N.; Long. 71° 30′ 00″ W. August 20, 1889, 1 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	69.9	69.9	6812	1.0240	72.8	1.02507	.....
5	69.0	68.7	66656	.....	.....	.....	.....
10	55.5	55.3	66663	.....	.....	.....	.....
15	48.6	48.4	66665	.....	.....	.....	.....
20	45.5	45.4	66664	.....	.....	.....	.....
25	44.5	44.4	62365	.....	.....	.....	.....
30	44.3	44.4	63914	.....	.....	.....	.....
35	44.0	43.9	66737	.....	.....	.....	.....
36	.....	.....	5320	1.0268	61.0	1.02611	8

Station No. 84 (K 5). Lat. 40° 32′ 00″ N.; Long. 71° 30′ 00″ W. August 20, 1889, 3 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	71.4	71.4	6812	1.0236	72.1	1.02456	....
5	70.7	70.4	66656	.....	.....	.....	.....
10	68.0	68.0	66737	.....	.....	.....	.....
15	67.8	67.8	63914	.....	.....	.....	.....
20	51.2	51.2	62365	.....	.....	.....	.....
25	45.3	45.2	66664	.....	.....	.....	.....
30	44.6	44.4	66665	.....	.....	.....	.....
38	44.4	44.3	66663	1.0268	55.4	1.02543	8

Station No. 85 (K 6). Lat. 40° 22′ 00″ N.; Long. 71° 30′ 00″ W. August 20, 1889, 5 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	71.8	71.8	6812	1.0233	73.8	1.02453	.....
5	71.8	71.5	66656	.....	.....	.....	.....
10	53.7	53.5	66737	.....	.....	.....	.....
15	50.3	50.4	63914	.....	.....	.....	.....
20	49.7	49.7	62365	.....	.....	.....	.....
25	46.1	46.0	66664	.....	.....	.....	.....
30	46.3	46.1	66665	.....	.....	.....	.....
40	45.0	44.9	66663	.....	.....	.....	.....
42	.....	.....	5320	1.0282	59.2	1.02728	8

Station No. 86 (K 7). Lat. 40° 12′ 00″ N.; Long. 71° 30′ 00″ W. August 20, 1889, 7 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	71.9	71.9	6812	1.0233	72.5	1.02432	.....
5	72.0	71.7	66656	.....	.....	.....	.....
10	71.0	70.9	66659	.....	.....	.....	.....
15	59.2	59.2	66737	.....	.....	.....	.....
20	48.0	48.1	63914	.....	.....	.....	.....
25	46.4	46.3	62365	.....	.....	.....	.....
30	45.5	45.4	66664	.....	.....	.....	.....
40	45.0	44.8	66665	.....	.....	.....	.....
47	46.0	45.9	66663	1.0268	57.6	1.02569	8

Station No. 87 (K 8). Lat. 40° 2′ 00″ N.; Long. 71° 30′ 00″ W. August 20, 1889, 9 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	71.8	71.8	6812	1.0234	73.4	1.02457	.....
5	71.2	70.9	66656	.....	.....	.....	.....
10	71.0	70.9	66659	.....	.....	.....	.....
15	69.0	68.7	66665	.....	.....	.....	.....
20	64.5	64.4	66664	.....	.....	.....	.....
25	51.5	51.5	62365	.....	.....	.....	.....
30	46.8	46.9	63914	.....	.....	.....	.....
40	46.0	45.9	66737	.....	.....	.....	.....
50	48.7	48.6	66663	1.0264	64.7	1.02623	8

* Thermometer did not reverse.

RECORD OF SERIAL TEMPERATURES AND DENSITIES—Continued.

Station No. 88 (K 9). Lat. 39° 52′ 00″ N.; Long. 71° 30′ 00″ W. August 20, 1889, 11 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced	Cup No.
Surface.	71.3	71.3	6812	1.0238	72.8	1.02487	.....
5.....	71.2	70.9	66656	.....	.....	.....	.....
10.....	71.3	71.1	52728	.....	.....	.....	.....
15.....	58.0	57.9	66661	.....	.....	.....	.....
20.....	60.5	60.2	66724	.....	.....	.....	.....
25.....	45.5	45.4	66663	.....	.....	.....	.....
30.....	49.8	49.6	66737	.....	.....	.....	.....
40.....	49.0	49.1	63914	.....	.....	.....	.....
50.....	53.0	53.0	62365	.....	.....	.....	.....
75.....	52.1	52.1	66664	.....	.....	.....	.....
100.....	46.6	46.4	66665	.....	.....	.....	.....
160.....	45.0	44.7	66659	.....	.....	.....	.....
166.....	.....	.....	5320	1.0276	60.6	1.02686	8

Station No. 89 (K 10). Lat. 39° 42′ 00″ N.; Long. 71° 30′ 00″ W. August 21, 1889, 2 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced	Cup No.
Surface.	72.3	72.3	6812	1.0241	73.7	1.02532	.....
5.....	72.2	71.9	66656	.....	.....	.....	.....
10.....	72.0	71.9	66661	.....	.....	.....	.....
15.....	64.1	64.0	66724	.....	.....	.....	.....
20.....	55.2	55.1	66663	.....	.....	.....	.....
25.....	48.8	48.6	66737	.....	.....	.....	.....
30.....	49.0	49.1	63914	.....	.....	.....	.....
40.....	52.2	52.2	62365	.....	.....	.....	.....
50.....	54.0	54.0	66664	.....	.....	.....	.....
75.....	54.0	53.8	66665	.....	.....	.....	.....
100.....	52.0	51.7	66659	1.0268	70.5	1.02751	8
150.....	47.0	46.8	66737	.....	.....	.....	.....
200.....	43.8	43.9	63914	.....	.....	.....	.....
250.....	41.6	41.5	62365	.....	.....	.....	.....
300.....	40.1	40.0	66664	.....	.....	.....	.....
400.....	39.7	39.5	66665	.....	.....	.....	.....
500.....	39.5	39.2	66659	1.0275	58.5	1.02650	8

Station No. 90 (K 11). Lat. 39° 32′ 00″ N.; Long. 71° 30′ 00″ W. August 21, 1889, 7 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced	Cup No.
Surface.	72.4	72.4	6812	1.0243	73.6	1.02550	.....
5.....	71.1	70.7	66656	.....	.....	.....	.....
10.....	60.6	60.5	66661	.....	.....	.....	.....
15.....	54.0	54.0	66724	.....	.....	.....	.....
20.....	52.4	52.3	66663	.....	.....	.....	.....
25.....	50.0	49.8	66737	.....	.....	.....	.....
30.....	50.1	50.2	63914	.....	.....	.....	.....
40.....	52.6	52.6	62365	.....	.....	.....	.....
50.....	54.5	54.5	66664	.....	.....	.....	.....
75.....	53.7	53.5	66665	.....	.....	.....	.....
100.....	50.0	49.7	66659	1.0274	65.7	1.02737	8
150.....	46.9	46.8	62365	.....	.....	.....	.....
200.....	44.4	44.3	66664	.....	.....	.....	.....
250.....	41.8	41.6	66665	.....	.....	.....	.....
300.....	40.8	40.5	66659	.....	.....	.....	.....
400.....	40.0	39.7	66656	.....	.....	.....	.....
500.....	39.6	39.7	63914	1.0280	60.0	1.02718	8

Station No. 91 (K 12). Lat. 39° 22′ 00″ N.; Long. 71° 30′ 00″ W. August 21, 1889, 1 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	74.8	74.8	6812	1.0242	76.5	1.02590	.....
5.....	72.5	72.2	66656	.....	.....	.....	.....
10.....	59.0	58.9	66664	.....	.....	.....	.....
15.....	47.4	47.2	66665	.....	.....	.....	.....
20.....	49.8	49.6	66737	.....	.....	.....	.....
25.....	57.2	51.1	66663	.....	.....	.....	.....
30.....	49.1	49.1	66724	.....	.....	.....	.....
40.....	51.0	50.8	66661	.....	.....	.....	.....
50.....	53.1	52.8	66659	.....	.....	.....	.....
75.....	53.0	53.1	63914	.....	.....	.....	.....
100.....	50.1	50.1	62365	1.0280	62.7	1.02755	8
150.....	45.4	45.5	63914	.....	.....	.....	.....
200.....	43.5	43.2	66659	.....	.....	.....	.....
250.....	41.7	41.6	66661	.....	.....	.....	.....
300.....	40.1	40.2	66724	.....	.....	.....	.....
400.....	39.6	39.5	66663	.....	.....	.....	.....
500.....	39.1	39.0	66737	1.0280	53.5	1.02644	8

Station No. 92 (H 12). Lat. 39° 22′ 00″ N.; Long. 71° 10′ 00″ W. August 21, 1889, 7 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	74.2	74.2	6812	1.0242	75.7	1.02576	.....
5.....	71.6	71.3	66656	.....	.....	.....	.....
10.....	62.3	62.2	66724	.....	.....	.....	.....
15.....	55.7	55.5	66665	.....	.....	.....	.....
20.....	54.0	53.7	66659	.....	.....	.....	.....
25.....	52.0	52.0	66664	.....	.....	.....	.....
30.....	52.1	51.9	66661	.....	.....	.....	.....
40.....	53.1	53.1	66724	.....	.....	.....	.....
50.....	54.5	54.4	66663	.....	.....	.....	.....
75.....	54.0	53.8	66737	.....	.....	.....	.....
100.....	53.0	52.8	62365	1.0282	62.4	1.02771	8
150.....	48.0	47.8	66656	.....	.....	.....	.....
200.....	43.1	42.9	66665	.....	.....	.....	.....
250.....	41.3	41.2	66737	.....	.....	.....	.....
300.....	41.0	40.9	66663	.....	.....	.....	.....
400.....	40.0	40.1	66724	.....	.....	.....	.....
500.....	39.4	39.3	66661	1.0298	58.8	1.02884	8

Station No. 93 (H 11). Lat. 39° 32′ 00″ N.; Long. 71° 10′ 00″ W. August 21, 1889, 10 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	73.4	73.4	6812	1.0240	75.2	1.02548	.....
5.....	71.0	70.8	66656	.....	.....	.....	.....
10.....	69.2	69.0	52728	.....	.....	.....	.....
15.....	60.5	60.5	63914	.....	.....	.....	.....
20.....	61.0	60.8	66659	.....	.....	.....	.....
25.....	48.0	47.7	66661	.....	.....	.....	.....
30.....	49.0	48.8	66665	.....	.....	.....	.....
40.....	51.7	51.5	66737	.....	.....	.....	.....
50.....	53.8	53.7	66663	.....	.....	.....	.....
75.....	54.0	54.0	66664	.....	.....	.....	.....
100.....	51.2	51.2	66724	1.0290	64.2	1.02876	8
150.....	47.6	47.4	66656	.....	.....	.....	.....
200.....	44.6	44.7	66724	.....	.....	.....	.....
250.....	41.8	41.7	66663	.....	.....	.....	.....
300.....	40.5	40.4	66737	.....	.....	.....	.....
400.....	39.9	39.7	66665	.....	.....	.....	.....
500.....	39.4	39.3	66661	1.0285	65.4	1.02843	8

RECORD OF SERIAL TEMPERATURES AND DENSITIES—Continued.

Station No. 94 (H 10). Lat. 39° 42′ 00″ N.; Long. 71° 10′ 00″ W. August 22, 1889, 1 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	72.9	72.9	6812	1.0242	74.3	1.02552	.....
5	72.0	71.7	66656	.....	.....	.....	.....
10	62.7	62.7	63914	.....	.....	.....	.....
15	47.3	47.1	66661	.....	.....	.....	.....
20	46.1	45.8	66659	.....	.....	.....	.....
25	46.8	46.6	66665	.....	.....	.....	.....
30	49.1	49.0	66737	.....	.....	.....	.....
40	50.0	49.9	66663	.....	.....	.....	.....
50	54.2	54.2	66664	.....	.....	.....	.....
75	54.3	54.3	66724	.....	.....	.....	.....
100	52.0	52.0	62365	1.0273	66.5	1.02739	8
150	47.0	46.7	66659	.....	.....	.....	.....
200	45.2	45.0	66665	.....	.....	.....	.....
250	42.2	42.1	66737	.....	.....	.....	.....
300	41.0	40.9	66663	.....	.....	.....	.....
400	40.0	39.9	66664	.....	.....	.....	.....
500	39.3	39.4	66724	1.0274	64.0	1.02713	8

Station No. 95 (H 9). Lat. 39° 51′ 00″ N.; Long. 71° 10′ 00″ W. August 22, 1889, 4 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	72.0	72.0	6812	1.0242	73.5	1.02538	.....
5	71.3	71.0	66656	.....	.....	.....	.....
10	70.3	70.3	62365	.....	.....	.....	.....
15	52.0	52.1	66724	.....	.....	.....	.....
20	47.5	47.5	66664	.....	.....	.....	.....
25	48.0	47.9	66663	.....	.....	.....	.....
30	50.1	49.9	66737	.....	.....	.....	.....
40	57.0	56.8	66665	.....	.....	.....	.....
50	55.7	55.4	66659	.....	.....	.....	.....
75	53.3	53.1	66661	.....	.....	.....	.....
100	50.0	50.1	63914	1.0282	63.2	1.02782	8
150	45.2	45.1	66663	.....	.....	.....	.....
200	43.4	43.3	66737	.....	.....	.....	.....
250	41.0	40.8	66665	.....	.....	.....	.....
300	40.0	39.7	66659	.....	.....	.....	.....
400	39.8	39.7	66661	.....	.....	.....	.....
450	39.4	39.5	63914	.....	.....	.....	.....
453	.....	.....	5320	1.0278	58.6	1.02681	8

Station No. 96 (H 8). Lat. 40° 2′ 00″ N.; Long. 71° 10′ 00″ W. August 22, 1889, 7 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	70.8	70.8	6812	1.0242	72.2	1.02518	.....
5	64.5	64.4	66656	.....	.....	.....	.....
10	67.2	67.0	52728	.....	.....	.....	.....
15	58.0	58.0	66724	.....	.....	.....	.....
20	57.0	57.0	62365	.....	.....	.....	.....
25	52.2	52.2	66664	.....	.....	.....	.....
30	55.6	55.5	66663	.....	.....	.....	.....
40	48.7	48.5	66737	.....	.....	.....	.....
50	47.5	47.3	66665	.....	.....	.....	.....
75	55.0	54.7	66659	.....	.....	.....	.....
100	50.5	50.3	66661	.....	.....	.....	.....
150	46.3	46.4	63914	.....	.....	.....	.....
160	.....	.....	5320	1.0276	64.8	1.02744	8

Station No. 97 (G 7). Lat. 40° 12′ 00″ N.; Long. 71° 3′ 00″ W. August 22, 1889, 9 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	71.8	71.8	6812	1.0240	73.4	1.02517	.....
5	57.0	56.9	66656	.....	.....	.....	.....
10	55.3	55.0	52728	.....	.....	.....	.....
15	52.0	52.0	66664	.....	.....	.....	.....
20	51.6	51.5	66663	.....	.....	.....	.....
25	50.2	50.0	66737	.....	.....	.....	.....
30	47.6	47.4	66665	.....	.....	.....	.....
40	47.0	46.7	66659	.....	.....	.....	.....
50	47.1	47.0	66661	.....	.....	.....	.....
75	50.6	50.7	63914	.....	.....	.....	.....
87	.....	.....	5320	1.0278	64.7	1.02763	8

Station No. 98 (H 6). Lat. 40° 22′ 00″ N.; Long. 71° 6′ 00″ W. August 22, 1889, 11 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	72.0	72.0	6812	1.0241	73.8	1.02533	.....
5	68.0	67.9	66656	.....	.....	.....	.....
10	64.0	63.9	*66664	.....	.....	.....	.....
15	57.2	57.2	63914	.....	.....	.....	.....
20	56.1	56.0	66661	.....	.....	.....	.....
25	48.1	47.8	66659	.....	.....	.....	.....
30	47.0	46.8	66665	.....	.....	.....	.....
40	45.4	45.3	66737	.....	.....	.....	.....
50	45.0	44.9	66663	.....	.....	.....	.....
52	.....	.....	5320	1.0262	64.2	1.02596	8

Station No. 99 (H 5). Lat. 40° 32′ 00″ N.; Long. 71° 10′ 00″ W. August 22, 1889, 2 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	73.2	73.2	6812	1.0237	73.7	1.02492	.....
5	71.3	71.0	66656	.....	.....	.....	.....
10	67.6	67.6	63914	.....	.....	.....	.....
15	65.3	65.2	66661	.....	.....	.....	.....
20	51.0	50.7	66659	.....	.....	.....	.....
25	47.1	46.9	66665	.....	.....	.....	.....
30	46.3	46.1	66737	.....	.....	.....	.....
40	45.5	45.4	66663	.....	.....	.....	.....
45	.....	.....	5320	1.0264	64.6	1.02621	8

Station No. 100 (H 4). Lat. 40° 42′ 00″ N.; Long. 70° 14′ 00″ W. August 22, 1889, 7 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	72.8	72.8	6812	1.0238	73.6	1.02500	.....
5	71.7	71.4	66656	.....	.....	.....	.....
10	65.0	64.9	66664	.....	.....	.....	.....
15	51.5	51.3	66661	.....	.....	.....	.....
20	47.0	46.8	66659	.....	.....	.....	.....
25	45.0	44.9	*66663	.....	.....	.....	.....
30	44.2	44.1	66737	.....	.....	.....	.....
39	45.3	45.2	*66663	1.0270	57.2	1.02584	8

Station No. 101 (H 3). Lat. 40° 52′ 00″ N.; Long. 71° 15′ 00″ W. August 22, 1889, 12 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	70.6	70.6	6812	1.0239	71.8	1.02481	.....
5	69.6	69.3	66656	.....	.....	.....	.....
10	56.1	55.9	66661	.....	.....	.....	.....
15	51.0	50.7	66659	.....	.....	.....	.....
20	46.2	46.1	66664	.....	.....	.....	.....
25	45.0	44.9	66737	.....	.....	.....	.....
30	45.4	45.3	66663	.....	.....	.....	.....
32	.....	.....	5320	1.0264	56.8	1.02520	8

* Thermometer did not reverse.

RECORD OF SERIAL TEMPERATURES AND DENSITIES—Continued.

Station No. 102 (J 1). Lat. 41° 12′ 00″ N.; Long. 71° 20′ 00″ W. August 27, 1889, 9 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	64.5	64.5	6812	1.0246	63.4	1.02425	.....
5	64.0	63.9	66656	.....	.....	.....	.....
10	63.7	63.6	66664	.....	.....	.....	.....
15	54.8	54.6	66737	.....	.....	.....	.....
20	53.0	52.9	66663	.....	.....	.....	.....
22	.....	.....	5320	1.0262	60.0	1.02538	8

Station No. 103 (J 2). Lat. 41° 2′ 00″ N.: Long. 71° 2′ 0″ 00 W. August 27, 1889, 11 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	64.3	64.3	6812	1.0244	60.3	1.02362	.....
5	64.3	64.2	66656	.....	.....	.....	.....
10	64.0	63.9	66661	.....	.....	.....	.....
15	61.8	61.6	66659	.....	.....	.....	.....
20	55.4	55.4	66664	.....	.....	.....	.....
25	51.3	51.1	66737	.....	.....	.....	.....
30	50.2	50.1	66663	1.0259	61.0	1.02521	8

Station No. 104 (K 1). Lat. 41° 12′ 00″ N.; Long. 71° 30′ 00″ W. August 31, 1889, 12 m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	67.3	67.3	6812	1.0240	69.4	1.02453	.....
5	64.7	64.6	66656	.....	.....	.....	.....
13	64.5	64.4	66663	.....	.....	.....	.....
20	64.0	64.0	66737	1.0241	70.8	1.02485	8

Station No. 105 (K 2). Lat. 41° 2′ 00″ N.; Long. 71° 31′ 15″ W. August 31, 1889, 6 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	68.2	68.2	6812	1.0240	69.1	1.02448	.....
5	66.0	65.9	66656	.....	.....	.....	.....
10	63.6	63.6	66737	.....	.....	.....	.....
15	62.0	61.8	66659	.....	.....	.....	.....
20	56.3	56.2	66663	.....	.....	.....	.....
25	51.7	51.7	66664	.....	.....	.....	.....
26	.....	.....	5320	1.0252	61.6	1.02459	8

Station No. 106 (K 3). Lat. 40° 52′ 00″ N.; Long. 71° 30′ 00″ W. August 31, 1889, 9 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	67.2	67.2	6812	1.0241	68.7	1.02452	.....
5	66.8	66.7	66656	.....	.....	.....	.....
10	66.8	66.7	66661	.....	.....	.....	.....
15	61.8	61.6	66659	.....	.....	.....	.....
20	51.2	51.2	66664	.....	.....	.....	.....
25	56.3	56.2	66663	.....	.....	.....	.....
30	47.0	46.9	66737	.....	.....	.....	.....
34	.....	.....	5320	1.0256	60.0	1.02468	8

Station No. 107 (K 4). Lat. 40° 42′ 00″ N.; Long. 71° 30′ 00″ W. August 31, 1889, 11 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	67.2	67.2	6812	1.0241	68.2	1.02445	.....
5	69.0	68.7	66656	.....	.....	.....	.....
10	66.0	65.7	66665	.....	.....	.....	.....
15	64.3	64.2	66661	.....	.....	.....	.....
20	53.4	53.1	66659	.....	.....	.....	.....
25	47.0	47.0	66664	.....	.....	.....	.....
30	53.4	53.3	66663	.....	.....	.....	.....
35	46.0	45.9	66737	.....	.....	.....	.....
36	.....	.....	5320	1.0262	57.0	1.02502	8

Station No. 108 (K 5). Lat. 40° 32′ 00″ N.; Long. 71° 30′ 00″ W. August 31, 1889, 12 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	66.5	66.5	6812	1.0246	68.0	1.02492	.....
5	65.8	65.7	66656	.....	.....	.....	.....
10	66.2	65.9	66665	.....	.....	.....	.....
15	65.2	65.1	66661	.....	.....	.....	.....
20	51.5	51.2	66659	.....	.....	.....	.....
25	49.4	49.4	66664	.....	.....	.....	.....
30	51.8	51.6	66737	.....	.....	.....	.....
35	45.7	45.6	66663	.....	.....	.....	.....
37	.....	.....	5320	1.0263	63.4	1.02595	8

Station No. 109 (J 3). Lat. 40° 52′ 00″ N.; Long. 71° 20′ 00″ W. September 1, 1889, 12 m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	65.3	65.3	6812	1.0248	67.0	1.02497	.....
5	64.3	64.2	66656	.....	.....	.....	.....
10	64.3	64.0	66665	.....	.....	.....	.....
15	58.6	58.5	66661	.....	.....	.....	.....
20	59.8	59.6	66659	.....	.....	.....	.....
25	56.0	56.0	66664	.....	.....	.....	.....
30	52.6	52.4	66737	.....	.....	.....	.....
35	47.5	47.4	66663	1.0261	57.5	1.02498	8

Station No. 110 (J 4). Lat. 40° 42′ 00″ N.; Long. 71° 20′ 00″ W. September 1, 1889, 2 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	67.4	67.4	6812	1.0246	68.6	1.02501	.....
5	67.2	67.1	66656	.....	.....	.....	.....
10	66.0	65.7	66665	.....	.....	.....	.....
15	58.0	57.9	66661	.....	.....	.....	.....
20	51.1	50.8	66659	.....	.....	.....	.....
25	46.1	46.0	66664	.....	.....	.....	.....
30	46.0	45.8	66737	.....	.....	.....	.....
33	46.0	45.9	66663	.....	.....	.....	.....
34	.....	.....	5320	1.0264	51.2	1.02461	8

Station No. 111 (J 5). Lat. 40° 32′ 00″ N.; Long. 71° 20′ 00″ W. September 1, 1889, 3 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	67.1	67.1	6812	1.0245	67.5	1.02474	.....
5	66.0	65.9	66656	.....	.....	.....	.....
10	66.0	65.7	66665	.....	.....	.....	.....
15	66.4	66.3	66661	.....	.....	.....	.....
20	64.0	63.8	66659	.....	.....	.....	.....
25	53.5	53.5	66664	.....	.....	.....	.....
30	48.9	48.7	66737	.....	.....	.....	.....
40	47.6	47.5	66663	1.0265	57.2	1.02534	8

Station No. 112 (J 6). Lat. 40° 22′ 00″ N.; Long. 71° 20′ 00″ W. September 1, 1889, 5 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	66.0	66.0	6812	1.0252	67.3	1.02541	.....
5	66.2	66.1	66656	.....	.....	.....	.....
10	65.7	65.4	66665	.....	.....	.....	.....
15	64.2	64.1	66661	.....	.....	.....	.....
20	63.0	62.8	66659	.....	.....	.....	.....
25	49.2	49.2	66664	.....	.....	.....	.....
30	48.0	47.8	66737	.....	.....	.....	.....
40	46.0	45.9	66663	.....	.....	.....	.....
43	.....	.....	5320	1.0260	54.0	1.02449	8

RECORD OF SERIAL TEMPERATURES AND DENSITIES—Continued.

Station No. 113 (J 7). Lat. 40° 12′ 00″ N.; Long. 71° 20′ 00″ W. September 1, 1889, 7 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	67.5	67.5	6812	1.0254	68.2	1.02575	.....
5	68.2	67.9	66656	.....	.....	.....	.....
10	67.8	67.8	63914	.....	.....	.....	.....
15	68.0	67.7	*66665	.....	.....	.....	.....
20	59.8	59.7	66661	.....	.....	.....	.....
25	52.2	52.0	66659	.....	.....	.....	.....
30	49.5	49.5	66664	.....	.....	.....	.....
40	49.8	49.7	66737	.....	.....	.....	.....
47	46.2	46.1	66663	.....	.....	.....	.....
48	.....	.....	5320	1.0260	54.8	1.02457	8

Station No. 114 (H 1). Lat. 41° 12′ 00″ N.; Long. 71° 1′ 00″ W. September 2, 1889, 11 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	65.2	65.2	6812	1.0246	66.4	1.02468	.....
5	64.1	64.0	66656	.....	.....	.....	.....
10	62.7	62.6	66664	.....	.....	.....	.....
15	61.2	61.2	66737	.....	.....	.....	.....
20	56.1	56.0	66663	.....	.....	.....	.....
23	.....	.....	5320	1.0260	61.6	1.02539	8

Station No. 115 (H 2). Lat. 41° 2′ 00″ N.; Long. 71° 10′ 00″ W. September 3, 1889, 1 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	65.5	65.5	6812	1.0244	67.0	1.02457	.....
5	64.8	64.7	66656	.....	.....	.....	.....
10	64.6	64.4	66659	.....	.....	.....	.....
15	57.1	57.0	66664	.....	.....	.....	.....
20	55.0	54.8	66737	.....	.....	.....	.....
25	51.6	51.5	66663	.....	.....	.....	.....
27	.....	.....	5320	1.0260	57.7	1.02490	8

Station No. 116 (H 3). Lat. 40° 52′ 00″ N.; Long. 71° 10′ 00″ W. September 3, 1889, 4 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	65.1	65.1	6812	1.0251	66.5	1.02519	.....
5	65.4	65.3	66656	.....	.....	.....	.....
10	64.0	63.9	66661	.....	.....	.....	.....
15	60.2	60.1	66663	.....	.....	.....	.....
20	52.2	52.0	66737	.....	.....	.....	.....
25	49.2	49.2	66664	.....	.....	.....	.....
30	47.6	47.3	66659	.....	.....	.....	.....
32	.....	.....	5320	1.0260	63.7	1.02569	8

Station No. 117 (H 4). Lat. 40° 42′ 00″ N.; Long. 71° 10′ 00″ W. September 3, 1889, 7 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	65.7	65.7	6812	1.0250	66.7	1.02512	.....
5	66.0	65.9	*66656	.....	.....	.....	.....
10	56.8	56.6	66661	.....	.....	.....	.....
15	50.3	50.2	66663	.....	.....	.....	.....
20	48.4	48.2	66737	.....	.....	.....	.....
25	47.5	47.5	66664	.....	.....	.....	.....
30	47.0	46.7	66659	.....	.....	.....	.....
33	.....	.....	5320	1.0261	57.9	1.02503	8

Station No. 118 (H 5). Lat. 40° 31′ 00″ N.; Long. 71° 10′ 00″ W. September 3, 1889, 11 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	67.8	67.8	6812	1.0248	68.7	1.02522	.....
5	66.4	66.3	66656	.....	.....	.....	.....
10	65.7	65.6	66665	.....	.....	.....	.....
15	60.3	60.2	66661	.....	.....	.....	.....
20	50.5	50.4	66663	.....	.....	.....	.....
25	48.6	48.4	66737	.....	.....	.....	.....
30	46.8	46.7	66664	.....	.....	.....	.....
40	46.6	46.3	66659	.....	.....	.....	.....
40½	.....	.....	5320	1.0268	57.0	1.02562	8

Station No. 119 (H 6). Lat. 40° 22′ 00″ N.; Long. 71° 10′ 00″ W. September 3, 1889, 3 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	67.6	67.6	6812	1.0243	69.4	1.02483	.....
5	67.0	66.7	66656	.....	.....	.....	.....
10	67.5	67.5	63914	.....	.....	.....	.....
15	66.0	65.7	66665	.....	.....	.....	.....
20	57.2	57.1	66661	.....	.....	.....	.....
25	55.0	54.9	66663	.....	.....	.....	.....
30	52.0	51.8	66737	.....	.....	.....	.....
40	45.2	45.1	66664	.....	.....	.....	.....
48	46.0	45.7	66659	.....	.....	.....	.....
49	.....	.....	5320	1.0260	59.7	1.02514	8

Station No. 120 (H 7). Lat. 40° 12′ 00″ N.; Long. 71° 10′ 00″ W. September 3, 1889, 10 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	70.2	70.2	6812	1.0249	70.6	1.02562	.....
5	70.0	69.7	66656	.....	.....	.....	.....
10	70.4	70.2	52728	.....	.....	.....	.....
15	64.9	64.9	63914	.....	.....	.....	.....
20	54.0	53.8	66665	.....	.....	.....	.....
25	49.3	49.1	66661	.....	.....	.....	.....
30	49.0	48.9	66663	.....	.....	.....	.....
40	46.6	46.5	66737	.....	.....	.....	.....
50	49.0	49.0	66664	.....	.....	.....	.....
75	50.9	50.6	66659	.....	.....	.....	.....
76	.....	.....	5320	1.0280	58.0	1.02694	8

Station No. 121 (H 8). Lat. 40° 2′ 00″ N.; Long. 71° 10′ 00″ W. September 4, 1889, 2 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	69.6	69.6	6812	1.0253	69.6	1.02586	.....
5	70.3	70.0	66656	.....	.....	.....	.....
10	66.2	66.0	52728	.....	.....	.....	.....
15	60.2	60.2	*63914	.....	.....	.....	.....
20	48.3	48.1	66665	.....	.....	.....	.....
25	48.0	47.7	66660	.....	.....	.....	.....
30	46.3	46.2	66661	.....	.....	.....	.....
40	47.0	46.8	66737	.....	.....	.....	.....
50	50.0	50.0	66664	.....	.....	.....	.....
75	52.0	51.7	66659	.....	.....	.....	.....
100	50.5	50.5	66664	.....	.....	.....	.....
145	46.1	45.8	66659	.....	.....	.....	.....
151	.....	.....	5320	1.0276	59.1	1.02667	8

Station No. 122 (H 10). Lat. 39° 42′ 00″ N.; Long. 71° 13′ 00″ W. September 4, 1889, 8 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	72.2	72.2	6812	1.0242	73.2	1.02534	.....
5	69.8	69.5	66656	.....	.....	.....	.....
10	68.0	68.0	66724	.....	.....	.....	.....
15	58.3	57.9	52728	.....	.....	.....	.....
20	53.9	54.0	63914	.....	.....	.....	.....
25	50.0	49.8	66665	.....	.....	.....	.....
30	52.2	52.0	66661	.....	.....	.....	.....
40	55.2	55.1	66663	.....	.....	.....	.....
50	54.0	53.8	66737	.....	.....	.....	.....
75	51.0	51.0	66664	.....	.....	.....	.....
100	47.8	47.5	66659	1.0274	59.9	1.02657	8
150	47.0	46.8	66665	.....	.....	.....	.....
200	42.2	42.1	66661	.....	.....	.....	.....
250	40.7	40.6	66663	.....	.....	.....	.....
300	39.9	39.8	66737	.....	.....	.....	.....
400	39.8	39.7	66664	.....	.....	.....	.....
500	39.1	38.8	66659	1.0275	60.0	1.02668	8

* Thermometer did not reverse.

RECORD OF SERIAL TEMPERATURES AND DENSITIES—Continued.

Station No. 123 (H 11). Lat. 39° 32′ 00″ N.; Long. 71° 10′ 00″ W. September 4, 1889, 11 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	69.9	69.9	6812	1.0244	71.8	1.02531	.....
5.....	70.1	69.8	66656	.....	.....	.....	.....
10.....	68.5	68.5	62365	.....	.....	.....	.....
15.....	62.0	61.9	66724	.....	.....	.....	.....
20.....	57.2	56.8	52728	.....	.....	.....	.....
25.....	51.8	51.8	66664	.....	.....	.....	.....
30.....	50.3	50.1	66737	.....	.....	.....	.....
40.....	54.8	54.7	66663	.....	.....	.....	.....
50.....	55.8	55.6	66661	.....	.....	.....	.....
75.....	53.0	52.8	66665	.....	.....	.....	.....
100.....	49.8	49.9	63914	1.0280	60.1	1.02719	8
150.....	54.2	54.0	66665	.....	.....	.....	.....
200.....	44.3	44.2	66661	.....	.....	.....	.....
250.....	42.1	42.0	66663	.....	.....	.....	.....
300	40.2	40.1	66737	.....	.....	.....	.....
400.....	40.1	40.0	66664	.....	.....	.....	.....
500.....	39.4	39.2	66665	1.0270	65.9	1.02700	8

Station No. 124 (H 12). Lat, 39° 22′ 00″ N.; Long. 71° 10′ 00″ W. September 5, 1889, 3 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	69.1	69.1	6812	1.0248	70.8	1.02555	.....
5.....	69.1	68.8	66656	.....	.....	.....	.....
10.....	68.8	68.8	66724	.....	.....	.....	.....
15.....	58.0	57.6	52728	.....	.....	.....	.....
20.....	54.5	54.5	66664	.....	.....	.....	.....
25.....	50.7	50.5	66737	.....	.....	.....	.....
30.....	49.8	49.7	66663	.....	.....	.....	.....
40.....	54.0	53.8	66661	.....	.....	.....	.....
50.....	54.5	54.3	66665	.....	.....	.....	.....
75.....	53.8	53.9	63914	.....	.....	.....	.....
100.....	51.3	51.0	66659	1.0276	62.6	1.02713	8
150.....	46.6	46.5	66737	.....	.....	.....	.....
200.....	44.0	43.9	66663	.....	.....	.....	.....
250.....	41.3	41.2	66661	.....	.....	.....	.....
300.....	40.5	40.3	66665	.....	.....	.....	.....
400.....	39.7	39.8	63914	.....	.....	.....	.....
500.....	39.6	39.3	66659	1.0270	63.8	1.02670	8

Station No. 125 (G 12). Lat. 39° 29′ 00″ N.; Long. 71° 5′ 00″ W. September 5, 1889, 6 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface	69.5	69.5	6812	1.0247	71.3	1.02538	.....
5.....	69.7	69.4	66656	.....	.....	.....	.....
10.....	70.0	69.8	52728	.....	.....	.....	.....
15.....	54.0	54.0	66724	.....	.....	.....	.....
20.....	46.7	46.6	66664	.....	.....	.....	.....
25.....	47.5	47.4	66737	.....	.....	.....	.....
30.....	48.8	48.7	66663	.....	.....	.....	.....
40.....	51.1	50.9	66661	.....	.....	.....	.....
50.....	53.2	53.0	66665	.....	.....	.....	.....
75.....	53.0	53.1	63914	.....	.....	.....	.....
100.....	50.4	50.1	66659	1.0276	64.2	1.02736	8
150.....	46.0	45.9	66737	.....	.....	.....	.....
200.....	43.7	43.6	66663	.....	.....	.....	.....
250.....	41.6	41.5	66661	.....	.....	.....	.....
300.....	40.3	40.1	66665	.....	.....	.....	.....
400.....	39.6	39.7	63914	.....	.....	.....	.....
500.....	39.3	39.0	66659	1.0276	61.4	1.02696	8

Station No. 126 (G 11). Lat. 39° 39′ 00″ N.; Long. 71° 5′ 00″ W. September 5, 1889, 9 a. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	70.3	70.3	6812	1.0244	73.0	1.02376	.....
5.....	69.3	69.0	66656	.....	.....	.....	.....
10.....	68.8	68.6	52728	.....	.....	.....	.....
15.....	56.2	56.2	66664	.....	.....	.....	.....
20.....	52.7	52.5	66737	.....	.....	.....	.....
25.....	50.5	50.4	66663	.....	.....	.....	.....
30.....	57.8	57.7	66661	.....	.....	.....	.....
40.....	56.2	56.2	66664	.....	.....	.....	.....
50.....	56.0	55.8	66665	.....	.....	.....	.....
75.....	52.7	52.8	63914	.....	.....	.....	.....
100.....	50.1	49.8	66659	1.0274	64.7	1.02723	8
150.....	46.0	45.9	66737	.....	.....	.....	.....
200.....	42.7	42.6	66663	.....	.....	.....	.....
250.....	41.0	40.9	66661	.....	.....	.....	.....
300.....	40.0	39.8	66665	.....	.....	.....	.....
400.....	39.6	39.7	63914	.....	.....	.....	.....
500.....	39.3	39.0	66659	1.0273	61.3	1.02665	8

Station No. 127 (G 10). Lat. 39° 49′ 00″ N.; Long. 71° 3′ 00″ W. September 5, 1889, 12 m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	70.1	70.1	6812	1.0245	73.3	1.02565	.....
5.....	69.0	68.7	66656	.....	.....	.....	.....
10.....	69.0	69.0	66724	.....	.....	.....	.....
15.....	56.0	55.6	52728	.....	.....	.....	.....
20.....	53.0	53.0	66664	.....	.....	.....	.....
25.....	50.0	49.8	66737	.....	.....	.....	.....
30	50.5	50.4	66663	.....	.....	.....	.....
40.....	52.5	53.3	66661	.....	.....	.....	.....
50.....	53.3	53.1	66665	.....	.....	.....	.....
75.....	51.2	51.3	63914	.....	.....	.....	.....
100.....	48.6	48.3	66659	1.0276	59.6	1.02673	8
150.....	44.1	44.0	66737	.....	.....	.....	.....
200.....	41.7	41.6	66663	.....	.....	.....	.....
250.....	40.7	40.6	66661	.....	.....	.....	.....
300.....	39.9	39.7	66665	.....	.....	.....	.....
400.....	39.3	39.4	63914	.....	.....	.....	.....
500.....	39.3	39.0	66659	1.0274	59.7	1.02654	8

Station No. 128 (G 9). Lat. 39° 52′ 00″ N.; Long. 71° 00′ 00″ W. September 5, 1889, 2 p. m.

Depth (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	72.3	72.3	6812	1.0246	75.4	1.02611	.....
5.....	72.2	71.9	66656	.....	.....	.....	.....
10.....	72.3	72.3	66724	.....	.....	.....	.....
15.....	58.0	57.6	52728	.....	.....	.....	.....
20.....	53.3	53.3	66664	.....	.....	.....	.....
25.....	50.6	50.4	63737	.....	.....	.....	.....
30.....	49.7	49.6	66663	.....	.....	.....	.....
40.....	52.0	51.8	66661	.....	.....	.....	.....
50.....	54.0	53.8	66665	.....	.....	.....	.....
75.....	51.0	51.1	63914	.....	.....	.....	.....
100.....	48.4	48.1	66659	1.0273	63.5	1.02696	8
150.....	46.0	45.9	66737	.....	.....	.....	.....
200	45.0	44.9	66663	.....	.....	.....	.....
250.....	41.4	41.3	66661	.....	.....	.....	.....
300.....	40.9	40.7	66665	.....	.....	.....	.....
400.....	39.5	39.6	63914	.....	.....	.....	.....
465.....	39.3	39.0	66659	.....	.....	.....	.....
472.....	.....	.....	5320	1.0277	51.5	1.02594	8

RECORD OF SERIAL TEMPERATURES AND DENSITIES—Continued.

Station No. 129 (G 8). Lat. 40° 2′ 00″ N.; Long. 71° 2′ 00″ W. September 5, 1889, 5 p. m.

Depth. (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	73.3	73.3	6812	1.0243	74.6	1.02567	.....
5	72.0	71.7	66656	.....	.....	.....	.....
10	73.0	73.0	62365	.....	.....	.....	.....
15	71.0	71.0	*66724	.....	.....	.....	.....
20	62.0	61.6	52728	.....	.....	.....	.....
25	57.3	57.2	66664	.....	.....	.....	.....
30	57.3	57.1	66737	.....	.....	.....	.....
40	52.0	51.9	66663	.....	.....	.....	.....
50	53.1	52.9	66661	.....	.....	.....	.....
75	51.2	51.0	66665	.....	.....	.....	.....
100	48.4	48.5	63914	.....	.....	.....	.....
150	46.0	45.7	66659	.....	.....	.....	.....
157	.....	.....	5320	1.0274	59.2	1.02648	8

Station No. 130 (G 7). Lat. 40° 13′ 00″ N.; Long. 71° 1′ 30″ W. September 5, 1889, 7 p. m.

Depth. (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	72.9	72.9	6812	1.0254	74.5	1.02676	.....
5	72.0	71.7	66656	.....	.....	.....	.....
10	73.0	73.0	66724	.....	.....	.....	.....
15	70.0	69.8	52728	.....	.....	.....	.....
20	51.0	51.0	66664	.....	.....	.....	.....
25	66.0	66.0	66737	.....	.....	.....	.....
30	56.0	55.9	66663	.....	.....	.....	.....
40	49.7	49.5	66661	.....	.....	.....	.....
50	54.2	54.0	66665	.....	.....	.....	.....
70	49.3	49.4	63914	.....	.....	.....	.....
74	.....	.....	5320	1.0272	61.6	1.02659	8

Station No. 131 (G 6). Lat. 40° 22′ 00″ N.; Long. 71° 1′ 00″ W. September 5, 1889, 9 p. m.

Depth. (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	73.0	73.0	6812	1.0254	74.0	1.02667	.....
5	73.0	72.7	66656	.....	.....	.....	.....
10	73.0	72.8	66664	.....	.....	.....	.....
15	72.8	72.8	66737	.....	.....	.....	.....
20	55.9	55.8	66663	.....	.....	.....	.....
25	48.0	47.8	66661	.....	.....	.....	.....
30	47.3	47.1	66665	.....	.....	.....	.....
40	47.6	47.7	63914	.....	.....	.....	.....
50	47.0	46.7	66659	.....	.....	.....	.....
52	.....	.....	5320	1.0261	63.1	1.02571	8

Station No. 132 (G 5). Lat. 40° 32′ 00″ N.; Long. 71° 00′ 00″ W. September 5, 1889, 12 p. m.

Depth. (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	68.5	68.5	6812	1.0248	70.8	1.02555	.....
5	68.5	68.2	66656	.....	.....	.....	.....
10	67.5	67.5	66737	.....	.....	.....	.....
15	65.2	65.1	66663	.....	.....	.....	.....
20	54.2	54.0	66661	.....	.....	.....	.....
25	50.0	49.8	66665	.....	.....	.....	.....
30	48.0	48.1	63914	.....	.....	.....	.....
40	46.8	46.5	66659	.....	.....	.....	.....
42	.....	.....	5320	1.0261	61.3	1.02545	8

Station No. 133 (G 4). Lat. 40° 42′ 00″ N.; Long. 71° 00′ 00″ W. September 6, 1889, 2 a. m.

Depth. (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	67.6	67.6	6812	1.0252	69.5	1.02575	.....
5	67.7	67.4	66656	.....	.....	.....	.....
10	67.1	67.1	66737	.....	.....	.....	.....
15	60.5	60.4	66663	.....	.....	.....	.....
20	52.2	52.0	66661	.....	.....	.....	.....
25	50.5	50.3	66665	.....	.....	.....	.....
30	48.4	48.5	63914	.....	.....	.....	.....
35	46.5	46.2	66659	.....	.....	.....	.....
37	.....	.....	5320	1.0264	57.7	1.02530	8

Station No. 134 (G 3). Lat. 40° 51′ 00″ N.; Long. 71° 00′ 00″ W. September 6, 1889, 5 a. m.

Depth. (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	67.1	67.1	6812	1.0250	68.7	1.02542	.....
5	66.2	66.1	66656	.....	.....	.....	.....
10	64.3	64.2	66663	.....	.....	.....	.....
15	56.0	55.8	66661	.....	.....	.....	.....
20	50.1	49.9	66665	.....	.....	.....	.....
25	49.3	49.4	63914	.....	.....	.....	.....
30	46.0	45.7	66659	.....	.....	.....	.....
31	.....	.....	5320	1.0255	62.3	1.02499	8

Station No. 135 (G 2). Lat. 41° 00′ 00″ N.; Long. 71° 00′ 00″ W. September 6, 1889, 8 a. m.

Depth. (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	67.0	67.0	6812	1.0245	69.6	1.02506	.....
5	66.0	65.9	66656	.....	.....	.....	.....
10	64.3	64.2	66661	.....	.....	.....	.....
15	56.6	56.4	66665	.....	.....	.....	.....
20	52.0	52.1	63914	.....	.....	.....	.....
25	50.2	49.9	66659	.....	.....	.....	.....
27	.....	.....	5320	1.0256	59.6	1.02473	8

Station No. 136 (G 2). Lat. 41° 9′ 00″ N.; Long. 71° 00′ 00″ W. September 6, 1889, 12 m.

Depth. (fath.).	Temperature. Obs.	Corr.	Therm. No.	Specific Gravity. Obs.	Temp.	Reduced.	Cup No.
Surface.	68.0	68.0	6812	1.0242	69.8	1.02480	.....
5	63.1	63.0	66656	.....	.....	.....	.....
10	56.2	56.3	63914	.....	.....	.....	.....
15	56.3	56.0	66659	.....	.....	.....	.....
19	.....	.....	5320	1.0252	63.3	1.02483	8

* Thermometer did not reverse.

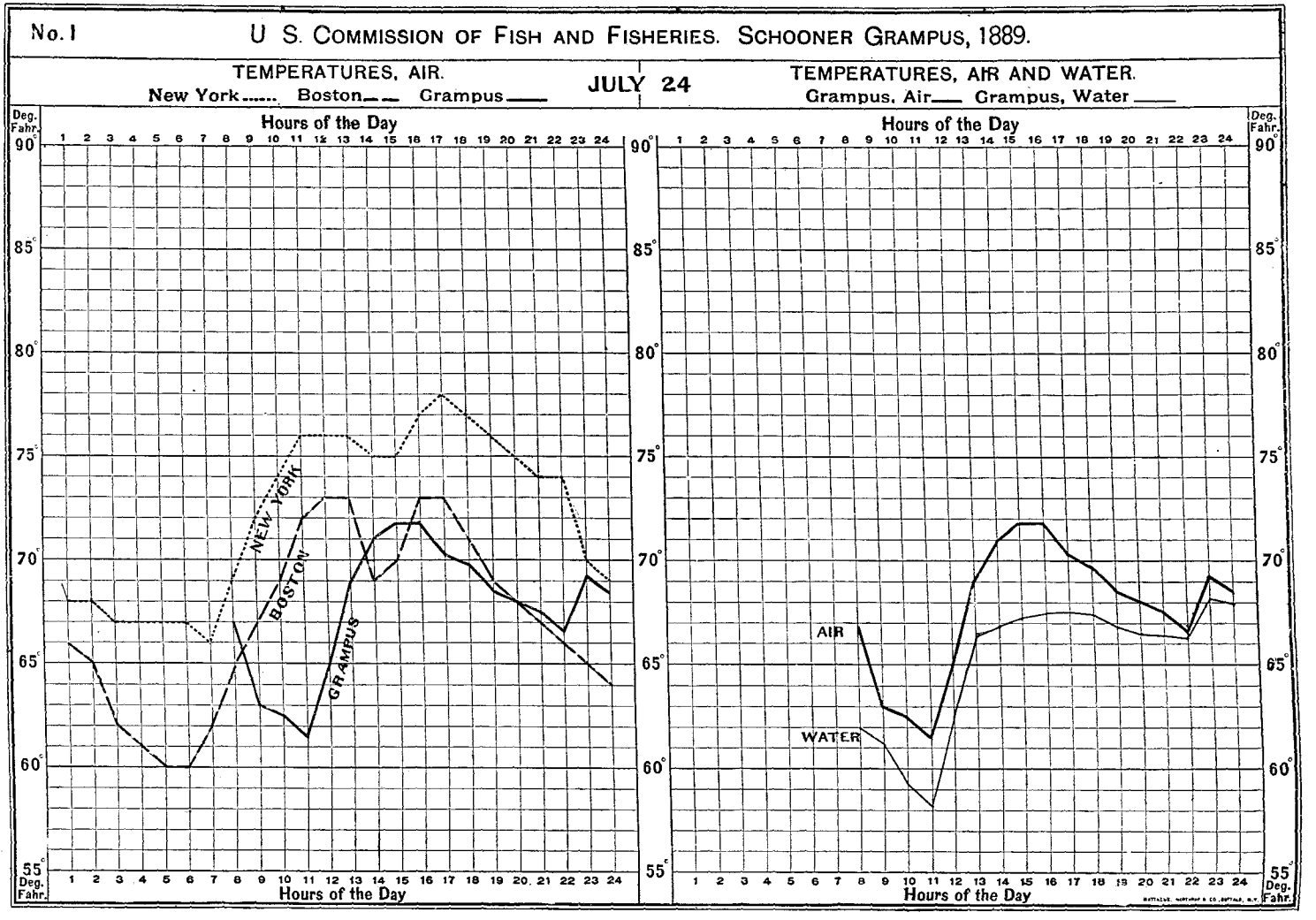
TABLE 1.

Date, July 24, 1889. Solar radiation thermometer, 135° F. Maximum temperature, 72.8° F. Six's, 71.2° F.
Terrestrial radiation thermometer, 58° F. Minimum temperature, 61.8° F. Six's, 62° F.

Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	t.	=32°.	0—10.	Upper.	Lower.	Direction.	Force.			
																		In.		
A. 2, No. 1	41° 7′ 0″ N., 70° 0′ 0″ W.	8	.....	61.9	67.2	67.4	61.9	5.5	71.4	29.968	77.6	29.838	0	.....	.....	NW. by W.	3	0	Calm.....	Libbey.
		9	.....	61.3	63.1	62.6	60.0	2.6	85.7	29.972	68.0	29.866	1	.....	Str	W. by S.	3	...	...do	Do.
A. 3, No. 2*	40° 56′ 0″ N., 70° 0′ 0″ W.	10	.....	59.4	62.6	62.5	59.8	2.7	85.5	30.012	66.8	29.911	1	.....	Str	W. by S.	2	....	...do	Do.
		11	.....	58.3	61.4	61.1	58.8	2.3	85.3	30.008	71.3	29.894	1	.....	Str. cu.	S. by W.	2	....	...do	Do.
A. 4, No. 3	40° 46′ 39″ N., 70° 0′ 0″ W.	12	L. 0–18	62.8	65.1	65.0	62.1	2.9	83.6	30.030	67.5	29.927	1	.....	Str. cu.	NW. by W.	3	....	...do	Do.
		13	.....	66.3.	69.0	69.4	64.2	5.2	74.8	30.026	70.3	29.915	2	.....	Str. cu.	WNW.	3	....	Mod. sw.	Rockwood.
A. 5, No. 4	40° 35′ 0″ N., 70° 0′ 0″ W.	14	.....	66.9	71.2	71.5	66.0	5.5	73.3	30.030	71.4	29.916	2	.....	Cir. str.	WNW.	2	....	.. do	Do.
		15	... .	67.2	71.8	72.0	66.7	5.3	75.7	30.030	72.0	29.913	½	.....	Cir. str.	SW. by W.	2	....	...do	Do.
		16	.....	67.5	71.8	71.8	66.8	5.0	75.5	30.050	73.5	29.931	½	Cir	.....	SW.	2	....	...do	Do.
A. 6, No. 5	40° 24′ 0″ N., 70° 0′ 0″ W.	17	H. 5–25	67.6	70.1	72.2	68.4	3.8	82.3	30.042	72.4	29.934	0	Str	.....	SW. by W.	3	....	...do	Do.
		18	.....	67.5	69.8	69.9	66.7	3.2	84.7	30.053	71.0	29.939	0	Str	.....	SW. by W.	3	....	...do	Magie.
A. 7, No. 6	41° 13′ 0″ N., 70° 2′ 0″ W.	19	.....	66.8	68.7	68.9	66.5	2.4	87.1	30.050	71.0	29.936	1	.....	Str ...	WSW.	3	....	...do	Do.
		20	.....	66.4	68.2	68.3	66.3	2.0	89.6	30.072	71.0	29.958	0	.....	.....	W. by S.	4	....	...do	Do.
A. 8, No. 7	40° 2′ 0″ N., 70° 3′ 0″ W.	21	.....	66.5	67.8	67.5	65.0	2.5	86.8	30.094	70.8	29.982	0	.....	.....	W. by S.	4	....	...do	Libbey.
		22	.....	66.3	66.6	66.4	65.0	1.4	91.9	30.106	70.2	29.995	0	.....	.....	W. by S.	5	....	...do	Do.
A. 9, No. 8	39° 51′ 0″ N., 70° 4′ 0″ W.	23	L. 11–40	68.2	69.2	69.1	67.0	2.1	89.6	30.100	71.2	29.986	0	.....	.....	W. by S.	5	....	...do	Do.
		24	.....	68.0	68.6	69.0	67.0	2.0	89.6	30.098	71.0	29.984	0	.....	.....	W. by S.	5	....	...do	Do.

* South Shoal light-ship abeam.

PLATE CXXVI.



Bull. U. S. F. C. 1889.—(To face page 428.) Libbey.

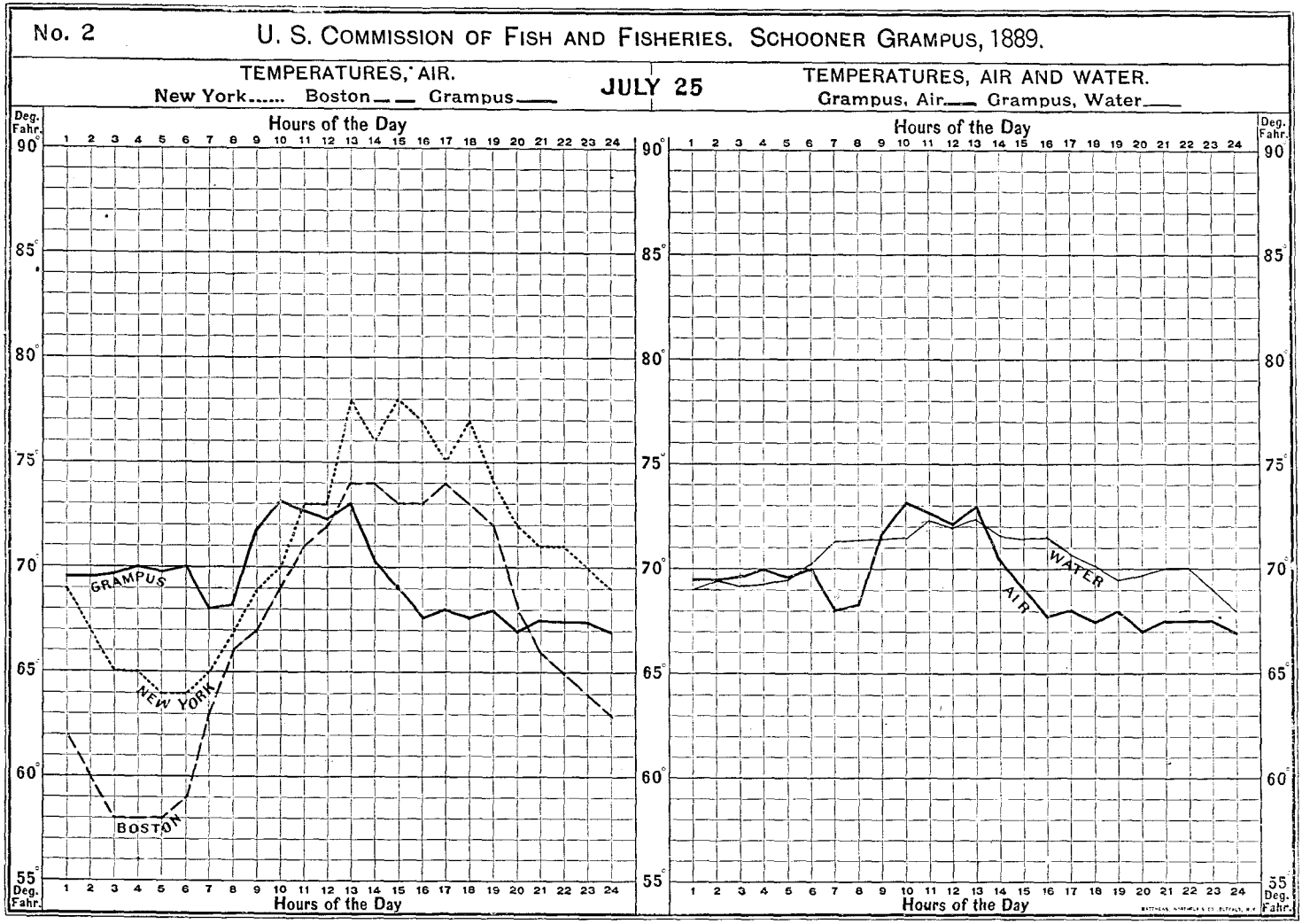

No. 2
U. S. COMMISSION OF FISH AND FISHERIES. SCHOONER GRAMPUS, 1889.
TEMPERATURES, AIR.
New York..... Boston_ _ Grampus____
JULY 25
TEMPERATURES, AIR AND WATER.
Grampus, Air___ Grampus, Water____
Deg. Fahr.
Hours of the Day
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
90° 85° 80° 75° 70° 65° 60° 55°
GRAMPUS
NEW YORK
BOSTON
WATER
AIR

TABLE 2.

Date, July 25, 1889. Solar radiation thermometer, 93.2° F. Maximum temperature, 73.6° F. Six's, 71.3° F.
Terrestial radiation thermometer, 65° F. Minimum temperature, 66.5° F. Six's, 67° F.

Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	t.	=32°.	0–10.	Upper.	Lower.	Direction.	Force.			
																		In.		
A. 10, No. 9	39°40′0″ N., 70°6′0″ W.	1	.....	69.0	69.6	69.4	67.3	2.1	89.6	30.100	71.0	29.986	0	.....	.....	W. by S.	4	....	Calm....	Rockwood.
		2	.....	69.5	69.5	70.0	67.4	2.6	87.4	30.112	71.0	29.998	3	.....	Str.....	W.	3	....	...do.....	Do.
		3	.....	69.3	69.6	70.0	68.0	2.0	89.8	30.112	72.0	29.995	½	.....	Str.....	W.	3	....	...do.....	Do.
		4	.....	69.5	70.0	70.0	68.0	2.0	89.8	30.120	73.0	30.001	0	.....	.....	W.	3	....	...do.....	Do.
		5	.....	69.7	69.8	69.9	68.0	1.9	89.8	30.126	73.0	30.007	8	Str.....	Cum...	WSW.	4	....	Mod.sw.	Magie.
		6	H. 6–25	70.2	70.0	70.0	68.0	2.0	89.8	30.168	73.0	30.049	10	Nimbus.		WSW.	2	....	...do.....	Do.
		7	.....	71.3	68.0	68.0	67.5	0.5	97.4	30.184	71.0	30.070	10	Nimbus.		NNW.	3	*.21	Rough..	Do.
		8	.....	71.4	68.2	68.2	67.0	1.2	94.8	30.188	72.5	30.070	10	Cu. Str.	Nim...	.....	0	....	...do.....	Do.
		9	.....	71.5	71.8	71.9	69.5	2.4	87.7	30.204	73.4	30.083	10	Cu. Str.	Nim...	WSW.	4	....	...do.....	Do.
		10	.....	71.5	73.1	73.0	70.1	2.9	85.3	30.204	73.6	30.084	10	Cu. Str.	Nim...	WSW.	4	....	.. do....	Libbey.
		11	.....	72.4	72.8	73.0	70.3	2.7	87.6	30.214	69.0	30.105	10	Cu. Str.	Nim...	N.	5	....	.. do....	Do.
		12	L. 0–57	72.0	72.3	72.6	70.0	2.6	87.7	30.232	72.0	30.115	10	Cu. Str.	Nim...	NW. by W.	6	....	Calm....	Do.
B. 12, No. 10	39°27′0″ N., 70°9′0″ W.	13	.....	72.6	73.0	73.0	70.5	2.5	87.8	30.220	74.3	30.098	10	Cir. Str.	Str	W. by S.	5	....	...do.....	Rockwood.
		14	.....	71.5	70.2	70.4	66.0	3.4	82.1	30.220	72.5	30.102	10	Str	Str	WSW.	7	....	...do.....	Do.
		15	.....	71.4	69.0	69.0	65.2	3.8	82.0	30.220	72.0	30.103	10	Nimbus.		WSW.	6	(†)	...do.....	Do.
C. 11, No. 11	39°34′0″ N., 70°21′0″ W.	16	.....	71.5	67.8	68.2	64.8	3.4	81.6	30.228	72.3	30.111	10	Str	Cum...	WSW.	4	(†)	...do.....	Libbey.
		17	.....	70.8	68.0	68.2	66.1	2.1	89.6	30.230	72.0	30.113	9	Str	Cum...	WSW.	4	.36	...do.....	Do.
C. 10, No. 12	39°44′0″ N., 70°21′0″ W.	18	H. 6–0	70.2	67.6	68.0	64.8	3.2	84.2	30.230	72.0	30.113	9	Str	Cum...	WSW.	3	....	...do....	Do.
		19	.....	69.5	68.0	68.0	65.4	2.6	86.9	30.230	72.0	30.113	5	Str	Cum...	WSW.	3	....	.. do....	Do.
		20	.....	69.7	67.0	67.3	65.0	2.3	87.2	30.230	72.0	30.113	5	Str	Cum...	WSW.	1	....	...do....	Do.
		21	.....	70.0	67.4	67.7	65.0	2.7	85.0	30.238	72.0	30.111	4	Str	.....	WSW.	1	....	...do.....	Rockwood.
		22	.....	70.0	67.5	68.0	65.0	3.0	84.3	30.240	71.5	30.125	8	Nimbus.		WSW.	½	(†)	...do.....	Do.
C. 9, No. 13	39°54′0″ N., 70°21′0″ W.	23	.....	69.0	67.5	68.0	65.5	2.5	87.0	30.240	71.0	30.126	10	Nimbus.		WSW.	½	(†)	...do.....	Do.
		24	L. 12–12	68.0	67.0	67.0	65.5	1.5	91.9	30.245	71.0	30.129	10	Nimbus.		WSW.	1	(†)	...do.....	Do.

* Rain squall.

† Rain.

TABLE 3.

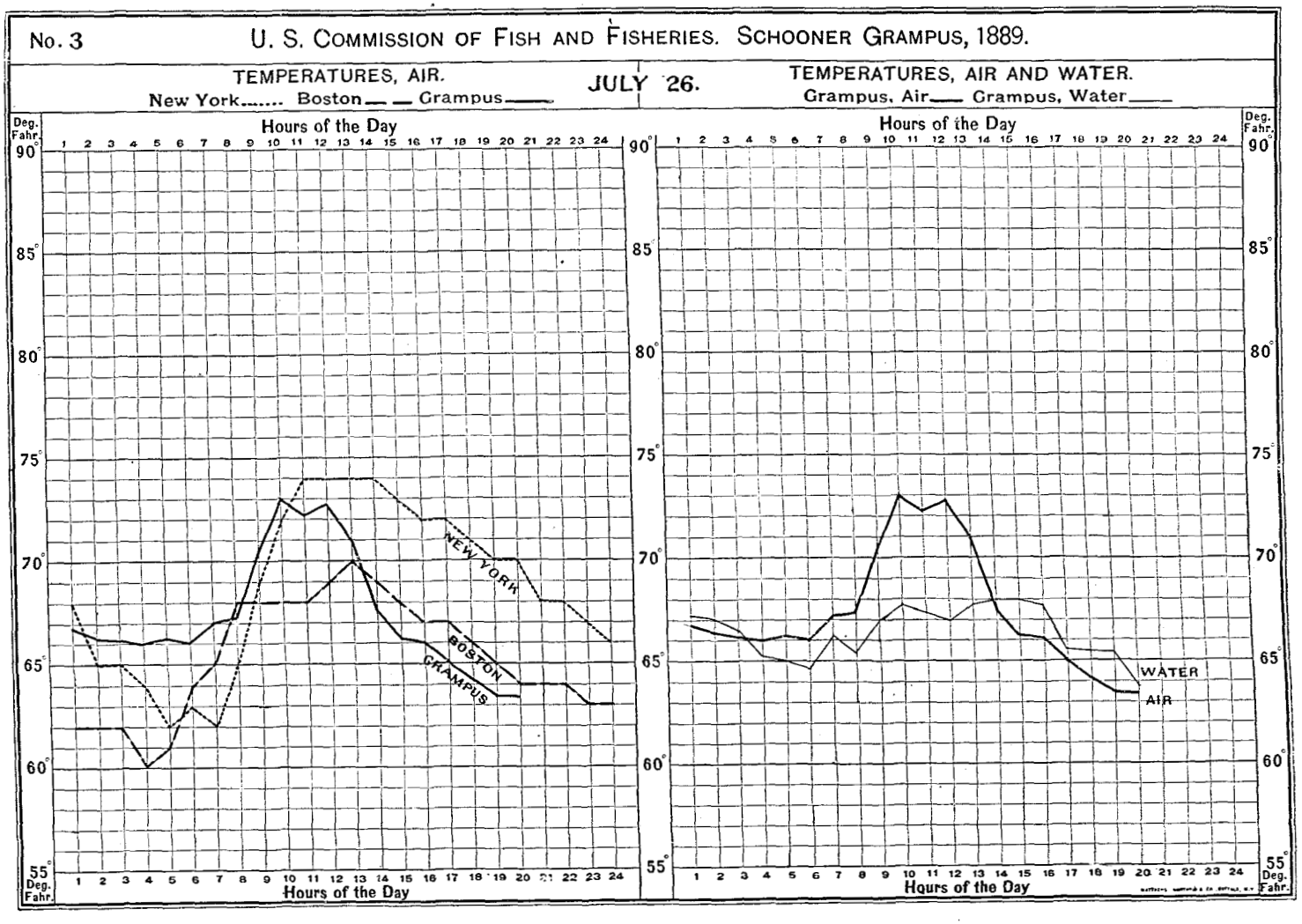
Date, July 26, 1889. Solar radiation thermometer, 140° F. Maximum temperature, 74.8° F. Six's, 74.2° F.
Terrestrial radiation thermometer, 63° F. Minimum temperature, 65° F. Six's, 65° F.

Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	t.	=32°.	0—10.	Upper.	Lower.	Direction.	Force.			
		1	.....	67.1	66.8	67.0	66.3	0.7	97.5	30.242	76.0	30.115	10	Nimbus.		WSW.	1	In. (†)	Mod. sw.	Magie.
		2	.....	67.0	66.3	66.5	66.0	0.5	97.3	30.228	70.3	30.117	10	Nimbus.		.....	0	.42	...do	Do.
		3	.....	66.5	66.2	66.3	65.0	1.3	92.5	30.222	70.5	30.110	10	Heavy fog.		ESE.	1	....	...do	Do.
		4	.....	65.3	66.0	66 0	65.0	1.0	94.5	30.226	69.9	30.115	9	.....	Str.....	ENE.	2	....	...do	Do.
		5	.....	65.2	66.2	66.0	65.3	0.7	97.4	30.226	70.2	30.115	9	.....	Cir. str.	ENE.	1	....	Calm ...	Libbey.
C. 8, No. 14	40° 4′ 0″ N.; 70° 21′ 0″ W.	6	H. 6–58	64.8	66.0	66.0	65.2	0.8	97.5	30.242	70.0	30.131	8	.....	Cir. str.	ENE.	1	....	...do	Do.
		7	.....	66.3	67.2	67.5	66.2	1.3	93.8	30.258	71.4	30.144	9	.....	Cir. str.	SE.	1	....	...do	Do.
		8	.....	65.5	67.3	67.6	66.0	1.6	92.0	30.258	71.4	30.144	9	.....	Cir. str.	SE.	1	....	...do	Do.
C. 7, No. 15	40° 14′ 0″ N.; 70° 21′ 0″ W.	9	.....	67.0	70.4	70.6	67.8	2.8	85.8	30.256	73.0	39.137	4	.....	Cir. str.	E.	2	....	...do	Rockwood.
		10	.....	67.8	73.0	73.0	68.5	4.5	78.4	30.270	74.0	30.148	3	.....	Cir. str.	E.	3	....	...do	Do.
C. 6, No. 16	40° 24′ 11″ N.; 70° 21′ 0″ W.	11	.....	67.4	72.2	72.0	67.8	4.2	79.0	30.278	74.0	30.156	8	Cir	Cum ...	SE.byE.	3	....	...do	Do.
		12	.....	67.0	72.7	72.4	68.0	4.4	78.3	30.280	74.0	30.158	8	.....	Cum ...	ESE.	2	....	...do	Do.
C. 5, No. 17	40° 34′ 0″ N.; 70° 21′ 0″ W.	13	L. 1–31	67.9	71.0	71.0	67.0	4.0	80.2	30.286	73.0	30.167	...	Fog.		E.	3	...	...do	Magie.
		14	.....	68.0	67.5	67.5	64.9	2.6	86.7	30.268	72.2	30.157	..	Fog.		E.	3	....	...do	Do.
C. 4, No. 18	40° 44′ 0″ N.; 70° 21′ 0 ′ W.	15	.....	68.0	66.1	66.0	64.0	2.0	89.1	30.254	72.0	30.137	7	Cir. cu.	Str.....	E.	3	....	...do	Do.
		16	.....	67.9	66.0	65.9	64.0	1.9	89.3	30.242	71.0	30.128	9	Cir. cu.	Str.....	E.	4	....	...do	Do.
C. 3, No. 19*	40° 54′ 0″ N.; 70° 21′ 0″ W.	17	.....	65.4	65.0	64.6	63.0	1.6	91.6	30.244	70.2	30.133	8	Cir. cu.	Str.....	E.	4	....	...do	Libbey.
		18	H. 6–36	65.5	64.2	64.0	62.7	1.3	93.4	30.250	70.0	30.136	7	Cir. cu.	Str.....	ENE.	4	....	...do	Do.
C. 2, No. 20	41° 4′ 0″ N.; 70° 21′ 0″ W.	19	.....	65.5	63.5	63.2	62.1	1.1	94.2	30.234	70.0	30.120	9	Cir. cu.	Str.....	E.	4	....	...do	Do.
		20	.....	63.7	63.5	63.5	62.0	1.5	91.5	30.220	68.0	30.114	4	.....	Str.....	E.	4	....	...do	Do.
		21	.....	.....	.....	.....	.....	....	.....	.....	.....	.....	...	.....	.....	.....	...	....	.....	
		22	.....	.....	.....	.....	.....	....	.....	.....	.....	.....	...	.....	.....	.....	...	....	.....	
		23	.....	.....	.....	.....	.....	....	.....	.....	.....	.....	...	.....	.....	.....	...	....	.....	
		24	L. 12–50	.....	.....	.....	.....	....	.....	.....	.....	.....	...	.....	.....	.....	...	....	.....	

* Thermometer 5320 used for density temperatures from this time on, instead of 6795.

† Rain.

PLATE CXXVIII.



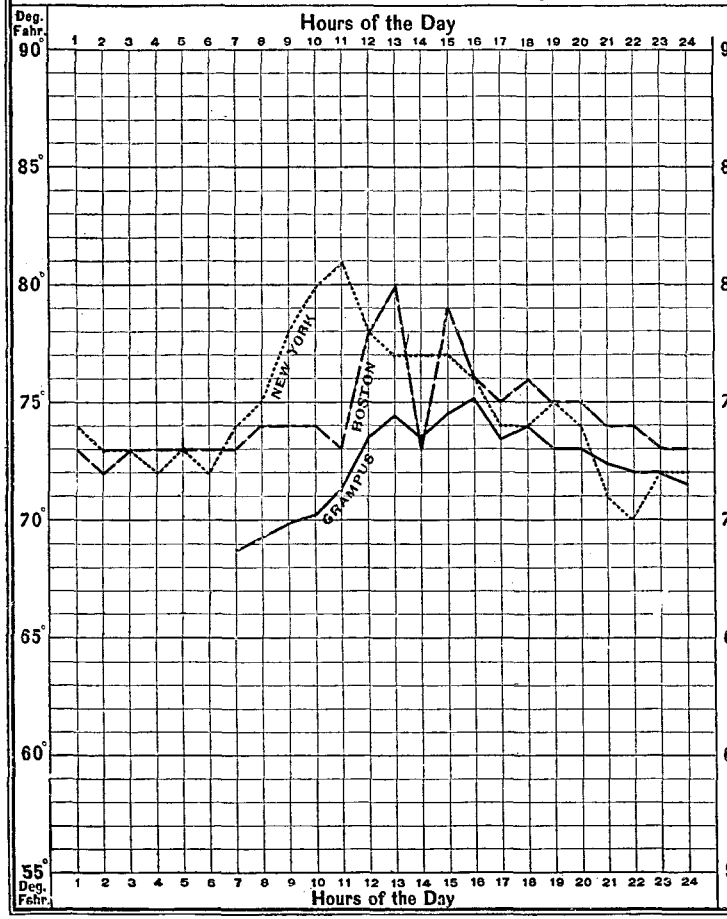
Bull. U. S. F. C. 1889. (To face page 430.) Linbey

No. 4

U. S. COMMISSION OF FISH AND FISHERIES. SCHOONER GRAMPUS, 1889.

AUGUST 1

TEMPERATURES, AIR.
New York..... Boston___ Grampus___



TEMPERATURES, AIR AND WATER.
Grampus, Air___ Grampus, Water___

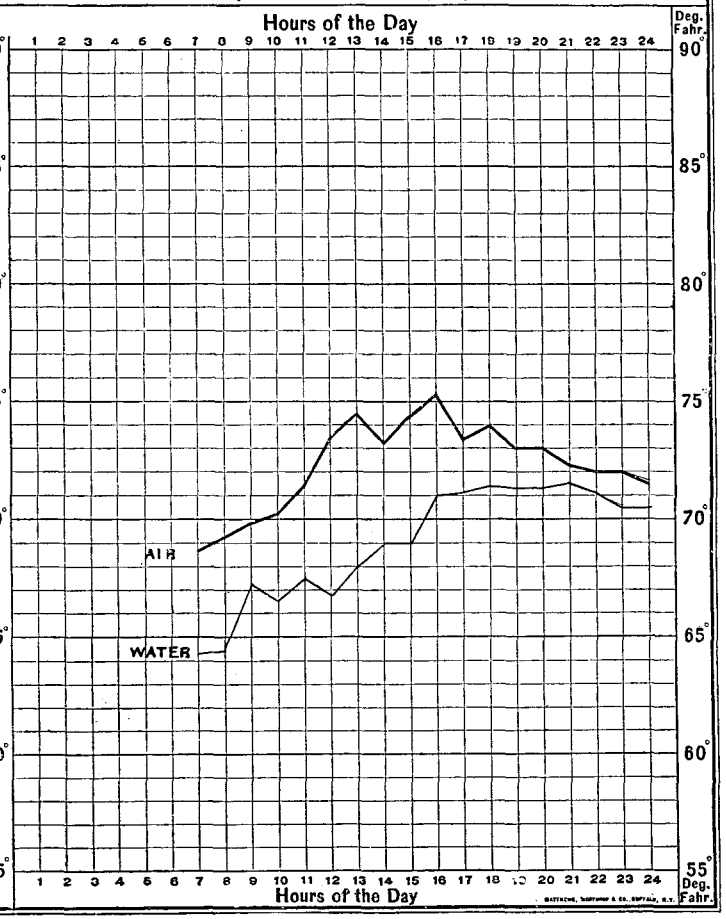


TABLE 4.

Date, August 1, 1889. Solar radiation thermometer, 142° F. Maximum temperature, 80.9° F. Six's, 74.8° F.
Terrestrial radiation thermometer, 58° F. Minimum temperature, 61° F. Six's, 61.2° F.

Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	t.	= 32°.	0—10.	Upper.	Lower.	Direction.	Force.			
																		In.		
		5	L. 5–5	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	...	.....	.....
		6	... ...	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	...	.....	.....
		7	.....	64.3	68.7	68.8	68.8	0.0	100.0	30.346	70.8	30.233	7	Cir. str.	Haze...	SSW.	5	...	Mod. sw.	Libbey.
F. 1, No. 21	41° 12′ 0″ N., 70° 50″ 0′ W.	8	.....	64.5	69.1	69.3	69.1	0.2	100.0	30.340	71.4	30.225	6	Cir. str.	Haze...	SSW.	4	...	... do	Do.
		9	.....	67.4	69.9	69.8	69.5	0.3	100.0	30.328	71.6	30.213	5	Cir.....	Haze...	SSW.	4	...	... do	Do.
		10	H. 10–55	66.4	70.2	70.4	70.0	0.4	98.0	30.344	72.0	30.227	5	Cir.....	Haze ..	SSW.	4	...	... do	Do.
		11	.....	67.4	71.5	72.0	70.9	1.1	95.0	30.338	73.4	30.219	6	Cir.....	Cu. str .	S. by W.	4	...	... do	Do.
F. 2, No. 22	41° 2′ 0″ N., 70° 50′ 0″ W.	12	.....	66.8	73.6	73.8	71.7	2.1	90.2	30.318	73.7	30.197	2	.....	Cu. str .	S. by W.	4	...	... do ...	Do.
		13	.....	68.0	74.5	74.1	72.0	2.1	90.3	30.300	74.0	30.178	1	.....	Cir.....	SSW.	5	...	... do ...	Magie.
		14	.....	69.0	73.3	73.3	71.9	1.4	92.5	30.274	74.3	30.152	3	.....	Cir.....	SSW.	5	...	... do	Do.
F. 3, No. 23	40° 52′ 0″ N., 70° 50′ 0″ W.	15	.....	69.0	74.5	74.5	73.0	1.5	92.7	30.278	75.0	30.153	4	Cir.....	Str.....	SSW.	3	...	... do	Do.
		16	.....	71.0	75.2	75.2	73.2	2.0	90.4	30.278	74.8	30.154	5	Cir.....	Str.....	SSW.	4	...	... do	Do.
		17	L. 5–47	71.1	73.3	73.3	72.7	0.6	97.5	30.280	75.0	30.155	1	Cir.....	Str.....	SSW.	5	...	... do	Rockwood.
F. 4, No. 24	40° 42′ 0″ N., 70° 50′ 0″ W.	18	.....	71.4	74.0	74.0	73.1	0.9	96.0	30.280	75.0	30.155	1	Cir.....	Str.....	SSW.	5	...	... do	Do.
		19	.....	71.4	73.0	73.2	72.8	0.4	97.5	30.274	75.5	30.148	2	Cir.....	Str.....	SSW.	4	...	... do	Do.
		20	.....	71.3	73.0	73.0	72.8	0.2	100.0	30.260	75.5	30.134	1	Cir.....	Str.....	SSW.	5	...	... do	Do.
F. 5, No. 25	40° 32′ 0″ N., 70° 50′ 0″ W.	21	.....	71.5	72.4	73.0	72.8	0.2	100.0	30.275	75.0	30.150	1	Cir.....	Str.....	SSW.	4	...	... do	Libbey.
		22	.....	71.2	72.0	72.6	72.4	0.2	100.0	30.290	75.0	30.165	2	.....	Str....	SSW.	4	...	... do	Rockwood.
		23	H. 11–13	70.6	72.0	72.3	71.8	0.5	97.5	30.280	74.5	30.156	3	.....	Str.....	SSW.	4	...	... do ...	Do.
		24	.....	70.5	71.7	72.0	71.2	0.8	96.0	30.290	75.0	30.165	3	.....	Str.....	SSW.	4	...	... do	Do.

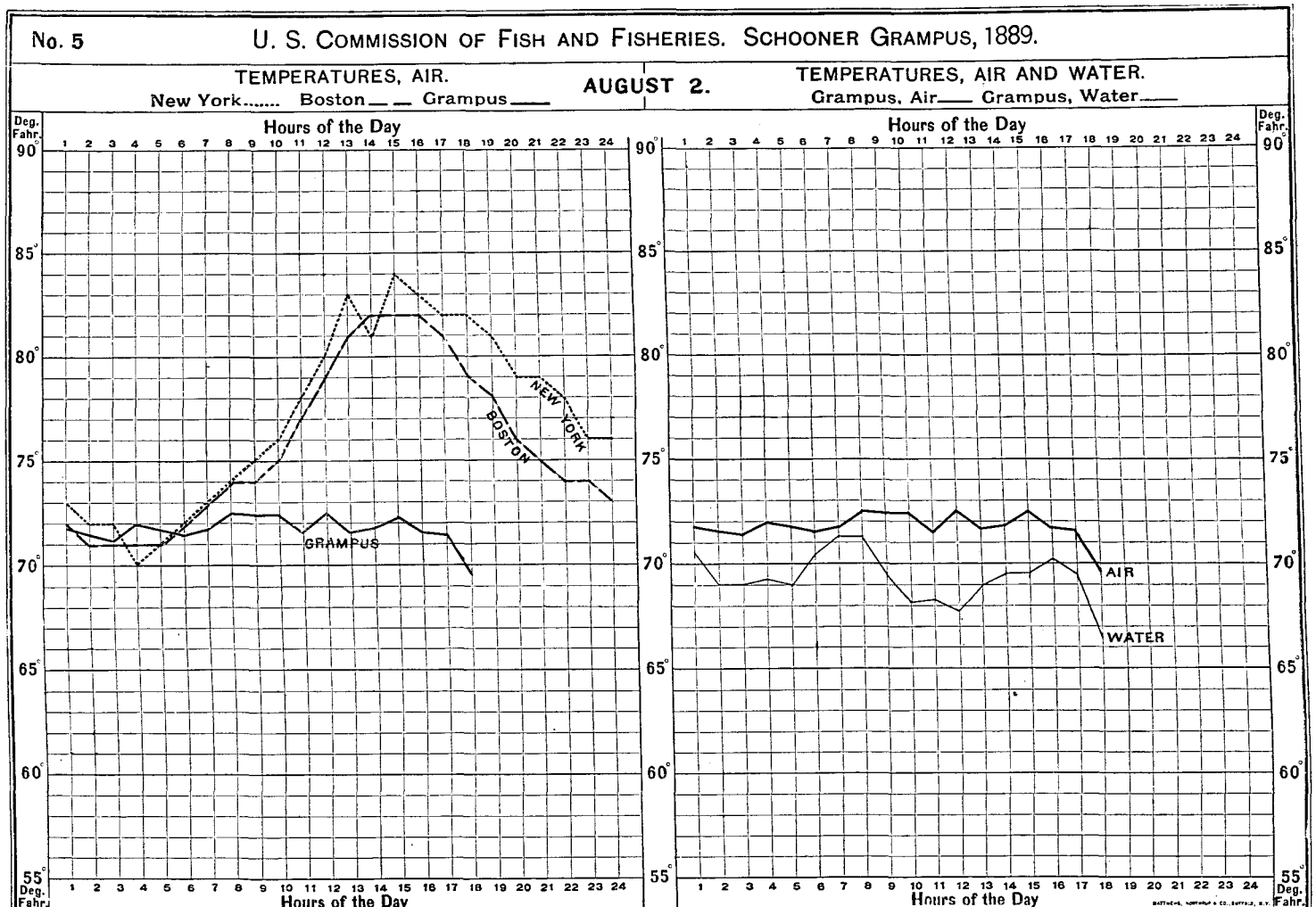
TABLE 5.

Date, August 2, 1889. Solar radiation thermometer 138° F. Maximum temperature 74.6° F. Six's, 71.4° F.
Terrestrial radiation thermometer, 68° F. Minimum temperature, 70.9° F. Six's 71.8° F.

Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	t.	=32°.	0-10.	Upper.	Lower.	Direction.	Force.			
																		In.		
F. 6, No. 26	40° 22′ 0″ N., 70° 50′ 0″ W.	1	.....	70.4	71.8	72.0	71.8	0.2	100.0	30.240	74.5	30.116	10	.....	Nimbus	SSW.	5	....	Mod. sw	Magie.
		2	.....	69.0	71.6	71.8	71.4	0.4	97.0	30.242	74.0	30.120	10	.....	Nimbus	SW. by S.	5	....	...do ...	Do.
		3	.....	69.0	71.4	71.8	71.6	0.2	100.0	30.250	74.5	30.126	10	.....	Nimbus	SW. by S.	5	....	...do ...	Do.
F. 7, No. 27	40° 12′ 0″ N., 70° 50′ 0″ W.	4	.....	69.2	72.0	72.0	72.0	0.0	100.0	30.262	74.2	30.140	10	.....	Nimbus	SW. by S.	4	....	...do ...	Do.
		5	L. 5-56	69.0	71.8	71.8	71.8	0.0	100.0	30.284	74.0	30.162	10	.....	Nimbus	SW. by S.	4	....	...do ...	Rockwood.
		6	.....	70.4	71.5	71.7	71.7	0.0	100.0	30.250	75.0	30.125	10	.....	Nimbus	SSW.	4	(*)	...do ...	Do.
		7	.....	71.3	71.7	72.0	72.0	0.0	100.0	30.244	75.0	30.119	10	.....	Nimbus	SSW.	4	.21	...do ...	Do.
		8	.....	71.4	72.4	72.7	72.7	0.0	100.0	30.256	76.0	30.129	10	.....	Nimbus	SSW.	4	....	...do ...	Do.
		9	.....	69.5	72.3	72.4	72.3	0.1	100.0	30.234	76.0	30.107	10	.....	Nimbus	SW.	5	....	...do ...	Magie.
		10	.....	68.1	72.2	72.8	72.1	0.7	97.5	30.244	75.5	30.118	8	Cir ...	Str	SW.	6	....	...do ...	Do.
		11	H. 11-52	68.3	71.5	72.2	70.5	1.7	92.4	30.242	74.5	30.118	9	Cir ...	Str	SW. by S.	4	....	...do ...	Do.
G. 1, No. 28	41° 12′ 0″ N., 71° 0′ 0″ W.	12	.....	67.9	72.5	73.5	71.0	2.5	87.9	30.224	75.0	30.099	2	Cir ...	Str	SW. by S.	5	....	...do ...	Do.
		13	.....	69.0	71.7	72.2	70.6	1.6	92.4	30.190	75.4	30.067	5	.....	Cir. str	SW. by S.	5	....	...do ...	Rockwood.
H. 1, No. 29	41° 12′ 0″ N., 71° 10′ 0″ W.	14	.....	69.6	71.8	72.0	70.9	1.1	94.9	30.188	75.0	30.063	7	.....	Cir. str.	SW. by S.	5	....	...do ...	Do.
		15	.....	69.5	72.4	72.1	71.6	0.5	97.5	30.180	74.5	30.056	10	Cir ..	Str	SW. by S.	6	....	...do ...	Do.
J. 1, No. 30	41° 12′ 0″ N., 71° 20′ 0″ W.	16	.....	70.1	71.7	72.0	71.7	0.3	100.0	30.180	74.0	30.058	10	Cir ...	Str	SW. by S.	5	....	Choppy	Do.
		17	.....	69.4	71.5	71.9	71.4	0.5	97.5	30.182	74.0	30.060	10	Cir ...	Str	SW. by S.	5	....	...do ...	Libbey.
K. 1, No. 31	41° 12′ 0″ N., 71° 30′ 0″ W.	18	L. 6-58	66.4	69.7	69.8	69.4	0.4	97.4	30.160	73.4	30.041	10	Cir ...	Str	SW. by S.	5	....	..do ...	Do.

* Rain.

PLATE CXXX.



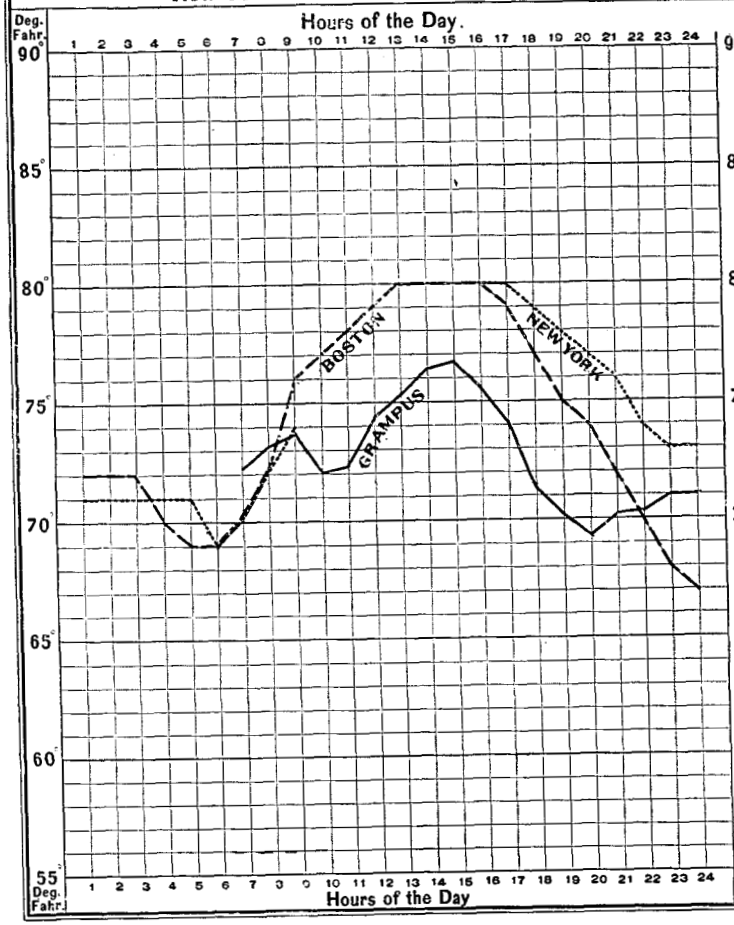
Bull. U. S. F. C. 1889.—(To face page 432.) Libbey.

No. 6

U. S. COMMISSION OF FISH AND FISHERIES. SCHOONER GRAMPUS, 1889.

AUGUST 4

TEMPERATURES, AIR.
New York..... Boston— — Grampus——



TEMPERATURES, AIR AND WATER.
Grampus, Air—— Grampus, Water——

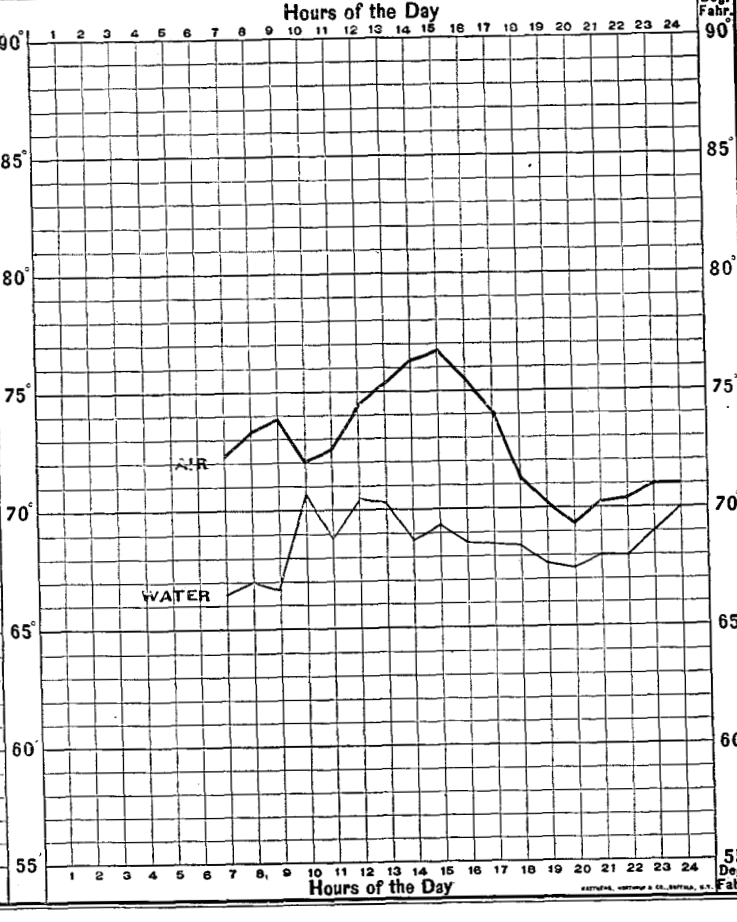


TABLE 6.

Date, August 4, 1889. Solar radiation thermometer, 138° F. Maximum temperature, 78° F. Six's, 76° F.
Terrestrial radiation thermometer, 65° F. Minimum temperature, 66° F. Six's, 66° F.

Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	t.	=32°.	0-10.	Upper.	Lower.	Direction.	Force.			
																		In.		
		1	H. 1-32	.....	.....	.....	.....	.....	.....	.....	.....	.....		.....	.....	.....		.....	.....	
		2		.....	.....	.....	.....	.....	.....	.....	.....	.....		.....	.....	.....		.....	.....	
		3		.....	.....	.....	.....	.....	.....	.....	.....	.....		.....	.....	.....		.....	.....	
		4		.....	.....	.....	.....	.....	.....	.....	.....	.....		.....	.....	.....		.....	.....	
		5		.....	.....	.....	.....	.....	.....	.....	.....	.....		.....	.....	.....		.....	.....	
		6		.....	.....	.....	.....	.....	.....	.....	.....	.....		.....	.....	.....		.....	.....	
*		7	L. 7-56	66.7	72.3	72.7	72.2	0.5	97.5	30.147	71.0	30.033	0	.....	.....	W.	2	....	Str. sw.	Rockwood.
K. 2, No. 32	41° 2′ 0″ N., 71° 30′ 0″ W.	8	.....	67.0	73.2	73.5	73.0	0.5	97.5	30.179	71.0	30.065	0	.....	.....	W.	1	.....	...do	Do.
		9	.....	66.8	73.9	74.0	73.5	0.5	97.5	30.185	71.5	30.069	0	.....	.....	W. by N.	1	.....	...do	Do.
J. 2, No. 33	41° 2′ 0″ N., 71° 20′ 0″ W.	10	.....	70.7	72.0	71.3	70.0	1.3	94.9	30.186	71.5	30.070	0	.....	.....	W. by N.	1	.....	...do	Do.
		11	.....	68.8	72.4	72.7	69.6	3.1	85.2	30.190	72.0	30.073	0	.....	.....	W. by N.	1	.....	...do	Do.
H. 2, No. 34	41° 0′ 0″ N., 71° 10′ 0″ W.	12	.....	70.4	74.6	74.6	69.0	5.6	74.4	30.186	73.0	30.067	0	.....	.....	W. by N.	1	†.50	...do	Do.
		13	H. 1-50	70.2	75.3	75.3	70.0	5.3	74.7	30.226	73.6	30.105	0	.....	.....	W. by N.	1	.....	...do	Libbey.
G. 2, No. 35	41° 2′ 0″ N., 71° 0′ 0″ W.	14	.....	68.8	76.3	76.0	70.6	5.4	74.7	30.226	74.3	30.104	0	.....	.....	W. by N.	1	.....	...do	Do.
		15	.....	69.2	76.8	77.0	70.3	6.7	70.8	30.230	74.8	30.106	0	.....	.....	W. by N.	1	.....	...do	Do.
		16	.....	68.7	75.7	75.8	69.3	6.5	76.4	30.230	74.3	30.108	0	.....	.....	W. by N.	1	....	Calmer .	Do.
		17	.....	68.5	74.1	73.8	69.0	4.8	78.6	30.224	73.4	30.105	0	.....	.....	W. by S.	3	.....	...do	Magie.
E. 1, No. 36	41° 12′ 0″ N., 70° 40′ 0″ W.	18	.....	68.5	71.2	71.2	67.8	3.4	82.4	30.228	73.0	30.109	0	.....	.....	W. by S.	3	....	Mod. sw.	Do.
		19	.....	67.8	70.2	70.0	67.0	3.0	84.8	30.228	72.6	30.110	1	.....	Str	W. by S.	4	.....	...do	Do.
E. 2, No. 37	41° 2′ 0″ N., 70° 40′ 0″ W.	20	.....	67.5	69.5	70.0	67.7	2.3	89.6	30.234	73.0	30.115	0	.....	.....	WSW.	3	.....	...do	Do.
		21	L. 9-12	68.0	70.1	70.1	68.3	1.8	92.2	30.280	73.2	30.161	1	.....	Str	WSW.	4	.....	...do	Rockwood.
		22	.....	68.0	70.3	70.5	69.0	1.5	92.3	30.282	73.0	30.163	6	.....	Cu. str .	WSW.	2	.....	...do	Do.
E. 3, No. 38	40° 52′ 0″ N., 70° 40′ 0″ W.	23	.....	69.0	71.0	71.2	69.6	1.6	92.3	30.290	74.0	30.168	4	.....	Cu. str .	WSW.	3	.....	...do	Do.
		24	.....	70.0	71.0	71.2	69.6	1.6	92.3	30.286	75.5	30.160	1	.....	Cu. str .	WSW.	2	.....	...do	Do.

* South of Block Island.

† Evaporation.

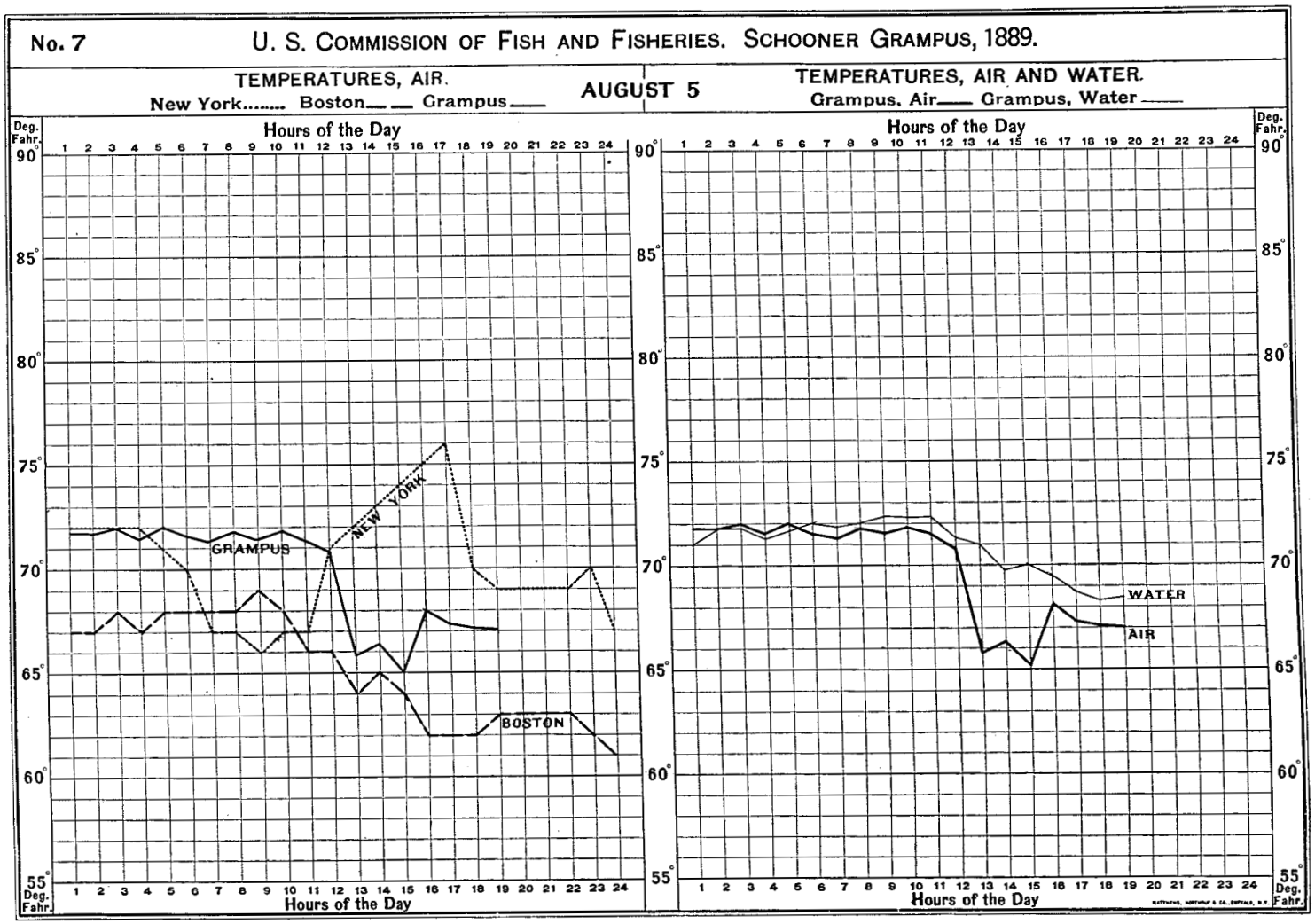
TABLE 7.

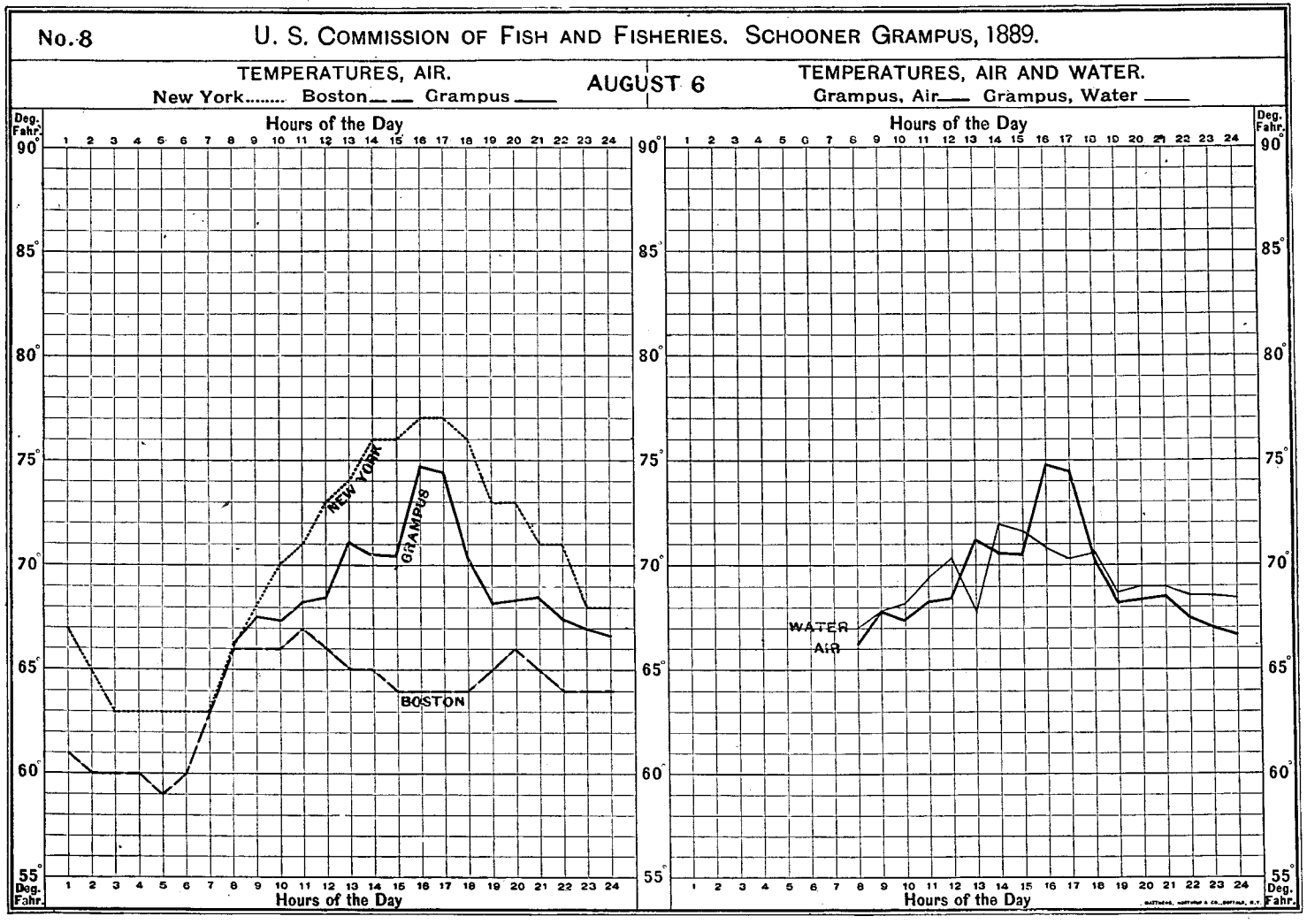
Date, August 5, 1889. Solar radiation thermometer, 138° F. Maximum temperature, 79° F. Six's, 80° F.
Terrestrial radiation thermometer, 54° F. Minimum temperature, 55° F. Six's, 57° F.

Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	t.	=32°.	0—10.	Upper.	Lower.	Direction.	Force.			
																		In.		
		1	.....	71.0	71.8	71.6	70.0	1.6	92.4	30.300	74.8	30.175	1	.....	Haze ..	WSW.	3	....	Calm	Libbey.
		2	H. 2-48	71.8	71.8	72.0	70.2	1.8	92.4	30.286	74.6	30.163	2	.....	Haze ..	SW.	3	....	...do	Do.
		3	.....	71.9	72.0	72.0	70.0	2.0	90.0	30.270	74.5	30.148	2	.....	Haze ..	SW.	2	....	...do	Do.
E. 4, No. 39	40° 42′ 0″ N., 70° 40′ 0″ W.	4	.....	71.4	71.6	71.8	70.2	1.6	92.4	30.250	74.0	30.128	4	.....	Str	SW.	4	.....	...do	Do.
		5	.....	71.6	72.1	72.1	71.2	0.9	95.0	30.280	74.7	30.156	4	.....	Str	SW. by S.	2	....	...do	Magie.
		6	.....	72.0	71.7	71.7	70.8	0.9	95.0	30.260	73.7	30.136	8	Cir ...	Str	SSW.	2	.....	...do	Do.
		7	.....	71.9	71.3	71.5	70.0	1.5	92.4	30.240	73.0	30.120	9	Cir ...	Str	S. by E.	3	.....	...do	Do.
E. 5, No. 40	40° 32′ 0″ N., 70° 40′ 0″ W.	8	L. 8-53	72.1	71.8	71.8	70.5	1.3	94.9	30.190	74.0	30.068	10	Cir ...	Str	SSE.	4	.....	...do	Do.
		9	.....	72.3	71.5	71.8	70.3	1.5	92.4	30.170	74.5	30.047	10	.....	Nimb ..	SE. by S.	5	(†)	...do	Rockwood.
F. 5, No. 41	40° 31′ 0″ N., 70° 50′ 0″ W.	10	.....	72.2	71.7	71.7	71.6	0.1	100.0	30.122	73.5	30.002	10	.....	Nimb ..	SE. by S.	5	(*)	Rising ...	Do.
		11	.....	72.2	71.5	71.5	71.1	0.4	97.5	30.087	74.0	29.965	10	.....	Nimb ..	S. by W.	6	(*)	...do	Do.
		12	.....	71.3	70.9	70.8	70.0	0.8	94.9	30.068	75.1	29.943	10	.....	Nimb ..	W.	5	(*)	Heavy sw	Do.
		13	.....	71.0	65.8	65.8	65.0	0.8	97.2	30.100	70.5	29.988	10	.....	Nimb ..	NE.	6	.51	...do	Magie.
		14	H. 2-49	69.9	66.2	66.2	65.0	1.2	94.5	30.112	66.5	30.002	10	.....	Nimb ..	NNE.	5	.....	...do	Do.
		15	.....	70.0	65.0	.....	.....	...	.....	30.080	70.0	29.969	10	.....	Nimb ..	ENE.	1	.....	.. do	Ship.
G. 3, No. 42	40° 52′ 0″ N., 71° 0′ 0″ W.	16	.....	69.4	68.1	68.1	65.8	2.3	86.8	30.188	69.7	30.078	2	..... Cu. str		.....	0	.....	...do	Libbey.
		17	.....	68.9	67.4	67.6	65.1	2.5	86.8	30.150	70.0	30.039	9	.....	Cu. str .	N.	2	.....	.. do	Rockwood.
		18	.....	68.3	67.1	67.3	65.0	2.3	86.8	30.184	70.0	30.073	6	Cir ...	Cu. str .	NNW.	½	.....	Mod. sw .	Do.
		19	.....	68.4	67.0	66.8	64.8	2.0	89.1	30.200	70.4	30.088	8	Cir ...	Cu. str .	.....	0	.....	...do	Do.
		20	.....	.....	.....	.....	.....	...	.....	.....	.....	.....	...	.....	.....	.....	...	...	.....	
		21	.....	.....	.....	.....	.....	...	.....	.....	.....	.....	...	.....	.....	.....	...	...	.....	
		22	L. 10-9	.....	.....	.....	.....	...	.....	.....	.....	.....	...	.....	.....	.....	...	...	.....	

Rain.

† Evaporation, .42.


No. 7
U. S. COMMISSION OF FISH AND FISHERIES. SCHOONER GRAMPUS, 1889.
TEMPERATURES, AIR.
New York..... Boston— — Grampus——
AUGUST 5
TEMPERATURES, AIR AND WATER.
Grampus, Air—— Grampus, Water ——
Deg. Fahr.
Hours of the Day
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
90° 85° 80° 75° 70° 65° 60° 55°
GRAMPUS
NEW YORK
BOSTON
WATER
AIR



Bull. U. S. F. C. 1889.—(To face page 435.) Libbey.

PLATE CXXXIII.

TABLE 8.

Date, August 6, 1889. Solar radiation thermometer, 108.3° F. Maximum temperature, 72.6° F. Six's, 78° F.
Terrestrial radiation thermometer, 64° F. Minimum temperature, 64.2° F. Six's, 64° F.

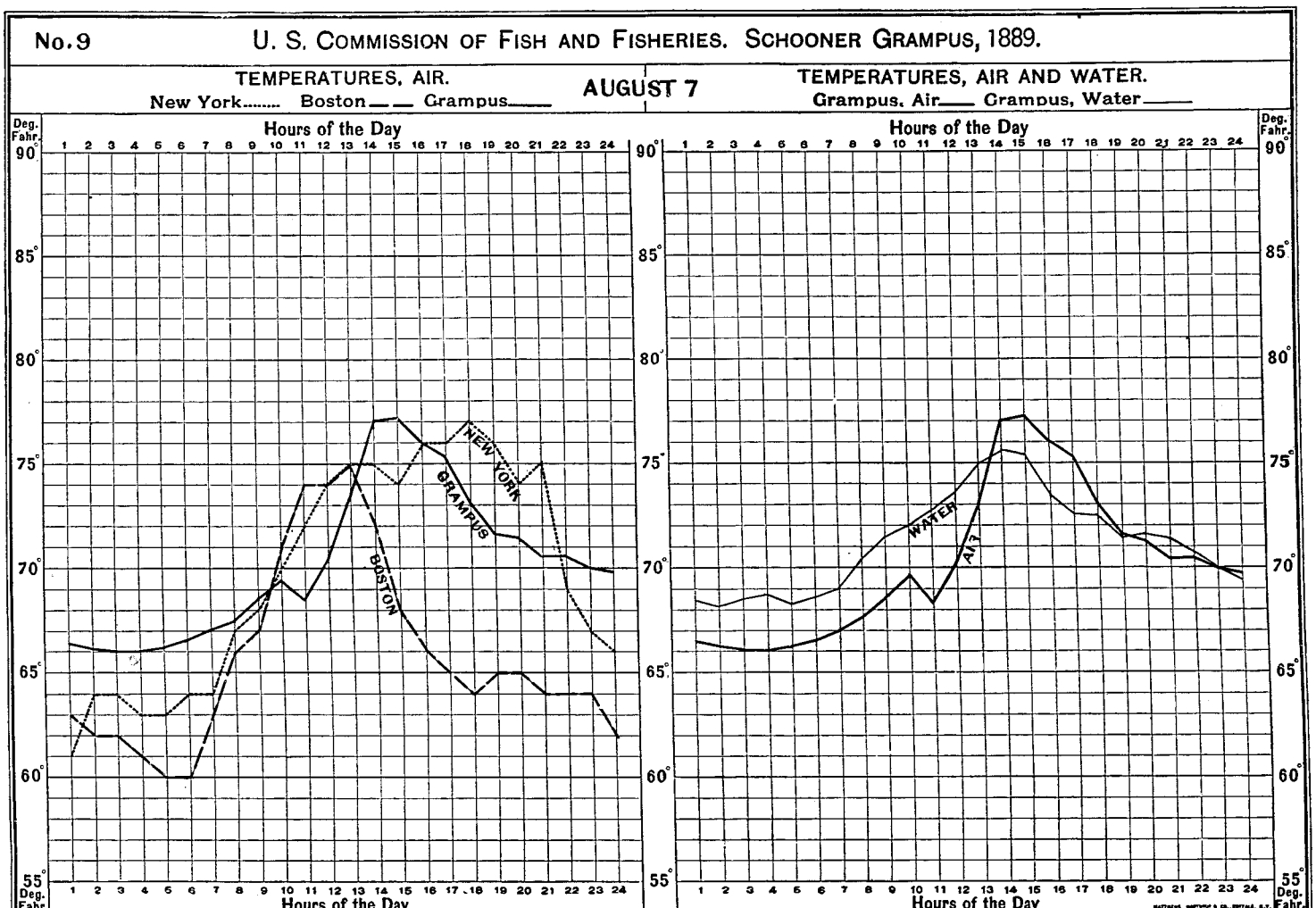
Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	t.	=32°.	0—10.	Upper.	Lower.	Direction.	Force.			
																		In.		
		3	H. 3–38	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	
		4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	
		5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	
		6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	
		7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	.....	.....	
		8	.....	67.0	66.1	66.0	63.8	2.2	89.0	30.292	69.5	30.182	9	Cir ...	Str	N.	1	.....	Calm ...	Rockwood.
		9	L. 9–49	67.8	67.8	68.0	65.0	3.0	84.3	30.312	69.8	30.202	8	Cir ...	Str	N.	1	.....	...do	Libbey.
		10	.....	68.2	67.4	67.5	64.7	2.8	84.2	30.328	69.8	30.218	7	Cir ...	Str	NE.	1	.....	...do	Do.
		11	.....	69.4	68.3	68.4	65.2	3.2	84.3	30.309	70.0	30.198	4	Cir ...	Str	ENE.	1	.....	...do	Do.
		12	.....	70.4	68.4	68.7	65.2	3.5	81.9	30.292	70.4	30.180	4	Cir ...	Str	.....	0	.....	...do	Do.
		13	.....	67.8	71.1	71.0	67.0	4.0	80.2	30.282	71.5	30.177	3	Cir ...	Cir	E.	1	.....	...do	Magie.
		14	.....	72.0	70.6	70.4	67.0	3.4	82.4	30.260	72.5	30.142	2	Str ...	Cir	SE.	1	.....	...do	Do.
		15	H. 3–42	71.7	70.5	70.4	67.0	3.4	82.4	30.260	72.0	30.143	2	Cir ...	Cu.....	SE.	1	.....	...do	Do.
		16	.....	70.6	74.9	75.0	70.0	3.0	85.4	30.264	72.0	30.147	3	Cir ...	Cu.....	S. by W.	1	.....	...do	Do.
		17	.....	70.3	74.4	73.9	68.7	5.2	76.4	30.254	72.0	30.137	1	Cir ...	Cu.....	S.	2	.....	...do	Rockwood.
D, 1, No. 43	41°12′0″ N., 70°30′0″ W.	18	.....	70.5	70.1	69.9	66.9	3.0	84.8	30.230	72.0	30.113	1	Cir ...	Cu.....	S.	2	.....	...do	Do.
		19	.....	68.6	68.1	68.2	65.9	2.3	87.0	30.250	71.5	30.135	2	Cir ...	Str	S.	2	.....	...do	Do.
		20	.....	69.0	68.3	68.4	66.5	1.9	89.5	30.250	73.0	30.131	7	.....	Str	S. by W.	2	.....	...do	Do.
		21	.....	69.0	68.4	68.6	66.4	2.2	89.6	30.260	72.0	30.143	8	.....	Cu. str.	SSW.	1	.....	...do	Libbey.
		22	.....	68.7	67.4	67.5	65.0	2.5	86.8	30.252	71.4	30.137	4	.....	Cu. str.	.....	0	.....	...do	Do.
		23	L. 11–1	68.6	67.0	67.3	65.3	2.0	89.3	30.240	70.8	30.127	5	.....	Cu. str.	.....	0	.....	...do	Do.
		24	.....	68.5	66.8	66.9	66.0	0.9	94.6	30.238	71.0	30.124	5	.....	Cu. str.	.....	0	.....	...do	Do.

TABLE 9.

Date, August 7, 1889. Solar radiation thermometer, 141° F. Maximum temperature, 79.4° F. Six's, 79° F.
Terrestrial radiation thermometer, 63.3° F. Minimum temperature, 64.7° F. Six's, 65.5° F.

Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	t.	=32°.	0—10.	Upper.	Lower.	Direction.	Force.			
																		In.		
		1	.....	68.5	66.5	66.6	65.4	1.2	94.5	30.230	71.0	30.116	1	.....	Str	.....	0	....	Calm ...	Magie.
		2	.....	68.1	66.2	66.4	65.0	1.4	91.9	30.218	72.0	30.101	1	.....	Str	.....	0	....	...do	Do.
		3	.....	68.5	66.0	66.0	64.1	1.9	89.1	30.200	72.0	30.083	1	.....	Str	.....	0	....	...do	Do.
		4	H. 4–34	68.7	66.0	66.0	63.6	2.4	86.4	30.200	71.0	30.086	2	.....	Str	WSW.	½	....	...do	Do.
		5	.....	68.3	66.2	66.4	64.1	2.3	86.6	30.190	70.0	30.079	8	Cir....	Cu. str.	WSW.	½	....	...do	Rockwood.
		6	.....	68.5	66.6	66.7	64.3	2.4	86.6	30.200	70.0	30.089	8	Cir	Cu. str.	W.	½	....	...do	Do.
		7	.....	69.0	67.0	66.9	64.7	2.2	89.1	30.204	70.0	30.093	3	Cir	Cu. str.	W.	1	....	...do	Do.
		8	.....	70.5	67.6	67.6	64.9	2.7	86.8	30.206	70.0	30.095	1	Cir	Cu. str.	W.	1	....	...do	Do.
D. 2, No. 44	41° 2′ 0″ N., 70° 30′ 0″ W.	9	.....	71.5	68.5	68.7	65.3	3.4	81.9	30.212	70.7	30.099	2	Cir	Cu. str.	W.	1	*. 42	...do	Libbey.
		10	L. 10–42	71.8	69.5	69.6	66.0	3.6	82.2	30.218	70.5	30.107	2	Cir	Cu. str.	W.	1	....	...do	Do.
		11	.....	72.7	68.4	68.6	64.9	3.7	81.9	30.196	71.0	30.082	4	Cir	Cu. str.	.....	0	....	...do	Do.
		12	.....	73.5	70.3	70.4	65.9	4.5	77.6	30.216	71.5	30.100	5	Cir	Cu. str.	.....	½	....	...do	Do.
D. 3, No. 45	40° 51′ 47″ N., 70° 30′ 0″ W.	13	.....	75.0	73.2	73.3	67.3	6.0	71.6	30.210	73.0	30.091	3	Cir	Cu. str	.....	¼	....	...do	Rockwood.
		14	.....	75.5	77.0	77.0	68.0	9.0	60.8	30.186	75.0	30.061	5	Cir	Cu. str.	SW. by W.	1	....	...do	Do.
		15	.....	75.3	77.1	77.0	66.8	10.2	56.3	30.174	75.5	30.048	2	Cir	Cu. str.	WSW.	2	....	...do	Do.
D. 4, No. 46	40° 42′ 0″ N., 70° 30′ 0″ W.	16	H. 4–35	73.5	76.0	76.0	66.0	10.0	56.3	30.166	75.0	30.041	3	Cir	Cu. str.	W.	3	....	...do	Do.
		17	.....	72.7	75.3	75.4	66.0	9.4	58.0	30.172	74.8	30.048	3	Cir	Cu. str.	W.	3	....	...do	Libbey.
		18	.....	72.6	73.1	73.2	64.9	8.3	61.5	30.172	74.6	30.048	3	Cir	Cu. str.	W.	3	....	...do	Do.
D. 5, No. 47	40° 32′ 0″ N., 70° 30′ 0″ W.	19	.....	71.3	71.6	71.6	65.4	6.2	70.8	30.188	74.8	30.064	1	.....	Str	W. by N.	2	....	...do	Do.
		20	.....	71.6	71.4	71.5	66.4	5.1	75.4	30.208	74.0	30.086	1	.....	Str	W. by N.	2	....	...do	Do.
D. 6, No. 48	40° 22′ 0″ N., 70° 30′ 0″ W.	21	.....	71.5	70.5	70.8	66.2	4.6	77.6	30.216	73.5	30.096	0	.....	.....	W. by S.	2	....	...do	Magie.
		22	.....	70.9	70.6	70.6	66.2	4.4	77.6	30.224	73.5	30 104	0	.....	.....	WSW.	2	....	...do	Do.
D. 7, No. 49	40° 12′ 0″ N., 70° 30′ 0″ W.	23	.....	70.0	70.0	70.0	65.5	4.5	77.4	30.222	73.5	30.102	0	.....	.....	WSW.	2	....	... do	Do.
		24	L. 11–49	69.5	69.8	69.8	66.0	3.8	79.9	30.222	73.0	30.103	0	.....	.....	WSW.	2	....	...do	Do.

*Evaporation.



Bull. U. S. F. C. 1889.—(To face page 436.) Libbey.

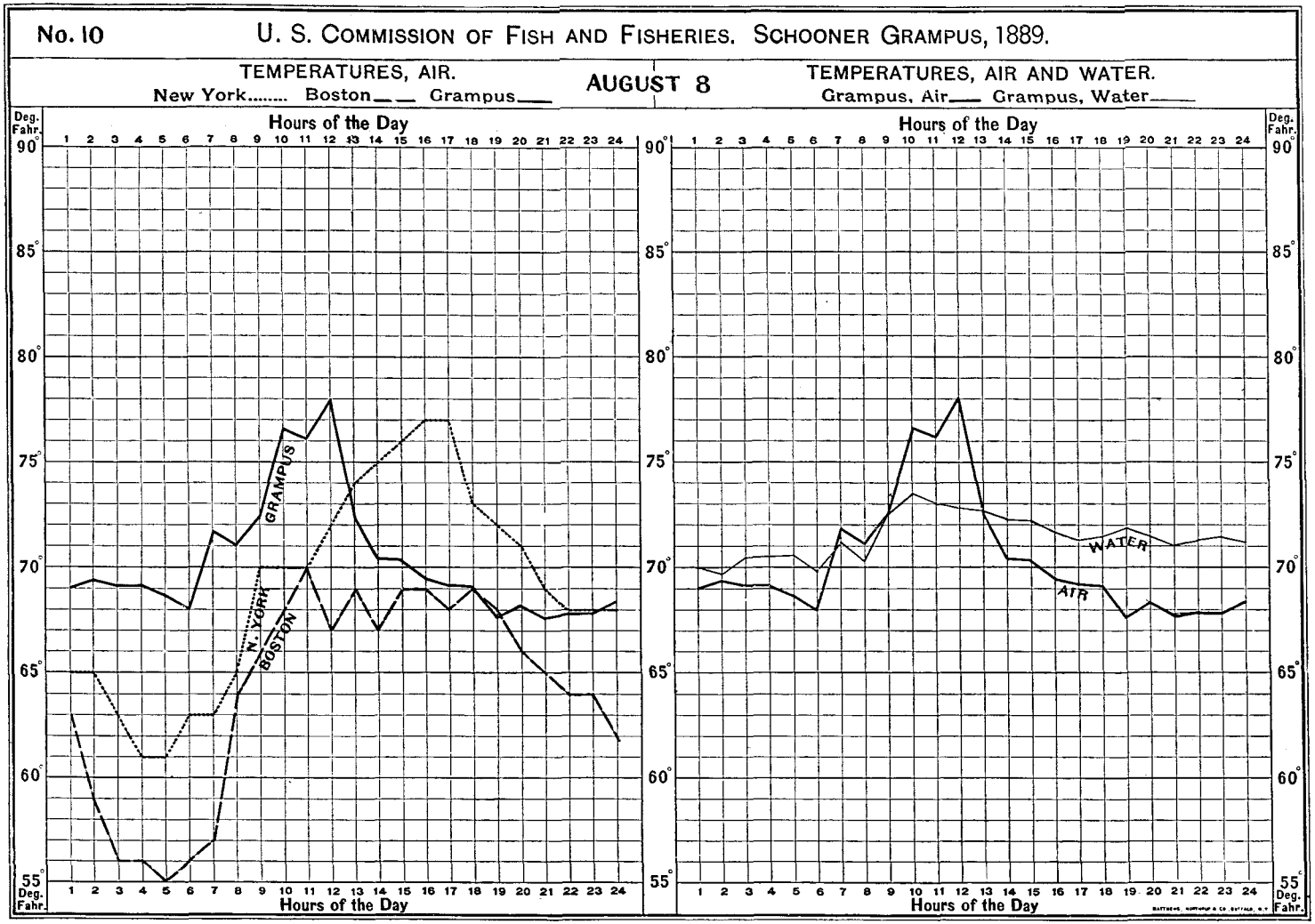

No. 10
U. S. COMMISSION OF FISH AND FISHERIES. SCHOONER GRAMPUS, 1889.
TEMPERATURES, AIR.
New York..... Boston___ Grampus___
AUGUST 8
TEMPERATURES, AIR AND WATER.
Grampus, Air___ Grampus, Water_____
Deg. Fahr.
Hours of the Day
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
90° 85° 80° 75° 70° 65° 60° 55°
GRAMPUS
N. YORK
BOSTON
WATER
AIR

PLATE CXXXV.

TABLE 10.

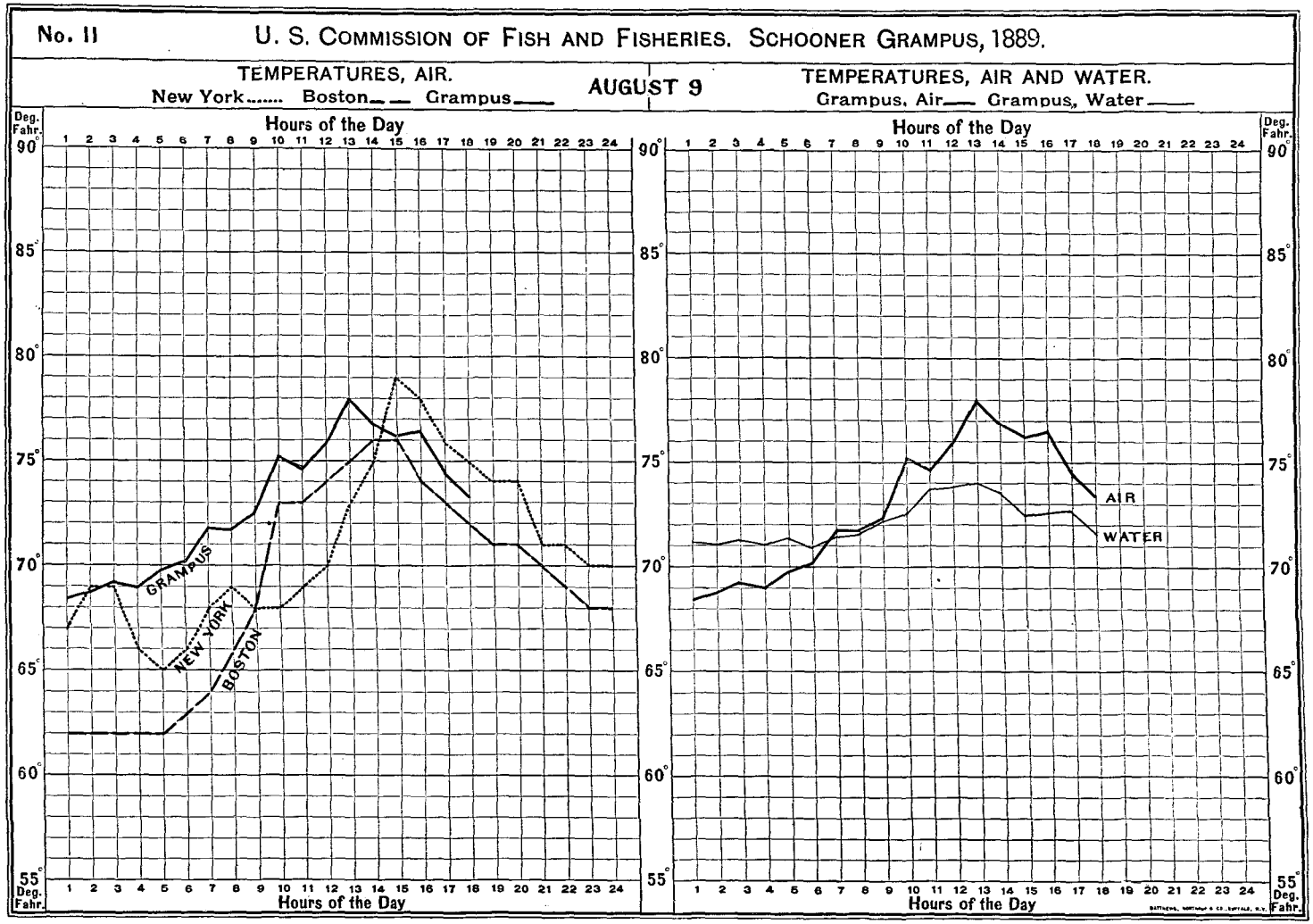
Date, August 8, 1889. Solar radiation thermometer, 125.4° F. Maximum temperature, 79.8° F. Six's, 79.2° F.
Terrestrial radiation thermometer, 66.2° F. Minimum temperature, 66.4° F. Six's, 67° F.

Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	t.	=32°.	0—10.	Upper.	Lower.	Direction.	Force.			
																		In.		
		1	.....	70.0	69.0	69.2	65.0	4.2	79.6	30.228	73.0	30.109	½	.....	Cum..	SSW.	1	....	Calm....	Rockwood.
		2	.....	69.7	69.4	69.8	65.1	4.7	77.3	30.224	73.0	30.105	½	.....	Cum..	.....	0	....	...do	Do.
		3	.....	70.4	69.3	69.4	65.4	4.0	79.6	30.230	72.5	30.112	½	.....	Str....	.....	0	....	...do	Do.
		4	.....	70.5	69.3	69.4	66.3	3.1	84.6	30.228	72.5	30.110	½	.....	Str....	N. by E.	1	....	...do	Do.
		5	H. 5–25	70.5	68.8	68.0	67.8	0.2	100.0	30.240	72.3	30.123	1	.....	Str....	NE.	1	....	...do	Libbey.
		6	.....	69.9	68.0	68.0	66.2	1.8	89.4	30.246	71.8	30.130	½	.....	Str....	NE.	1	....	...do	Do.
D. 8, No. 50	40° 2′ 0″ N., 70° 30′ 0″ W.	7	.....	71.1	71.8	71.4	65.7	5.7	72.9	30.254	71.9	30.138	⅛	.....	Str....	NE. by N.	3	....	...do	Do.
		8	.....	70.3	71.0	71.2	64.5	6.7	68.3	30.258	72.0	30.141	⅛	.....	Str....	NE. by N.	3	....	...do	Do.
D. 10, No. 51	39° 49′ 0″ N., 70° 30′ 0″ W.	9	.....	72.3	72.3	72.6	66.2	6.4	69.2	30.272	72.0	30.155	¼	.....	Cum..	NNE.	3	....	...do	Magie.
		10	.....	73.4	76.7	76.8	69.5	7.3	66.6	30.290	74.0	30.168	¼	.....	Cum..	NNE.	4	....	...do	Do.
		11	L. 11–33	73.0	76.2	76.2	69.0	7.2	68.5	30.292	74.6	30.168	¼	.....	Cum..	NE.	3	....	...do	Do.
		12	.....	72.9	78.0	77.9	69.5	8.4	63.0	30.282	74.5	30.159	0	.....	.....	NE.	2	....	...do	Do.
		13	.....	72.6	72.3	72.1	66.1	6.0	71.2	30.300	73.7	30.179	0	.....	.....	NE.	3	....	...do	Libbey.
		14	.....	72.3	70.3	70.3	64.5	5.8	72.5	30.284	72.8	30.166	0	.....	Haze..	NE.	3	....	...do	Do.
D. 10, No. 52	39° 42′ 0″ N., 70° 30′ 0″ W.	15	.....	72.2	70.2	70.1	63.5	6.6	67.8	30.282	73.0	30.163	0	.....	Haze..	NE.	1	....	...do	Do.
		16	.....	71.7	69.5	69.5	64.0	5.5	72.5	30.276	72.8	30.158	0	.....	Haze..	NE.	1	....	...do	Do.
		17	H. 5–26	71.5	69.2	69.2	63.0	6.2	70.0	30.302	73.0	30.183	0	.....	Haze..	NE.	1	....	...do	Magie.
		18	.....	71.6	69.1	69.0	63.5	5.5	72.1	30.304	73.0	30.184	0	.....	Haze .	NE.	1	....	...do	Do.
		19	.....	71.9	67.7	67.7	62.2	5.5	71.7	30.304	72.5	30.185	¼	.....	Cum..	ENE.	1	....	...do	Do.
		20	.....	71.6	68.2	68.2	63.8	4.4	76.6	30.332	72.0	30.213	0	.....	.....	E. by S.	1	....	...do	Do.
		21	.....	71.0	67.7	68.0	64.0	4.0	79.3	30.350	72.5	30.230	⅓	.....	Cum..	E.	1	....	...do	Rockwood.
		22	.....	71.3	67.9	68.0	64.0	4.0	79.3	30.330	72.5	30.210	1	.....	Cum..	SE.	2	....	...do	Do.
D 11, No. 53	39° 32′ 0″ N., 70° 30′ 0″ W.	23	.....	71.4	67.9	68.0	64.0	4.0	79.3	30.332	72.0	30.213	⅓	.....	Cum..	SE.	1	....	...do	Do.
		24	.....	71.2	68.3	68.5	64.0	4.5	77.0	30.340	72.0	30.221	0	.....	Cum..	S. by W.	3	....	...do	Do.

TABLE 11.

Date, August 9, 1889. Solar radiation thermometer, 122.9° F. Maximum temperature, 84° F. Six's 78.6° F.
Terrestrial radiation thermometer, 65.2° F. Minimum temperature, 66.2° F. Six's 68° F.

Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	t.	=32°.	0—10.	Upper.	Lower.	Direction.	Force.			
																		In.		
		1	L. 0–35	71.1	68.5	68.8	63.5	5.3	72.1	30.326	71.7	30.204	½	.....	Cum ..	S. by W.	3	....	Calm ...	Libbey.
		2	.....	71.0	68.8	68.9	64.0	4.9	74.7	30.315	71.0	30.201	½	.....	Str....	SSW.	3	....	...do	Do.
D. 12, No. 54	39° 22′ 0″ N., 70° 30′ 0″ W.	3	.....	71.3	69.2	69.4	64.2	5.2	74.7	30.320	71.0	30.206	½	.....	Str....	SSW.	3	....	...do	Do.
		4	.....	71.0	69.0	69.5	65.5	4.0	79.6	30.308	72.0	30.189	½	.....	Str....	SSW.	2	....	...do	Do.
		5	.....	71.3	69.7	69.8	66.0	3.8	79.9	30.332	72.0	30.213	1	Cir....	Str....	SSW.	2	....	...do	Magie.
		6	H. 6–13	70.9	70.1	70.2	66.9	3.3	82.4	30.334	72.0	30.215	2	Cir....	Str....	S. by W.	2	....	...do	Do.
		7	.....	71.4	71.8	71.9	67.0	4.9	75.8	30.336	73.5	30.213	4	Cir....	Str....	W. by S.	3	....	...do	Do.
D. 13, No. 55	39° 12′ 0″ N., 70° 32′ 0″ W.	8	.....	71.6	71.8	71.9	66.3	5.6	73.3	30.346	72.8	30.226	4	Cir....	Str....	W. by S.	3	....	...do	Do.
		9	.....	72.2	72.4	72.5	67.0	5.5	73.7	30.332	73.5	30.210	4	Cir....	Str....	WSW.	3	....	...do	Rockwood.
		10	.....	72.4	75.2	75.0	68.5	6.5	70.2	30.340	74.5	30.215	4	Cir	Str....	WSW.	4	....	...do	Do.
E. 13, No. 56	39° 14′ 0″ N., 70° 40′ 0″ W.	11	.....	73.7	74.7	75.0	70.0	5.0	76.8	30.340	75.0	30.213	5	Cir....	Str....	WSW.	4	....	...do	Do.
		12	L. 12–24	73.8	75.8	75.7	70.0	5.7	74.7	30.336	75.0	30.209	4	Cir....	Str....	WSW.	4	....	...do	Do.
E. 12, No. 57	39° 24′ 0″ N., 70° 40′ 0″ W.	13	.....	74.0	78.0	78.0	70.4	7.6	67.1	30.322	77.0	30.190	7	Cir....	Str....	W. by S.	4	....	...do	Magie.
		14	.....	73.5	76.8	78.8	69.9	8.9	61.8	30.328	76.5	30.198	8	Cir....	Str....	W. by S.	4	....	...do ...	Do.
		15	.....	72.5	76.2	76.2	70.2	6.0	72.7	30.266	77.0	30.136	6	Cir....	Str....	W. by S.	4	....	Mod. sw.	Do.
E. 11, No. 58	39° 34′ 0″ N., 70° 40′ 0″ W.	16	.....	72.6	76.5	76.5	70.2	6.3	70.8	30.272	76.5	30.144	5	Cir....	Str....	WSW.	4	....	Choppy.	Do.
		17	.....	72.7	74.5	74.5	69.3	5.2	76.4	30.264	76.0	30.137	6	Cir....	Str....	WSW.	4	....	...do	Rockwood.
		18	H. 6–15	71.5	73.2	73.0	68.7	4.3	78.3	30.250	76.0	30.123	6	.....	Cu. str.	WSW.	5	....	...do	Do.



Bull. U. S. F. C. 1889.—(To face page 438.) Libbey.

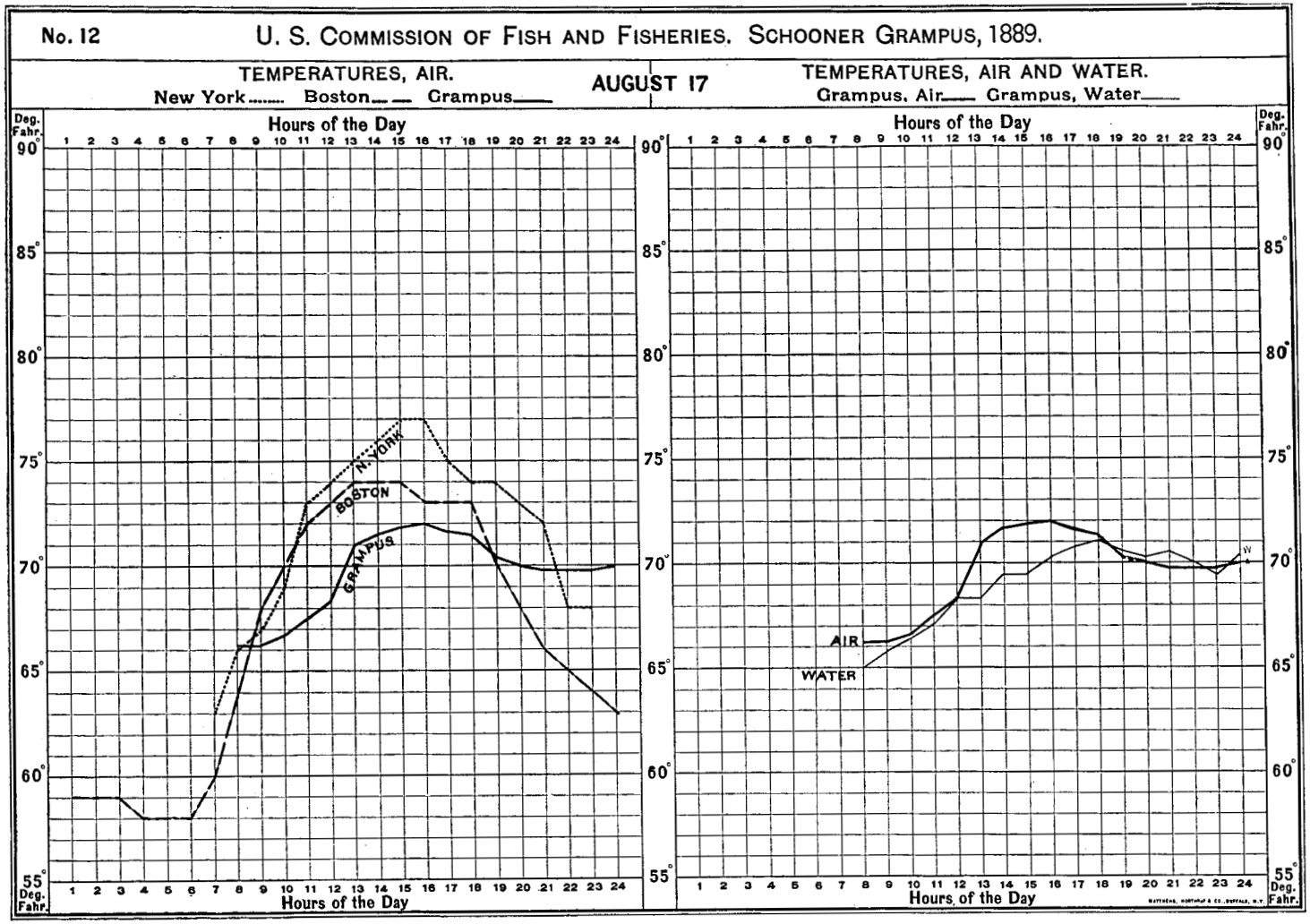

No. 12
U. S. COMMISSION OF FISH AND FISHERIES. SCHOONER GRAMPUS, 1889.
TEMPERATURES, AIR.
New York..... Boston.... Grampus.....
AUGUST 17
TEMPERATURES, AIR AND WATER.
Grampus, Air..... Grampus, Water.....
Deg. Fahr.
Hours of the Day
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
90°
85°
80°
75°
70°
65°
60°
55°
N. YORK
BOSTON
GRAMPUS
AIR
WATER

TABLE 12.

Date, August 17, 1889. Solar radiation thermometer, 135.3° F. Maximum temperature, 77° F. Six's, 75° F.
Terrestrial radiation thermometer, 60.3° F. Minimum temperature, 61.7° F. Six's, 61.2° F.

Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	t.	=32°.	0—10.	Upper.	Lower.	Direction.	Force.			
																		In.		
		1	H. 0-40	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	...	.....	
		2		.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	...	.....	
		3		.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	...	.....	
		4		.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	...	.....	
		5		.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	...	.....	
		6		.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	...	.....	
		7	L. 7-3	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	...	...	.....	
		8	.....	65.0	66.2	66.2	65.1	1.1	94.5	30.090	69.0	29.981	1	.....	Str ...	W. by S.	2	...	Calm ...	Rockwood.
		9	.....	65.9	66.3	66.8	64.5	2.3	86.7	30.102	69.0	29.993	3	Cir ...	Str ...	W.	2	...	...do ...	Libbey.
		10	.....	66.4	66.7	62.0	63.8	3.2	83.9	30.118	69.4	30.008	3	Cir ...	Str ...	W. by S.	2	...	...do ...	Do.
		11	.....	67.2	67.5	68.0	64.0	4.0	79.3	30.120	71.0	30.006	3	Cir ...	Str ...	W. by S.	3	...	...do ...	Do.
G. 2, No. 59	41° 2′ 0″ N., 71° 0′ 0″ W.	12	H.12-54	68.2	68.2	68.8	64.5	4.3	79.5	30.112	70.4	30.000	4	Cir ...	Str ...	W. by S.	3	...	...do ...	Do.
		13	.....	68.2	71.0	71.0	66.0	5.0	75.4	30.102	71.2	29.998	6	Cir ...	Str ...	W. by S.	3	...	...do ...	Magie.
G. 3, No. 60	40° 52′ 0″ N., 71° 0′ 0″ W.	14	.....	69.5	71.6	71.7	67.0	4.7	75.8	30.086	71.3	29.971	3	Cir ...	Str ...	W. by S.	3	...	...do ...	Do.
		15	.....	69.5	71.9	72.0	67.0	5.0	75.8	30.094	72.0	29.977	2	Cir ...	Str ...	W. by S.	3	...	...do ...	Do.
G. 4, No. 61	40° 42′ 0″ N., 71° 3′ 0″ W.	16	.....	70.2	72.0	72.0	66.5	5.5	73.5	30.094	72.0	29.977	2	Cir ...	Str ...	W. by S.	4	...	...do ...	Do.
		17	.....	70.8	71.8	71.8	66.8	5.0	75.6	30.123	73.0	30.004	4	Cir ...	Str ...	W.	4	...	Mod. sw.	Rockwood.
G. 5, No. 62 (*)	40° 32′ 0″ N., 71° 0′ 0″ W.	18	.....	71.2	71.4	71.4	66.0	5.4	73.3	30.125	72.5	30.007	3	Cir ...	Str ...	W.	2	...	...do ...	Do.
		19	.....	70.4	70.3	70.3	65.2	5.1	75.1	30.120	72.5	30.002	2	Cir ...	Str ...	W.	2	...	...do ...	Do.
G. 6, No. 63	40° 22′ 0″ N., 71° 0′ 0″ W.	20	L. 8-12	70.2	70.0	70.0	65.5	4.5	77.5	30.150	72.5	30.032	1	.....	Str ...	W.	2	...	...do ...	Do.
		21	.....	70.4	69.8	70.0	66.0	4.0	79.9	30.142	72.3	30.024	1	.....	Str ...	W.	3	...	...do ...	Libbey.
G. 7, No. 64	40° 12′ 0″ N., 71° 0′ 0″ W.	22	.....	70.0	69.8	70.0	66.0	4.0	79.9	30.140	72.3	30.022	1	.....	Str ...	W.	3	...	...do ...	Do.
		23	.....	69.6	69.8	69.8	65.8	4.0	79.9	30.150	72.3	30.032	1	.....	Str ...	WNW.	3	...	...do ...	Do.
G. 8, No. 65	40° 2′ 0″ N., 71° 0′ 0″ W.	24	.....	70.3	70.0	70.1	66.2	3.9	80.0	30.140	73.0	30.021	0	.....	.....	WNW.	3	...	...do ...	Do.

* Surface thermometer 6812 was used from this point on.

TABLE 13.

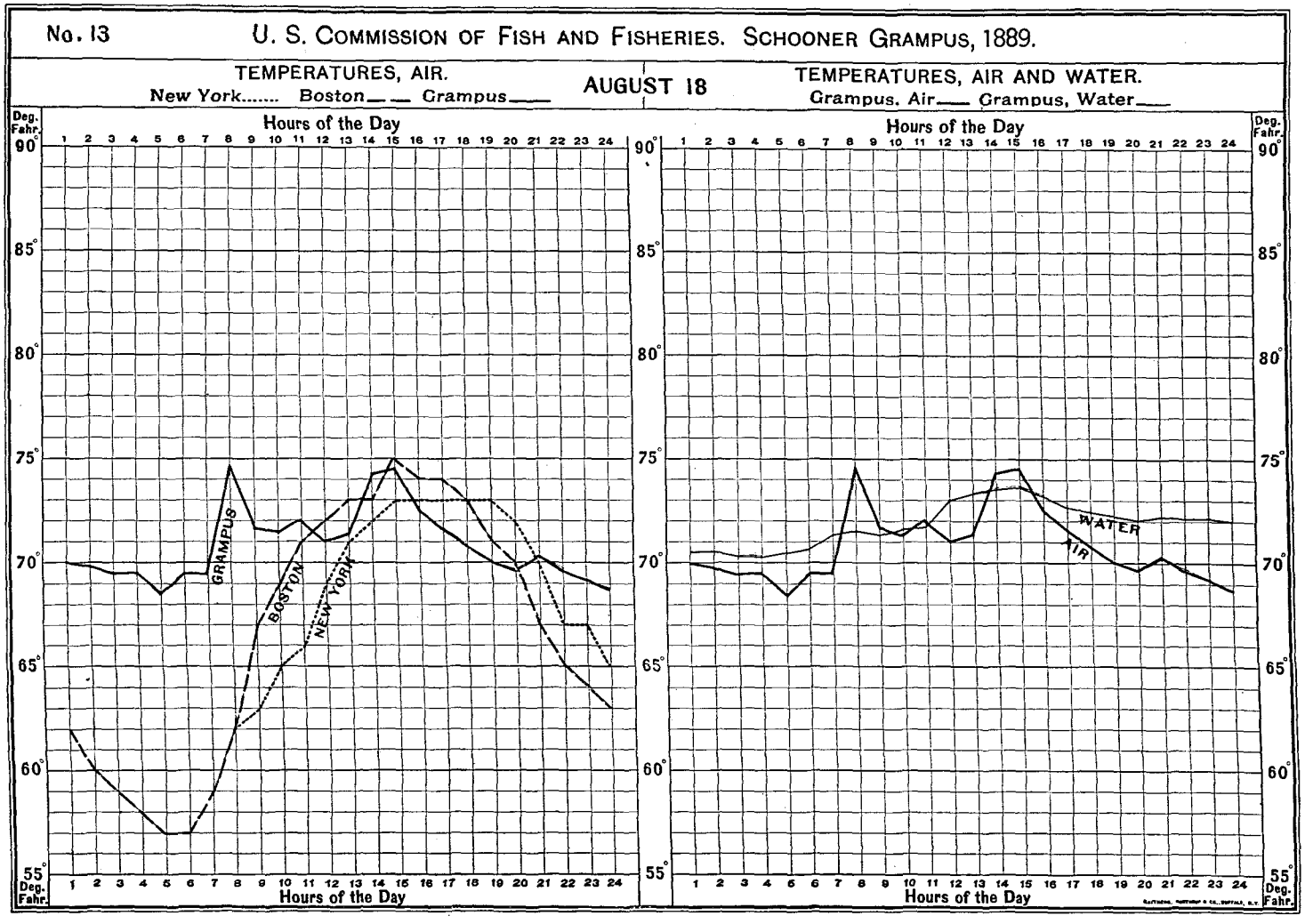
Date, August 18, 1889. Solar radiation thermometer, 133° F. Maximum temperature, 76.3° F. Six's, 77° F.
Terrestrial radiation thermometer, 66.2° F. Minimum temperature, 65.5° F. Six's, 64.5° F.

Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	*t.*	=32°.	0—10.	Upper.	Lower.	Direction.	Force.			
																		In.		
		1	H. 1–48	70 6	70.0	70.0	66.6	3.4	82.2	30.102	72.6	29.984	0	.....	.....	WNW.	4	....	Calm ...	Magie.
		2	.....	70.6	69.8	69.8	66.6	3.2	84.6	30.138	73.0	30.019	0	.....	.....	WNW.	3	....	...do ...	Do.
G. 9, No. 66	39° 52′ 0″ N., 71° 0′ 0″ W.	3	.....	70.4	69.5	69.5	66.5	3.0	84.7	30.128	72.4	30.011	0	.....	.....	NW. by N.	3	....	...do ...	Do.
		4	.....	70.3	69.6	69.6	67.0	2.6	87.2	30.128	72.5	30.010	1	Cir ..	Str ...	NW. by N.	3	....	...do ...	Do.
		5	.....	70.5	68.5	68.5	66.0	2.5	87.0	30.170	72.5	30.052	2	.....	Str ...	NW. by N.	2	....	...do ...	Rockwood.
		6	.....	70.6	69.6	69.7	65.7	4.0	79.7	30.170	72.0	30.053	1	.....	Str ...	NW. by N.	1	....	...do ...	Do.
		7	.....	71.3	69.5	69.5	66.0	3.5	82.2	30.170	72.5	30.052	1	.....	Str ...	NNW.	1	....	...do ...	Do.
F. 10, No. 67	39° 42′ 0″ N., 70° 54′ 0″ W.	*8	L. 8–4	71.5	74.6	74.5	69.0	5.5	74.4	30.176	73.0	30.057	½	.....	Str ...	NNW.	1	†.50	...do	Do.
		9	.....	71.4	71.8	71.9	67.0	4.9	75.7	30.200	72.0	30.083	0	.....	.....	N.	1	....	...do	Libbey.
		10	.....	71.6	71.5	71.7	66.8	4.9	75.5	30.200	72.0	30.083	3	Str...	Str ...	N.	1	....	...do	Do.
		11	.....	71.8	72.0	72.0	67.0	5.0	75.8	30.192	72.0	30.075	5	Str...	Str ...	N.	1	....	...do	Do.
F. 11, No. 68	39° 30′ 0″ N., 70° 58′ 0″ W.	12	.....	73.0	71.0	71.0	65.8	5.2	75.2	30.190	73.0	30.071	2	.....	Str ...	N.	1	....	...do	Do.
		13	H. 1–50	73.2	71.3	71.0	65.6	5.4	73.0	30.184	74.0	30.062	2	.....	Str ...	NNW.	1	....	...do	Rockwood.
		14	.....	73.4	74.3	74.0	67.5	7.0	67.7	30.180	75.5	30.055	6	.....	Str ...	NW.	1	....	...do	Do.
		15	.....	73.6	74.5	74.0	67.5	6.5	69.8	30.174	75.5	30.049	8	.....	Str ...	NW. by W.	2	....	...do ...	Do.
G. 12, No. 69	39° 22′ 0″ N., 71° 4′ 0″ W.	16	.....	73.2	72.5	72.0	66.7	5.3	73.5	30.188	74.0	30.066	9	.....	Str ...	NW. by W.	1	....	Mod. sw.	Do.
		17	.....	72.8	71.7	71.8	66.7	5.1	75.5	30.184	74.5	30.061	9	Str...	Cum ..	NW. by W.	2	....	...do	Libbey.
		18	.....	72.5	70.8	70.8	66.0	3.8	80.0	30.192	74.0	30.070	6	Str...	Cum ..	NW. by W.	2	....	...do	Do.
		19	.....	72.2	70.0	70.1	66.0	4.1	79.9	30.200	73.0	30.081	2	.....	Cum ..	NNW.	2	....	...do ...	Do.
H. 13, No. 70	39° 12′ 0″ N., 71° 9′ 30″ W.	20	.....	72.0	69.8	70.0	65.7	4.3	77.4	30.220	73.8	30.099	6	.....	Str ...	NW. by N.	2	....	...do	Do.
		21	L. 9–18	72.2	70.1	70.1	66.3	3.8	79.9	30.222	73.0	30.102	1	.....	Str ...	NNW.	2	....	...do ...	Magie.
		22	.....	72.2	69.7	69.8	65.5	4.3	77.5	30.216	73.0	30.097	2	.....	Str ...	.....	0	....	...do	Do.
		23	.....	72.2	69.2	69.2	65.0	4.2	79.6	30.216	73.0	30.097	1	.....	Str ...	.....	0	....	...do	Do.
		24	.....	72.0	68.8	68.8	65.3	3.5	81.9	30.214	73.0	30.095	1	.....	Str ...	.....	0	....	.. do ...	Do.

* Sun on thermometer box.

† Evaporation.

PLATE CXXXVIII.



Bull. U. S. F. C. 1889.—(To face page 440.) Libbey.

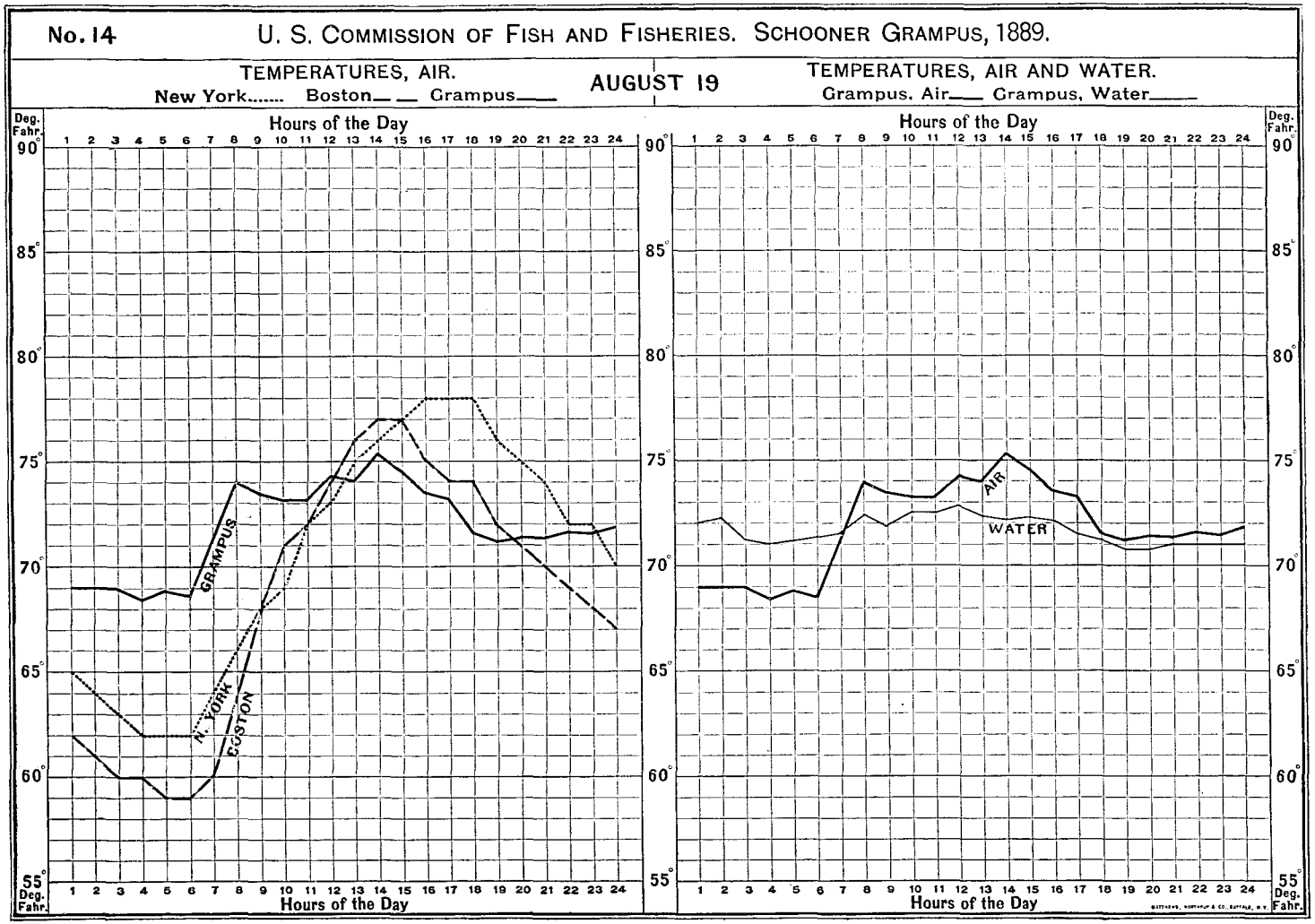

No. 14
U. S. COMMISSION OF FISH AND FISHERIES. SCHOONER GRAMPUS, 1889.
TEMPERATURES, AIR.
New York..... Boston— — Grampus——
AUGUST 19
TEMPERATURES, AIR AND WATER.
Grampus. Air—— Grampus, Water——
Deg. Fahr.
Hours of the Day
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
90°
85°
80°
75°
70°
65°
60°
55°
GRAMPUS
N. YORK
BOSTON
AIR
WATER

TABLE 14.

Date, August 19, 1889. Solar radiation thermometer, 131.3° F. Maximum temperature, 78.9° F. Six's, 77° F.
Terrestrial radiation thermometer, 65.7° F. Minimum temperature, 67.8° F. Six's, 69° F.

Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	t.	=32°.	0—10.	Upper.	Lower.	Direction.	Force.			
																		In.		
		1	.....	72.0	69.0	69.0	65.5	3.5	84.3	30.206	72.5	30.089	1	.....	Str.....	NW.	½	....	Calm...	Rockwood.
		2	H. 2–50	72.2	69.0	69.3	64.8	4.5	77.0	30.220	72.0	30.103	1	.....	Cum ...	NW. by W.	2	....	...do ...	Do.
		3	.....	71.3	69.0	69.2	65.0	4.2	79.6	30.216	72.0	30.099	½	.....	Cum ...	NW. by W.	2	....	...do ...	Do.
J.13, No. 71	39° 12′ 0″ N., 71° 20′ 0″ W.	4	. ...	71.0	68.6	68.8	64.8	4.0	79.5	30.220	71.5	30.085	½	.....	Cum ...	NW. by W.	2	....	...do ...	Do.
		5	.....	71.2	68.9	69.0	65.5	3.5	81.9	30.230	72.2	30.113	¼	.....	Cu. str.	NW. by W.	2	....	...do ...	Libbey.
		6	.... ..	71.3	68.8	69.0	66.0	3.0	84.6	30.245	72.0	30.128	2	.....	Cu. str.	NW.	3	....	...do ...	Do.
J.12, No. 72	39° 22′ 0″ N., 71° 22′ 0″ W.	7	.....	71.5	71.4	71.8	67.8	4.0	80.3	30.248	72.8	30.130	½	.....	Cu. str.	NW.	3	....	...do ...	Do.
		*8	.....	72.3	74.0	74.2	69.3	4.9	76.4	30.268	74.2	30.146	½	.....	Cu. str.	NW.	2	....	...do ...	Do.
		9	L. 9–12	71.9	73.5	73.3	68.1	5.2	76.1	30.266	73.0	30.147	½	.....	Cu. str.	NW. by W.	2	....	...do ...	Magie.
		10	.....	72.4	73.2	73.2	68.7	4.5	78.5	30.252	74.0	30.130	2	.....	Cu. str.	NW.	2	....	...do ...	Do.
J.11, No. 73	39° 30′ 20″ N., 71° 20′ 0″ W.	11	.....	72.5	73.2	73.2	68.9	4.3	78.5	30.266	74.0	30.144	0	Haze.		NW. by W.	2	....	...do ...	Do.
		12	.....	72.8	74.2	74.0	69.0	5.0	76.4	30.232	74.0	30.110	0	Haze.		NW. by W.	3	....	...do ...	Do.
		13	.....	72.4	74.0	74.1	69.4	4.7	78.7	30.246	76.3	30.119	0	Haze.		NW. by W.	3	....	...do ...	Libbey.
J.10, No. 74	39° 40′ 20″ N., 71° 21′ 30″ W.	14	H. 2–43	72.2	75.3	75.4	70.2	5.2	76.8	30.240	75.6	30.115	0	Haze.		WNW.	3	....	...do ...	Do.
		15	.....	72.3	74.6	74.8	70.8	4.0	81.1	30.250	75.8	30.124	0	Haze.		W.	3	....	...do ...	Do.
J. 9, No. 75	39° 52′ 0″ N., 71° 19′ 0″ W.	16	.....	72.1	73.6	73.8	70.0	3.8	81.0	30.200	76.0	30.073	0	Haze.		W.	3	....	...do ...	Do.
		17	.....	71.6	73.2	73.0	69.7	3.3	83.0	30.176	74.5	30.053	0	Thick haze.		W.	3	†.44	...do ...	Magie.
		18	.....	71.2	71.5	71.5	68.2	3.3	82.7	30.164	75.7	30.038	2	Thick haze.		W.	3	....	...do ...	Do.
J. 8, No. 76	40° 2′ 0″ N., 71° 21′ 0″ W.	19	.....	70.8	71.2	71.2	68.5	2.7	87.3	30.164	75.3	30.039	4	Cir ...	Str	W.	4	....	...do ...	Do.
		20	.....	70.8	71.3	71.3	68.5	2.8	87.4	30.162	74.5	30.040	0	.....	Str	W.	4	....	...do ...	Do.
		21	.....	71.0	71.3	71.5	68.5	3.0	85.0	30.210	74.5	30.087	0	.....	Str	W.	4	....	...do ...	Rockwood.
J. 7, No. 77	40° 12′ 0″ N., 71° 20′ 0″ W.	22	L. 10–30	71.0	71.5	71.7	69.8	1.9	89.9	30.172	74.0	30.050	1	.....	Str	W. by S.	4	....	...do ...	Do.
		23	.....	71.0	71.4	71.8	69.8	2.0	89.9	30.164	74.5	30.041	2	.....	Str	W. by S.	5	....	...do ...	Do.
J. 6, No. 78	40° 22′ 0″ N., 71° 20′ 0″ W.	24	.....	71.0	71.8	72.0	70.0	2.0	90.0	30.160	74.0	30.038	4	.....	Cu. str.	W. by S.	4	....	...do ...	Do.

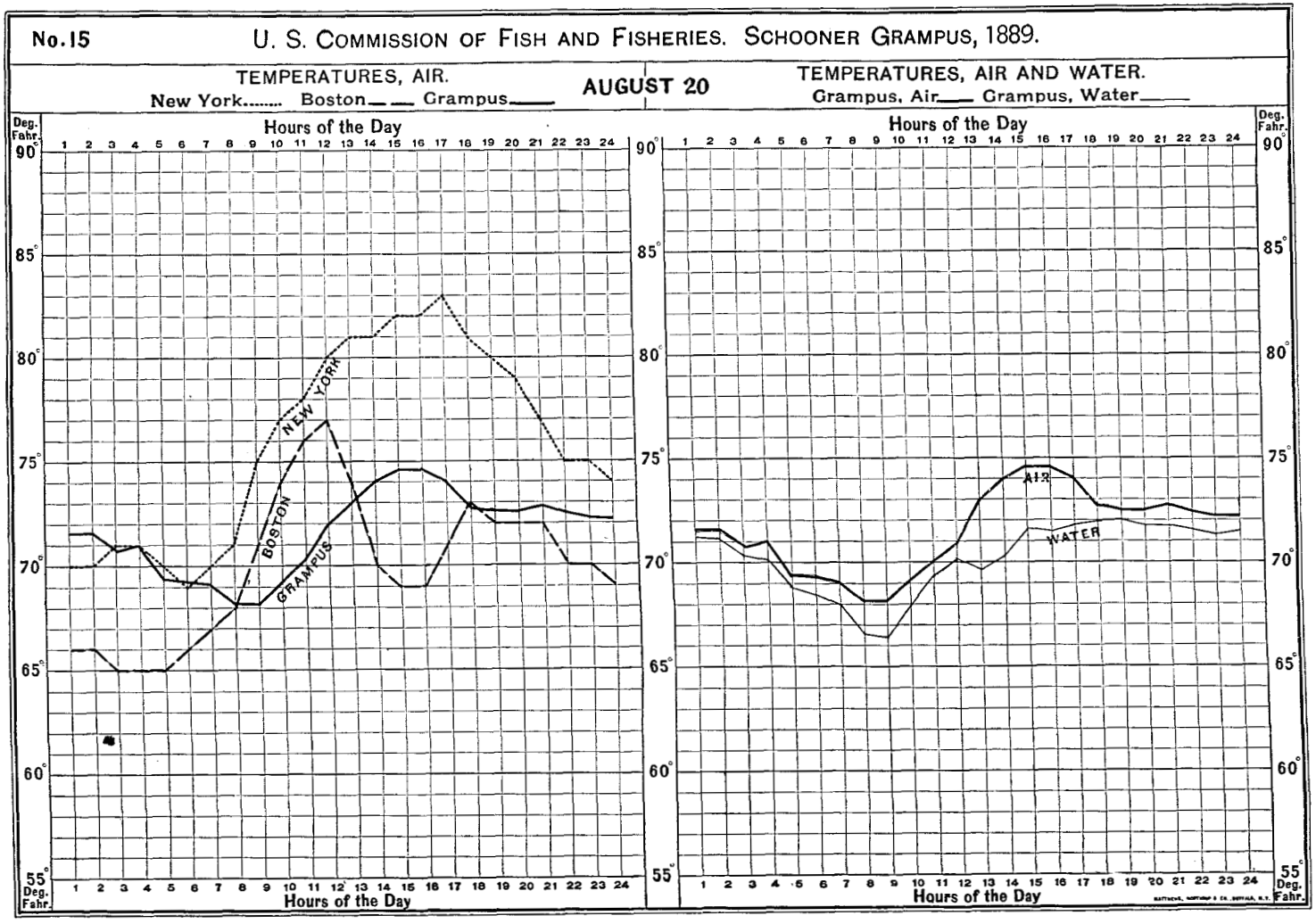
* Sun on thermometer box.

† Evaporation.

TABLE 15.

Date, August 20, 1889. Solar radiation thermometer, 126° F. Maximum temperature, 84° F. Six's, 82.5° F.
Terrestrial radiation thermometer, 61.3° F. Minimum temperature, 67.4° F. Six's, 67.5° F.

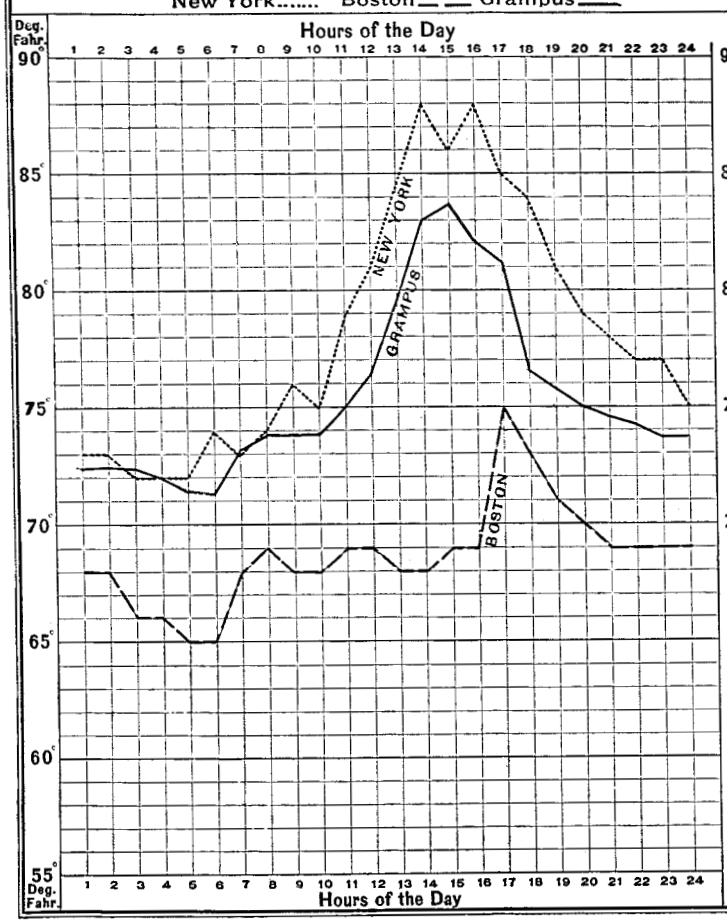
Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	t.	=32°.	0—10.	Upper.	Lower.	Direction.	Force.			
																		In.		
J. 5, No. 79	40° 32′ 0″ N., 71° 20′ 0″ W.	1	.....	71.2	71.6	72.0	70.7	1.3	92.3	30.140	74.5	30.017	8	.....	Cum...	WSW.	5	.12	Mod. sw.	Libbey.
		2	.....	71.1	71.6	71.8	71.0	0.8	97.5	30.128	74.3	30.006	9	.....	Cum...	WSW.	5	...	...do	Do.
J. 4, No. 80	40° 42′ 0″ N., 71° 20′ 0″ W.	3	H. 3–48	70.5	70.8	71.0	70.8	0.2	100.0	30.090	74.1	29.968	8	.....	Str	WSW.	5	....	...do	Do.
		4	.....	70.3	71.0	71.2	70.3	0.9	94.9	30.080	74.2	29.958	9	.....	Cu. str.	WSW.	5	....	...do	Do.
		5	.....	68.8	69.4	69.4	68.8	0.6	97.3	30.062	75.0	29.937	10	.....	Cu. str.	WSW.	5	....	...do	Magie.
J. 3, No. 81	40° 52′ 0″ N., 71° 20′ 0″ W.	6	.....	68.5	69.3	69.5	68.9	0.6	97.3	30.052	75.0	29.927	9	.....	Cu. str.	WSW.	5	....	...do	Do.
		7	.....	68.0	69.1	69.3	68.9	0.4	97.4	30.068	74.5	29.944	5	Cir	Cu. str.	W. by S.	4	....	...do	Do.
		8	.....	66.5	68.2	68.3	67.6	0.7	97.3	30.058	73.5	29.938	8	Cir	Cu. str.	W.	4	....	...do	Do.
		9	.....	66.4	68.2	68.2	67.6	0.6	97.3	30.074	72.5	29.956	8	.....	Cu. str.	W.	3	..	Calm ...	Rockwood.
K. 3, No. 82	40° 52′ 0″ N., 71° 30′ 0″ W.	10	L. 10–3	67.9	69.1	69.3	68.3	1.0	94.7	30.062	75.0	29.937	8	.....	Cu. str.	W.	3	....	Mod. sw.	Do.
		11	.....	69.2	70.1	70.0	69.0	1.0	94.8	30.040	73.5	29.920	6	.....	Cir.str.	W.	3	..	...do	Do.
		12	.....	70.1	71.9	72.0	70.0	2.0	90.0	30.044	74.0	29.922	6	.....	Cir.str.	W. by S.	3	....	...do	Do.
K. 4, No. 83	40° 42′ 0″ N., 71° 30′ 0″ W.	13	.....	69.7	73.0	73.0	70.4	2.6	87.7	30.052	75.0	29.927	0		Haze.	W.	3	....	.. do	Magie.
		14	.....	70.2	73.9	73.9	71.9	2.0	90.2	30.040	75.0	29.915	0		Haze.	W.	3	....	...do	Do.
K. 5, No. 84	40° 32′ 0″ N., 71° 30′ 0″ W.	15	H. 3–33	71.4	74.5	74.5	71.4	3.1	85.6	30.026	75.0	29.901	0		Haze.	W.	3	....	.. do	Do.
		16	.....	71.3	74.5	74.5	71.7	2.8	85.4	30.036	75.0	29.911	0		Haze.	W.	3	....	...do ...	Do.
K. 6, No. 85	40° 22′ 0″ N., 71° 30′ 0″ W.	17	.....	71.8	74.0	73.8	71.9	1.9	90.2	30.064	75.5	29.938	0		Haze.	W.	3	....	...do	Rockwood.
		18	.....	71.9	72.8	72.6	71.1	1.5	92.5	30.066	75.5	29.940	5	Cir ..	Str	W.	4	....	...do	Do.
K. 7, No. 86	40° 12′ 0″ N., 71° 30′ 0″ W.	19	.....	72.0	72.6	73.0	71.7	1.3	92.5	30.060	75.0	29.937	7	Cir ..	Str	WNW.	3	....	...do	Do.
		20	.....	71.8	72.6	72.8	71.8	1.0	95.0	30.066	75.5	29.940	4	.....	Str	WNW.	3	....	...do	Do.
K. 8, No. 87	40° 2′ 0″ N., 71° 30′ 0″ W.	21	.....	71.8	72.8	73.0	72.0	1.0	95.0	30.064	75.8	29.938	2	.....	Str	WNW.	3	....	...do	Libbey.
		22	.....	71.5	72.6	72.8	72.0	0.8	97.5	30.070	75.8	29.944	2	.....	Str	WNW.	3	....	...do ...	Do.
K. 9, No. 88	39° 52′ 0″ N., 71° 30′ 0″ W.	23	L. 11–20	71.3	72.3	72.4	71.8	0.6	97.5	30.068	75.5	29.942	4	.....	Str	W. by W.	1	....	...do	Do.
		24	.....	71.6	72.3	72.3	72.0	0.3	97.5	30.070	75.5	29.944	3	.....	Str	W. by N.	½	....	...do ...	Do.


No. 15
U. S. COMMISSION OF FISH AND FISHERIES. SCHOONER GRAMPUS, 1889.
TEMPERATURES, AIR.
New York..... Boston___ Grampus____
AUGUST 20
TEMPERATURES, AIR AND WATER.
Grampus, Air___ Grampus, Water____
Deg. Fahr.
Hours of the Day
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
90° 85° 80° 75° 70° 65° 60° 55°
NEW YORK
BOSTON
GRAMPUS
AIR
WATER

No. 16

U. S. COMMISSION OF FISH AND FISHERIES. SCHOONER GRAMPUS, 1889.

AUGUST 21



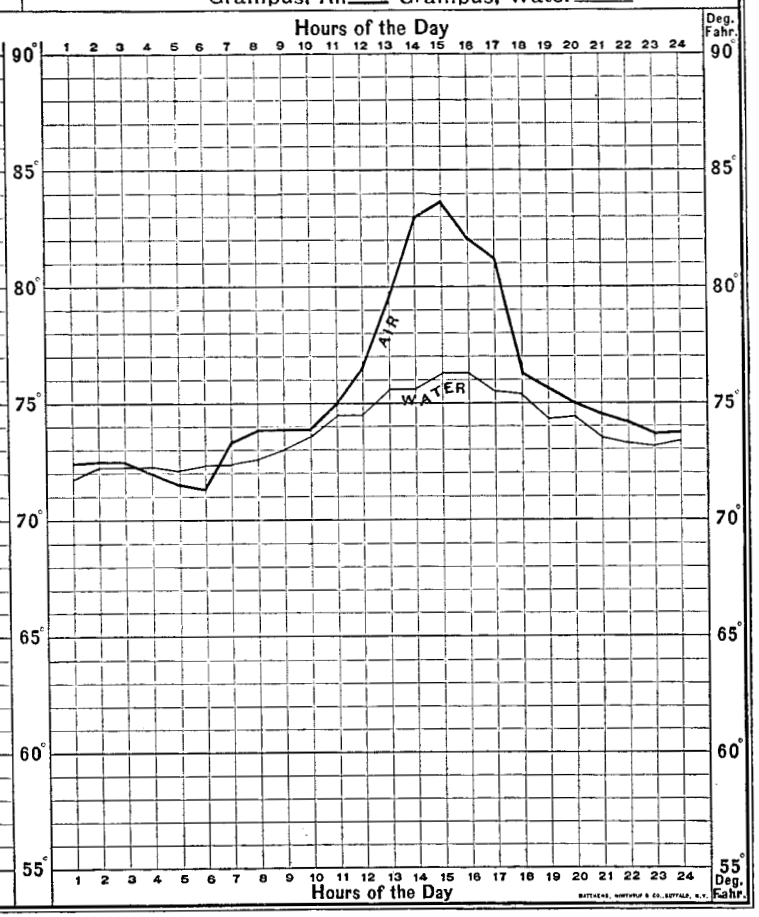


TABLE 16.

Date, August 21, 1889. Solar radiation thermometer, 122° F. Maximum temperature, 84° F. Six's, 83° F.
Terrestrial radiation thermometer, 70.1° F. Minimum temperature, 62.8° F. Six's, 62° F.

Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	t.	=32°	0—10.	Upper.	Lower.	Direction.	Force.			
																		In.		
		1	.....	71.7	72.5	72.5	72.2	0.3	97.5	30.074	76.0	29.947	3	.....	Str ...	W.	2	....	Calm ...	Magie.
K. 10, No. 89	39° 42′ 0″ N., 71° 30′ 0″ W.	2	.....	72.2	72.6	72.7	72.2	0.5	97.5	30.062	76.0	29.935	0	Haze.		W.	2	....	...do	Do.
		3	.....	72.3	72.4	72.6	72.3	0.3	97.5	30.064	76.0	29.937	0	Haze.		W.	2	....	...do	Do.
		4	H. 4–38	72.2	72.1	72.1	72.0	0.1	100.0	30.068	76.0	29.941	0	Haze.		W.	2	....	...do	Do.
		5	.....	72.2	71.6	71.7	71.0	0.7	97.5	30.060	75.0	29.935	7	Cir ..	Str ...	W.	2	....	...do	Rockwood.
		6	.....	72.4	71.4	71.5	71.2	0.3	97.5	30.068	75.0	29.943	4	Cir ..	Cu.str.	W.	2	....	Mod. sw.	Do.
K. 11, No. 90	39° 32′ 0″ N., 71° 30′ 0″ W.	*7	.....	72.4	73.3	73.5	73.0	0.3	97.5	30.078	75.5	29.952	3	Cir ..	Str ...	W.	2	....	...do	Do.
		8	.....	72.7	73.9	74.0	72.0	2.0	90.0	30.090	75.5	29.963	3	Cir ..	Str ...	NNW.	1	....	...do	Do.
		9	.....	73.0	73.9	74.0	72.0	2.0	90.0	30.100	75.5	29.973	3	Cir ..	Str ...	.....	0	....	... do	Libbey.
		10	L. 10–50	73.6	73.9	74.0	72.0	2.0	90.0	30.114	75.8	29.988	3	Cir ..	Str ...	WSW.	1	....	...do	Do.
		11	.....	74.6	75.0	75.2	72.5	2.7	88.1	30.120	76.4	29.993	8	Cir ..	Str ...	WSW.	1	....	...do	Do.
		12	.....	74.6	76.5	76.9	73.2	3.7	83.8	30.122	76.7	29.994	5	Cir ..	Str ...	WSW.	1	....	...do	Do.
K. 12, No. 91	39° 22′ 0″ N., 71° 30′ 0″ W.	13	.....	75.5	79.6	79.6	75.0	4.6	80.2	30.090	78.5	29.956	5	Cir ..	Str ...	WSW.	1	....	...do ...	Rockwood.
		*14	.....	75.5	83.0	82.8	76.8	6.0	74.7	30.090	78.5	29.956	4	Cir ..	Str ...	SW. by W.	1	....	...do	Do.
		*15	.....	76.2	83.8	83.2	76.7	6.5	72.9	30.092	79.0	29.957	0	Haze.		SW. by W.	1	....	...do	Do.
		*16	H. 4–18	76.2	82.0	82.0	76.6	5.4	76.6	30.086	79.5	29.950	0	Haze.		SW. by W.	1	....	...do	Do.
		17	.....	75.4	81.2	79.7	76.2	3.5	85.5	30.090	80.0	29.952	3	.....	Str ...	SW. by W.	1	....	...do	Libbey.
		18	.....	75.3	76.3	76.6	75.0	1.6	92.9	30.084	79.6	29.947	4	Cir ..	Str ...	SW. by W.	1	....	...do	Do.
H. 12, No. 92	39° 22′ 0″ N., 71° 10′ 0″ W.	19	.....	74.2	75.7	75.8	75.0	0.8	95.2	30.068	79.0	29.923	4	Cir ..	Str ...	SW. by W.	1	....	...do	Do.
		20	.....	74.4	75.0	75.2	74.8	0.4	97.6	30.080	79.8	29.943	2	.....	Str ...	SW. by W.	2	....	...do	Do.
		21	.....	73.5	74.5	74.6	74.3	0.3	97.6	30.070	79.0	29.935	0	.....	.....	SW. by W.	2	....	...do	Magie.
H. 11, No. 93	39° 32′ 0″ N., 71° 10′ 0″ W.	22	.....	73.4	74.1	74.3	74.0	0.3	97.6	30.078	78.0	29.945	0	.....	.....	SW.	2	....	...do	Do.
		23	.....	73.2	73.7	73.9	73.5	0.4	97.5	30.072	77.5	29.941	0	.....	.....	SW.	2	....	...do	Do.
		24	L. 12–5	73.5	73.7	73.9	73.5	0.4	97.5	30.062	78.0	29.931	0	.....	.....	SW.	2	....	...do	Do.

*Sun on thermometer box.

TABLE 17.

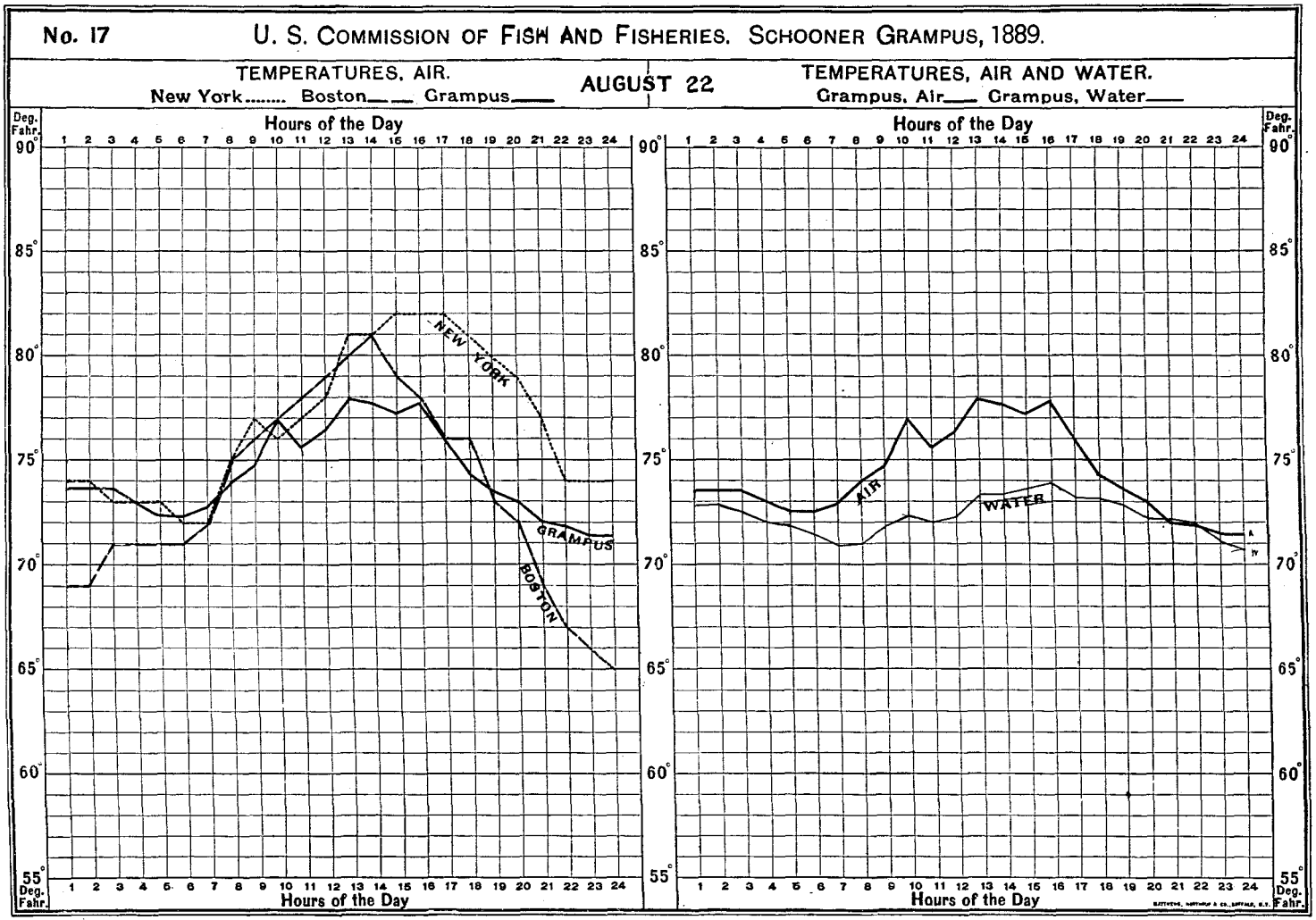
Date, August 22, 1889. Solar radiation thermometer, 132.3° F. Maximum temperature, 81.3° F. Six's, 79° F.
Terrestrial radiation thermometer, 71° F. Minimum temperature, 72° F. Six's, 72° F.

Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	t.	=32°.	0—10.	Upper.	Lower.	Direction.	Force.			
																		In.		
H. 10, No. 94	39° 42′ 0″ N., 71° 10′ 0″ W.	1	.....	72.9	73.6	73.6	73.1	0.5	97.5	30.016	77.0	29.880	1	.....	Str	SW.	3	....	Calm ..	Rockwood.
		2	.....	72.9	73.6	73.8	73.0	0.8	95.1	30.024	77.0	29.894	1	.....	Str	SW.	3	....	...do ..	Do.
		3	.....	72.6	73.6	73.6	73.0	0.6	97.5	30.020	77.0	29.890	1	.....	Cu. str.	SW.	4	....	...do ...	Do.
H. 9, No. 95	39° 51′ 0″ N., 71° 10′ 0″ W.	4	.....	72.0	73.0	73.0	72.5	0.5	97.5	30.008	77.0	29.878	1	.....	Str	WSW.	4	....	...do ...	Do.
		5	H. 5–19	71.9	72.5	72.8	72.5	0.3	97.5	30.013	76.8	29.885	1	.....	Haze ..	SW. by W.	3	....	...do ...	Libbey.
		6	.....	71.5	72.4	72.4	72.2	0.2	100.0	30.013	79.2	29.877	3	Cir ..	Str	WSW.	3	....	...do ...	Do.
H. 8, No. 96	40° 2′ 0″ N., 71° 10′ 0″ W.	* 7	.....	70.8	72.8	73.0	72.5	0.5	97.5	30.018	76.5	29.890	3	Cir ..	Str	SW. by W.	3	....	.. do ...	Do.
		8	.....	71.0	74.0	74.0	73.0	1.0	95.1	30.020	77.8	29.889	2	.....	Str	WSW.	4	....	...do ...	Do.
G. 7, No. 97	40° 12′ 0″ N., 71° 3′ 0″ W.	9	.....	71.8	74.8	75.0	73.4	1.6	92.7	30.024	76.7	29.896	0		Haze.	WSW.	4	....	...do ...	Magie.
		*10	.....	72.2	77.0	77.1	75.0	2.1	90.7	30.008	77.0	29.878	0		Haze.	W.	4	....	...do ...	Do.
H. 6, No. 98	40° 22′ 0″ N., 71° 6′ 0″ W.	11	L. 11–32	72.0	75.5	75.5	73.4	2.1	90.4	30.020	76.0	29.893	0		Haze.	W.	4	....	...do ...	Do.
		12	.....	72.3	76.2	76.2	73.5	2.7	88.2	30.020	78.0	29.887	0		Haze.	WNW.	3	....	..do ...	Do.
		13	.....	73.2	78.0	78.4	72.6	5.8	73.4	30.010	78.5	29.876	0		Haze.	WNW.	1	....	...do ...	Libbey.
H. 5, No. 99	40° 32′ 0″ N , 71° 10′ 0″ W.	14	.....	73.2	77.8	78.0	72.0	6.0	73.4	30.016	78.8	29.882	0		Haze.	WNW.	1	....	...do ...	Do.
		15	.....	73.4	77.2	77.6	72.0	5.6	75.4	29.990	78.5	29.856	0		Haze.	WNW.	1	† .50	.. do ...	Do.
		16	H. 4–58	73.9	77.8	78.0	71.8	6.2	73.1	30.012	78.5	29.878	0		Haze.	WNW.	1	....	...do ...	Do.
		17	.....	73.2	76.0	76.1	70.2	5.9	72.9	30.014	78.7	29.880	0		Haze.	WNW.	1	....	...do ...	Magie.
		18	.....	73.2	74.1	74.2	70.9	3.3	83.1	30.016	79.0	29.881	0		Haze.	WNW.	1	....	...do ...	Do.
H. 4, No. 100	40° 42′ 0″ N., 71° 14′ 0″ W.	19	.....	72.8	73.5	73.5	71.3	2.2	90.2	30.028	80.0	29.890	0		Haze.	WSW.	1	....	...do ...	Do.
		20	.....	72.3	73.0	73.0	71.5	1.5	92.5	30.052	78.0	29.919	0		Haze.	W. by S.	1	....	.. do ...	Do.
		21	.....	72.2	72.0	72.3	71.0	1.3	92.5	30.066	77.5	29.935	0		Haze.	WSW.	1	....	...do ...	Rockwood.
		22	.....	72.0	71.9	72.0	71.0	1.0	95.0	30.070	77.0	29.940	0		Haze.	WSW.	1	....	.. do ...	Do.
		23	.....	71.2	71.4	71.8	71.0	0.8	95.0	30.088	76.5	29.960	0		Haze.	WSW.	1	....	.. do ...	Libbey.
H. 3, No. 101	40° 52′ 0″ N., 71° 15′ 0″ W.	24	.....	70.8	71.3	71.3	71.0	0.3	97.5	30.094	76.0	29.967	0		Haze.	SW.	1	....	...do ...	Rockwood.

* Sun on thermometer box.

† Evaporation.

PLATE CXLII.



Bull. U. S. F. C. 1889.—(To face page 444.) Libbey.

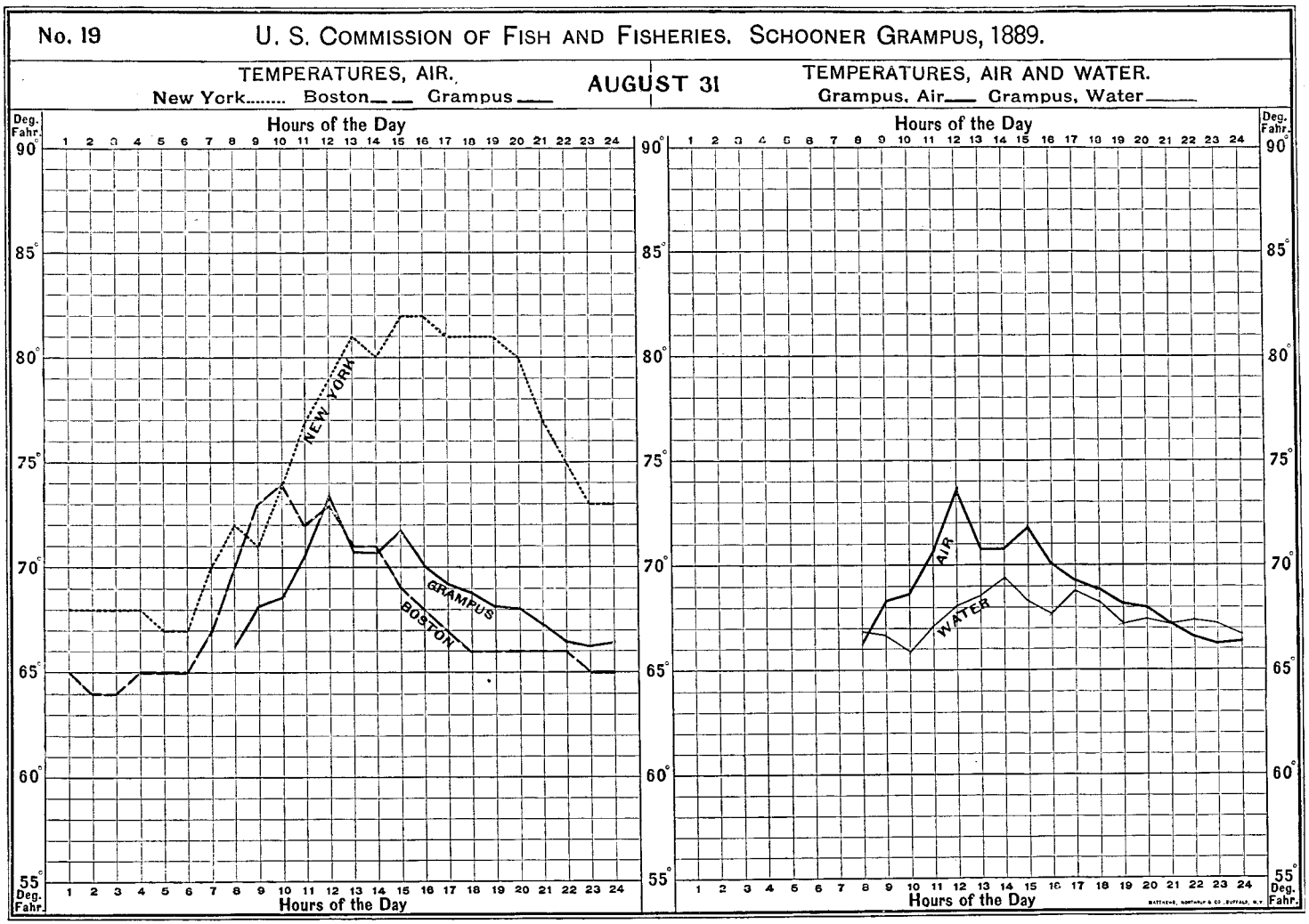

No. 19
U. S. COMMISSION OF FISH AND FISHERIES. SCHOONER GRAMPUS, 1889.
TEMPERATURES, AIR.
New York..... Boston— — Grampus ——
AUGUST 31
TEMPERATURES, AIR AND WATER.
Grampus, Air—— Grampus, Water——
Deg. Fahr.
Hours of the Day
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
90° 85° 80° 75° 70° 65° 60° 55°
NEW YORK
GRAMPUS
BOSTON
AIR
WATER

TABLE 18.

Date, August 27, 1889. Solar radiation thermometer, 112° F. Maximum temperature, 70.4° F. Six's, 71° F.
Terrestrial radiation thermometer, 61° F. Maximum temperature, 61.4° F. Six's, 62° F.

Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	t.	$=32°$.	0—10.	Upper.	Lower.	Direction.	Force.			
																		In.		
		2	L. 2–36	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		8	H. 8–0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		14	L. 2–44	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		20	H. 8–17	63.0	63.1	63.0	60.2	2.8	83.1	30.336	66.5	30.233	1	.....	Str ...	ENE.	3	....	Mod. sw ..	Magie.
J. 1, No. 102	41° 12′ 0″ N., 71° 20′ 0″ W.	21	.....	64.5	63.0	63.0	61.0	2.0	88.6	30.342	66.5	30.240	1	.....	Str ...	ENE.	3	....	....do	Do.
		22	.....	63.0	62.8	62.5	61.8	0.7	97.0	30.340	66.4	30.237	0	.....	.....	ENE.	3	....	... do	Libbey.
J. 2, No. 103	41° 2′ 0″ N., 71° 20′ 0″ W.	23	.....	64.3	63.0	63.2	62.0	1.2	94.2	30.328	66.0	30.225	0	.....	.....	ENE.	5	....	... do	Do.
		24	.....	64.7	63.3	63.2	62.0	1.2	94.2	30.330	66.4	30.230	0	.....	.....	ENE.	6	....	Heavy sw.	Do.

TABLE 19.

Date, August 31, 1889. Solar radiation thermometer, 135° F. Maximum temperature, 77.5° F. Six's, 78° F.
Terrestrial radiation thermometer, 62.4° F. Minimum temperature, 57.8° F. Six's, 58° F.

		5	L. 5–34	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		8	.....	66.8	66.3	67.1	66.0	1.1	94.6	30.230	68.8	30.124	.....	Cir	Haze .	N. by W.	2	....	Calm	McNeill.
		9	.....	66.7	68.2	69.0	66.9	2.1	89.5	30.221	69.4	30.111	0	.....	Haze .	N. by W.	2	....	....do	Do.
		10	.....	65.9	68.6	69.0	66.9	2.1	89.5	30.228	69.4	30.118	0	.....	Haze .	NE. by N.	2	....	....do	Do.
		11	H. 11–15	67.1	70.7	71.0	68.9	2.1	89.8	30.227	70.0	30.116	0	Cir	Haze .	NE. by N.	2	....	....do	Do.
K. 1, No. 104	41° 12′ 0″ N., 71° 30′ 0″ W.	12	.....	68.1	73.7	73.6	70.1	3.5	83.2	30.241	71.6	30.126	0	Cir	Haze .	NE.	1	....	....do	Do.
		13	.....	68.5	70.8	70.8	69.0	1.8	89.9	30.226	72.3	30.109	2	Cir ...	Haze .	NE. by N.	1	....	....do	Libbey.
		14	.....	69.3	70.8	70.9	69.3	1.6	92.3	30.232	72.8	30.114	1	Cir. str.	Haze .	NE. by N.	1	....	....do	Do.
		15	.....	68.2	71.8	72.0	70.2	1.8	90.0	30.250	72.2	30.133	1	Str	Haze .	E. by S.	1	....	....do	Do.
		16	.....	67.8	70.0	70.2	68.8	1.4	92.2	30.260	72.0	30.143	0	.....	Haze .	S.	1	....	....do	Do.
		17	.....	68.7	69.3	69.4	68.0	1.4	92.2	30.256	73.0	30.137	1	Cir	Haze .	ESE.	1	....	....do	Magie.
K. 2, No. 105	41° 2′ 0″ N., 71° 31′ 15″ W.	18	L. 6–43	68.2	68.9	68.9	68.0	1.9	89.8	30.262	73.0	30.143	0	.....	Haze .	ENE.	2	....	....do	Do.
		19	.....	67.1	68.1	68.0	67.5	0.6	97.3	30.250	72.0	30.133	0	.....	Haze .	E.	3	....	....do	Do.
		20	.....	67.5	68.0	68.2	67.7	0.5	97.3	30.264	72.0	30.147	0	.....	Haze .	E.	3	....	....do	Do.
K. 3, No. 106	40° 52′ 0″ N., 71° 30′ 0″ W.	21	.....	67.2	67.3	68.0	67.4	0.6	97.3	30.258	70.7	30.145	0	.....	Haze .	E.	3	....	....do	McNeill.
		22	.....	67.3	66.6	67.1	66.7	0.4	97.3	30.273	71.0	30.159	0	.....	Haze .	NE.	3	....	....do	Do.
K. 4, No. 107	40° 42′ 0″ N., 71° 30′ 0″ W.	23	.....	67.2	66.3	66.9	66.5	0.4	97.3	30.301	71.0	30.190	0	.....	Haze .	NE. by E.	4	....	....do	Do.
K. 5, No. 108	40° 32′ 0″ N., 71° 30′ 0″ W.	24	H. 12–0	66.5	66.4	66.8	66.8	0.0	100.0	30.296	70.2	30.185	10	.....	Fog ...	E.	5	....	....do	Do.

TABLE 20.

Date, September 1, 1889. Solar radiation thermometer, 129.4° F. Maximum temperature, 72.8° F. Six's, 72° F.
Terrestrial radiation thermometer, 63.2° F. Minimum temperature, 57.8° F. Six's, 59° F.

Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	t.	$=32°$.	0—10.	Upper.	Lower.	Direction.	Force.			
																		In.		
		6	L. 6–39	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
		9	.....	66.5	67.2	67.8	66.1	1.7	92.0	30.391	70.0	30.280	0	.....	Haze .	NE.	4	*.20	Mod. sw.	McNeill.
		10	.....	66.2	67.9	68.4	65.9	2.5	86.9	30.383	71.0	30.269	0	.....	Haze .	NE.	3	.....	...do	Do.
		11	.....	65.4	67.9	68.3	65.9	2.4	86.8	30.379	69.5	30.269	0	.....	Haze .	NE.	3	.....	...do	Do.
J. 3, No. 109	40° 52′ 0″ N., 71° 20′ 0″ W.	12	H. 12–16	65.8	69.2	69.4	66.0	3.4	82.2	30.388	69.7	30.278	0	.....	Haze .	NNE.	3	.....	...do	Do.
		13	.....	67.3	67.8	67.9	65.0	2.9	84.3	30.395	69.2	30.286	1	Cir ...	Haze .	NNE.	3	.....	...do	Magie.
J. 4, No. 110	40° 42′ 0″ N., 71° 20′ 0″ W.	14	.....	67.4	68.9	68.9	66.0	2.9	84.6	30.380	70.5	30.267	0	.....	Haze .	NNE.	3	.....	...do	Do.
J. 5, No. 111	40° 32′ 0″ N., 71° 20′ 0″ W.	15	.....	67.0	68.1	68.1	66.2	1.9	89.5	30.382	73.0	30.263	0	.....	Haze .	NE.	4	.....	...do	Do.
		16	.....	66.3	68.2	68.2	66.3	1.9	89.5	30.386	73.0	30.267	0	.....	Haze .	NE.	4	.....	...do	Do.
J. 6, No. 112	40° 22′ 0″ N., 71° 20′ 0″ W.	17	.....	66.0	67.4	67.8	66.2	1.6	92.0	30.370	70.2	30.259	0	.....	Haze .	NE. by E.	4	.....	Choppy.	McNeill.
		18	.....	67.5	66.4	66.9	65.0	1.9	89.3	30.362	72.1	30.245	0	.....	Haze .	NE. by E.	5	.....	...do	Do.
J. 7, No. 113	40° 12′ 0″ N., 71° 20′ 0″ W.	19	L. 7–52	67.5	66.4	66.9	65.0	1.9	89.3	30.368	69.1	30.259	0	.....	Haze .	NE. by E.	5	.....	...do	Do.
		20	.....	66.2	66.3	66.7	64.8	1.9	89.1	30.378	69.8	30.268	0	.....	Haze	NE. by E.	5	.....	...do	Do.

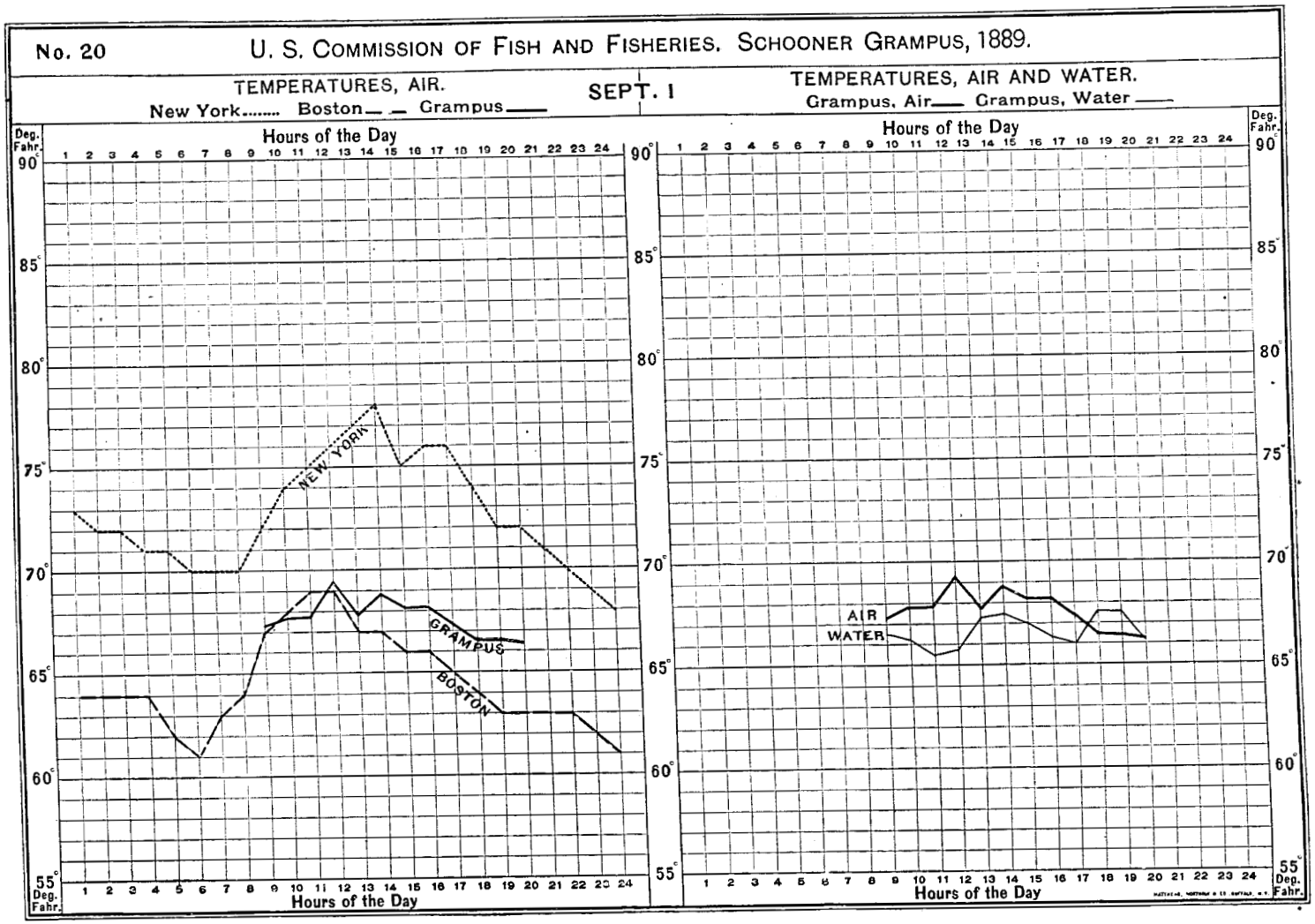
* Evaporation.

TABLE 21.

Date, September 2, 1889. Solar radiation thermometer, 128.5° F. Maximum temperature, 74° F. Six's, 73° F.
Terrestrial radiation thermometer, 59.3° F. Minimum temperature, 60° F. Six's, 60.2° F.

		1	H. 1–12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
		7	L. 7–43	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
		13	H. 1–20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
		19	.....	66.3	65.8	65.8	63.7	2.1	89.0	30.304	68.8	30.196	0	.....	.....	SW.	2	*.26	Calm.....	Libbey.
		20	L. 8–59	67.2	65.4	65.5	63.8	1.7	91.6	30.312	69.0	30.203	0	.....	.....	SW.	2	.....	...do	Do.
		21	.....	66.6	65.2	65.2	64.0	1.2	94.4	30.316	69.0	30.207	0	.....	.....	WSW.	2	.....	...do	Do.
		22	.....	65.1	65.1	65.0	64.0	1.0	94.4	30.316	67.9	30.211	0	.....	.....	WSW.	2	.....	...do	Do.
H. 1, No. 114	41° 12′ 0″ N., 71° 10′ 0″ W.	23	.....	65.2	65.1	65.0	64.0	1.0	94.4	30.306	67.5	30.202	0	.....	.....	WSW.	2	.....	...do	Do.
		24	.....	64.4	64.6	64.7	63.5	1.2	94.3	30.290	68.0	30.184	0	.....	.....	WSW.	2	.....	...do	Do.

* Evaporation.


No. 20
U. S. COMMISSION OF FISH AND FISHERIES. SCHOONER GRAMPUS, 1889.
TEMPERATURES, AIR.
New York..... Boston— — Grampus——
SEPT. 1
TEMPERATURES, AIR AND WATER.
Grampus, Air—— Grampus, Water ——
Deg. Fahr.
Hours of the Day
90°
85°
80°
75°
70°
65°
60°
55°
NEW YORK
GRAMPUS
BOSTON
AIR
WATER

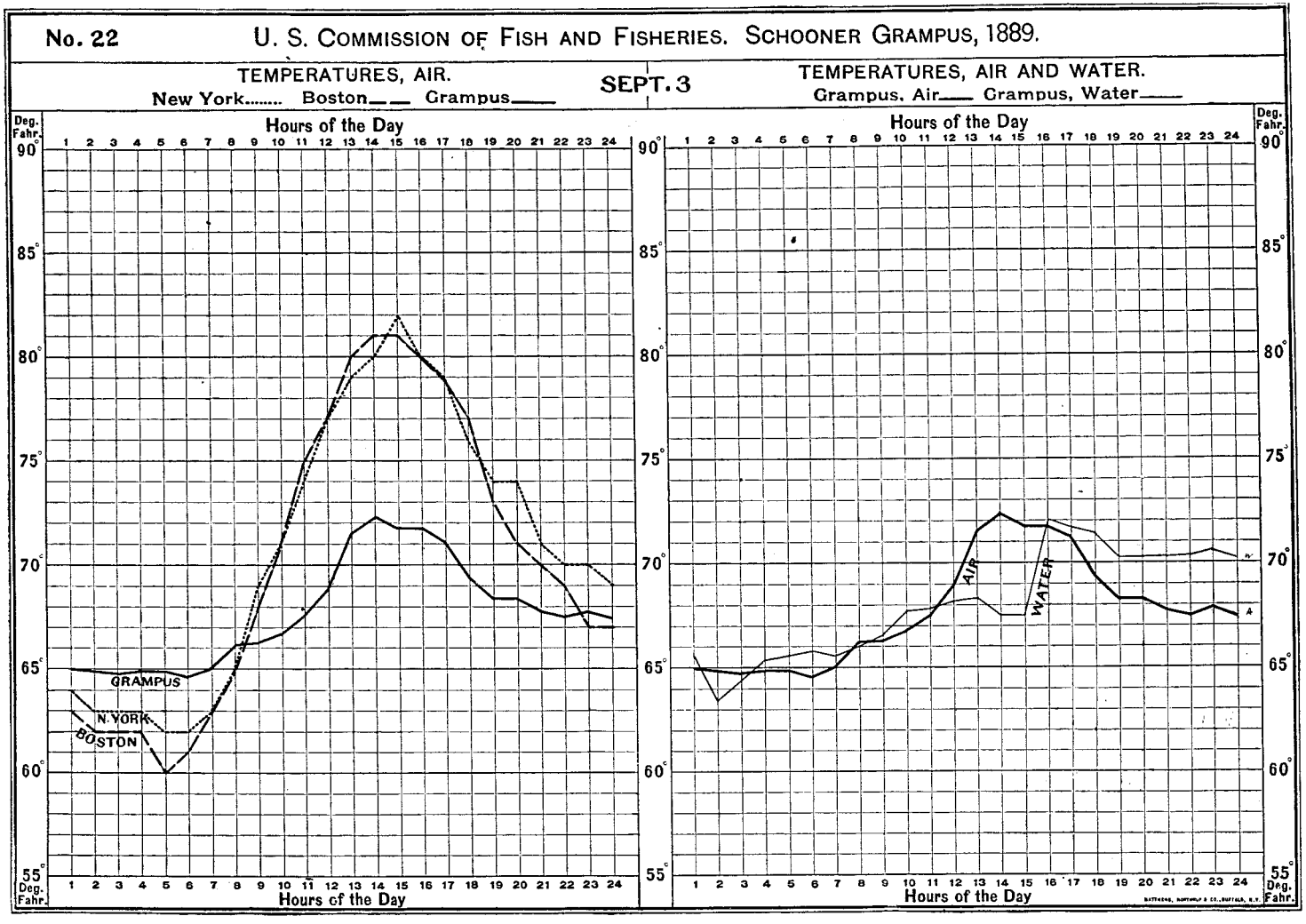

No. 22
U. S. COMMISSION OF FISH AND FISHERIES. SCHOONER GRAMPUS, 1889.
TEMPERATURES, AIR.
New York..... Boston___ Grampus____
SEPT. 3
TEMPERATURES, AIR AND WATER.
Grampus, Air____ Grampus, Water____
Deg. Fahr.
Hours of the Day
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
90° 85° 80° 75° 70° 65° 60° 55°
GRAMPUS
N. YORK
BOSTON
AIR
WATER

TABLE 22.

Date, September 3, 1889. Solar radiation thermometer, 138.5° F. Maximum temperature, 75.9° F. Six's, 75° F.
Terrestrial radiation thermometer, 62.4° F. Minimum temperature, 63.5° F. Six's, 64° F.

Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	t.	=32°	0–10.	Upper.	Lower.	Direction.	Force.			
																		In.		
H. 2, No. 115	41° 2′ 0″ N., 71° 10′ 0″ W.	1	.....	65.5	65.0	65.0	63.0	2.0	89.0	30.284	68.6	30.177	0	.....	Haze..	W.	2	....	Calm...	Magie.
		2	H. 2-21	63.2	64.9	65.0	64.0	1.0	94.4	30.282	68.0	30.176	0	.....	Haze..	WSW.	2	....	...do ...	Do.
		3	.....	64.4	64.8	64.8	63.6	1.2	94.3	30.290	68.0	30.184	0	.....	Haze..	WSW.	2	....	...do ...	Do.
H. 3, No. 116	40° 52′ 0″ N., 71° 10′ 0″ W.	4	.....	65.1	64.9	64.9	64.1	0.8	97.2	30.284	67.5	30.179	0	.....	Haze..	WSW.	2	....	...do ...	Do.
		5	.....	65.4	64.9	65.2	64.0	1.2	94.4	30.298	67.8	30.193	0	.....	Haze..	WSW.	2	....	...do ...	McNeill.
		6	.....	65.7	64.7	64.8	64.2	0.6	97.2	30.317	67.4	30.213	0	.....	Haze..	WSW.	2	....	...do ...	Do.
H. 4, No. 117	40° 42′ 0″ N., 71° 10′ 0″ W.	7	.....	65.6	65.0	65.2	64.6	0.6	97.2	30.300	68.0	30.194	0	.....	Haze..	WSW.	2	....	...do ...	Do.
		8	L. 8-48	66.1	66.2	66.7	65.8	0.9	94.5	30.285	68.1	30.179	0	.....	Haze..	WSW.	2	....	... do ...	Do.
		9	.....	66.4	66.3	66.7	65.3	1.4	91.9	30.304	68.0	30.198	0	.....	Haze..	SW. by W.	2	....	...do ...	Do.
		10	.....	67.7	66.8	67.0	65.5	1.5	91.9	30.312	68.8	30.204	0	.....	Haze..	SW. by W.	2	....	...do ...	Libbey.
H. 5, No. 118	40° 31′ 0″ N., 71° 10′ 0″ W.	11	.....	67.8	67.5	67.7	66.0	1.7	92.0	30.314	68.9	30.206	0	.....	Haze..	SW.	2	....	...do ...	Do.
		12	.....	68.2	68.8	69.2	66.5	2.7	87.0	30.300	69.0	30.189	0	.....	Haze..	SW. by W.	2	....	...do ...	Do.
		13	.....	68.3	71.4	71.8	67.9	3.9	80.2	30.285	70.0	30.174	0	.....	Haze..	SW. by W.	2	....	...do ...	McNeill.
		14	H. 2-24	67.6	72.3	72.3	68.0	4.3	80.4	30.291	70.8	30.178	0	.....	Haze..	WSW.	2	....	...do ...	Libbey.
H. 6, No. 119	40° 22′ 0″ N., 71° 10′ 0″ W.	15	.....	67.6	71.8	72.3	67.8	4.5	78.0	30.272	70.7	30.159	0	.....	Haze..	SW. by W.	2	....	...do ...	McNeill.
		16	.....	72.0	71.8	72.0	67.0	5.0	75.8	30.252	71.2	30.138	0	.....	Haze..	WSW.	2	....	...do ...	Do.
		17	.....	71.8	71.2	71.2	66.5	4.7	77.6	30.250	71.8	30.134	0	.....	Haze..	WSW.	1	....	...do ...	Libbey.
		18	.....	71.5	69.2	69.2	65.0	4.2	79.6	30.250	70.8	30.137	1	.....	Str ...	SW.	1	....	...do ...	Do.
		19	.....	70.3	68.3	68.5	63.7	4.8	74.3	30.250	70.7	30.137	1	.....	Str ...	WSW.	1	....	...do ...	Do.
		20	.....	70.2	68.3	68.2	63.4	4.8	74.3	30.256	70.1	30.142	0	.....	.....	SW. by W.	1	....	...do ...	Do.
		21	L. 9-59	70.2	67.9	68.0	63.3	4.7	76.6	30.264	71.1	30.150	0	.....	.....	SW.	2	....	...do ...	Magie.
H. 7, No. 120	40° 12′ 0″ N., 71° 10′ 0″ W.	22	.....	70.3	67.5	68.0	63.8	4.2	79.0	30.288	70.2	30.177	0	.....	.....	SSW.	2	....	...do ...	Do.
		23	.....	70.5	67.8	67.8	64.1	3.7	81.7	30.270	70.0	30.159	0	.....	.....	SSW.	2	....	...do ...	Do.
		24	.....	70.0	67.5	67.8	64.6	3.2	84.1	30.282	70.6	30.169	0	.....	.....	SW. by S.	2	....	...do ...	Do.

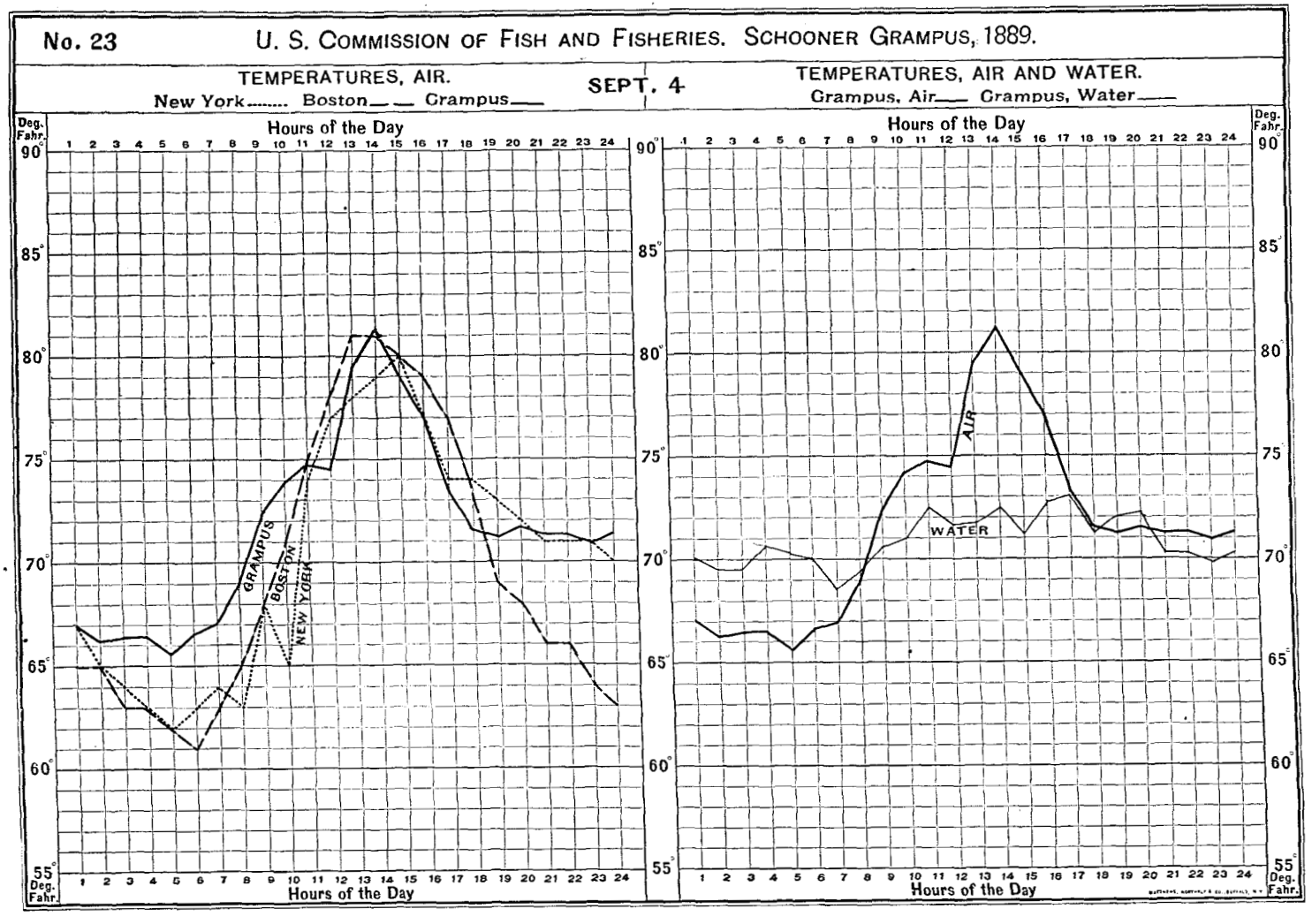
TABLE 23.

Date, September 4, 1889. Solar radiation thermometer, 140° F. Maximum temperature, 82° F. Six's, 81.6° F.
Terrestrial radiation thermometer, 64.3° F. Minimum temperature, 65.3° F. Six's, 65° F.

Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	t.	=32°	0—10.	Upper.	Lower.	Direction.	Force.			
																		In.		
		1	.....	70.2	67.2	67.5	65.1	2.4	86.8	30.280	69.4	30.171	0	.....	Haze .	N. by W.	2	....	Calm ..	McNeill.
H. 8, No. 121	40° 2′ 0″ N., 71° 10′ 0″ W.	2	.....	69.6	66.3	66.8	64.0	2.8	84.1	30.252	70.0	30.141	0	.....	Haze .	N. by W.	1	....	...do ...	Do.
		3	H. 3–24	69.6	66.4	66.8	64.1	2.7	86.6	30.276	69.6	30.166	0	.....	Haze .	WSW.	1	....	...do ...	Do.
		4	.....	70.8	66.5	66.9	64.0	2.9	84.1	30.274	69.4	30.165	0	.....	Haze .	WSW.	1	....	...do ...	Do.
		5	.....	70 3	65.7	66.0	62.4	3.6	81.1	30.260	69.4	30.171	0	.....	Haze .	WSW.	1	....	...do ...	Libbey.
		6	.....	70.0	66.7	67.0	65.0	2.0	89.3	30.304	64.2	30.195	0	.....	Haze .	WSW.	1	....	...do ...	Do.
		7	.....	68.5	67.0	67.2	64.5	2.7	86.6	30.296	69.9	30.186	0	.....	Haze	WSW.	1	....	...do ...	Do.
		8	.....	69.2	68.8	69.4	65.5	3.9	79.6	30.300	70.1	30.189	5	.....	Str ...	WSW.	1	...	...do ...	Do.
		9	L. 9–49	70.3	72.5	72.8	67.8	5.0	75.8	30.304	71.5	30.191	1	.....	Str ...	.....	0	....	...do ...	Magie.
		10	.....	71.0	74.1	74.2	68.8	5.4	74.0	30.326	72.0	30.209	0	.....	Str ...	.....	0	....	...do ...	Do.
		11	.....	72.7	74.8	74.8	69.0	5.8	72.4	30.324	72.6	30.206	0	.....	Str ...	.....	0	....	...do ...	Do.
		12	.....	71.7	74.5	74.5	69.5	5.0	76.4	30.322	73.0	30.203	0	.....	Str ...	.....	0	....	...do ...	Do.
		13	.....	71.8	79.5	79.4	71.5	7.9	65.7	30.312	74.6	30.188	0	.....	Str ...	.....	0	....	...do ...	Libbey.
		*14	.....	72.5	81.3	81.0	71.0	10.0	59.0	30.300	74.5	30.176	2	Cir ...	.....	.....	0	....	...do ...	Do.
		*15	H. 3–25	71.0	79.2	78.8	69.2	9.6	59.6	30.300	74.7	30.176	8	Cir ...	Str ...	.....	0	....	...do ...	Do.
		*16	.....	72.8	77.2	77.0	68.5	8.5	62.6	30.296	74.5	30.172	4	Cir ...	Str ...	.....	0	....	...do ...	Do.
		17	.....	73.0	73.2	73.2	67.0	6.2	71.6	30.290	75.0	30.165	0	.....	.....	ESE.	1	....	...do ...	Magie.
		18	.....	71.3	71.5	71.3	67.2	4.1	80.2	30.292	75.0	30.167	1	.....	Str ...	ESE.	1	...	...do ...	Do.
		19	.....	72.0	71.2	71.3	69.6	1.7	92.3	30.300	75.5	30.174	0	.....	.....	ESE.	2	....	...do ...	Do.
H. 10, No. 122	39° 42′ 0″ N., 71° 13′ 0″ W.	20	.....	72.2	71.6	71.6	70.7	0.9	94.9	30.330	75.0	30.205	0	.....	.....	SE. by S.	2	...	...do ...	Do.
		21	.....	70.2	71.2	71.4	70.9	0.5	97.4	30.265	74.8	30.141	0	.....	.....	ESE.	3	....	...do ...	McNeill.
		22	L. 10–53	70.2	71.2	71.2	70.7	0.5	97.4	30.298	74.0	30.176	0	.....	.....	SE. by S.	3	....	...do ...	Do.
H. 11, No. 123	39° 32′ 0″ N., 71° 10′ 0″ W.	23	.....	69.9	70.9	71.2	71.0	0.2	100.0	30.325	68.3	30.219	0	.....	.....	SE.	2	....	...do ...	Do.
		24	.....	70.2	71.2	71.2	70.9	0.3	98.5	30.315	74.0	30.193	0	.....	.....	SE. by S.	2	...	...do ...	Do.

*Sun on thermometer bo x.

PLATE CXLVI.



Bull. U. S. F. C. 1889.—(To face page 448.) Libbey.

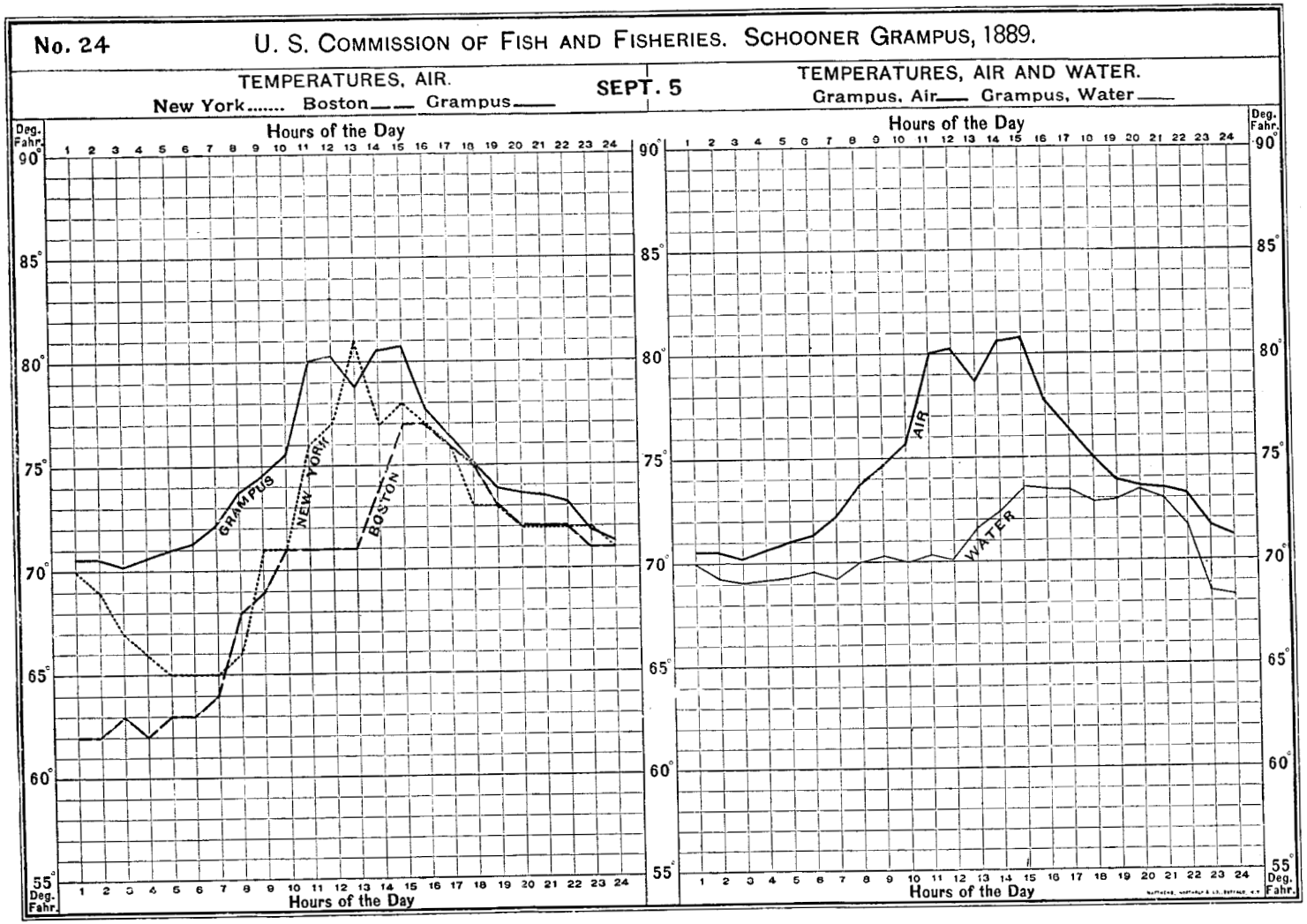

No. 24
U. S. COMMISSION OF FISH AND FISHERIES. SCHOONER GRAMPUS, 1889.
TEMPERATURES, AIR.
New York..... Boston—— Grampus——
SEPT. 5
TEMPERATURES, AIR AND WATER.
Grampus, Air—— Grampus, Water——
Deg. Fahr.
Hours of the Day
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
90° 85° 80° 75° 70° 65° 60° 55°
GRAMPUS
NEW YORK
BOSTON
AIR
WATER

TABLE 24.

Date, September 5, 1889. Solar radiation thermometer, 142.7° F. Maximum temperature, 82.9° F. Six's, 82.4° F
Terrestrial radiation thermometer, 64° F. Minimum temperature, 64.7 F. Six's, 64° F.

Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	*t.*	=32°.	0—10.	Upper.	Lower.	Direction.	Force.			
																		In.		
		1	.....	70.0	70.6	70.8	70.6	0.2	100.0	30.290	74.0	30.168	0	.....	.....	SE.	2	....	Calm ..	Libbey.
		2	.....	69.2	70.6	70.7	70.5	0.2	100.0	30.280	73.8	30.159	0	.....	.....	SE.	3	....	...do ...	Do.
H. 12, No. 124	39° 22′ 0″ N., 71° 10′ 0″ W.	3	.....	69.1	70.2	70.3	70.3	0.0	100.0	30.288	74.0	30.166	0	.....	.....	SE.	2	...	...do ...	Do.
		4	H. 4–20	69.2	70.6	70.8	70.8	0.0	100.0	30.284	74.0	30.162	2	.....	Str.....	SE.	1	....	...do ...	Do.
		5	.....	69.3	71.0	71.0	71.0	0.0	100.0	30.286	73.0	30.167	3	.....	Str.....	SE.	2	....	...do ...	Magie.
G. 12, No. 125	39° 29′ 0″ N., 71° 5′ 0″ W.	6	.....	69.5	71.3	71.3	71.2	0.1	100.0	30.302	74.3	30.180	2	.....	Str.....	SE.	2	....	...do ...	Do.
		7	.....	69.2	72.1	72.1	72.1	0.0	100.0	30.310	74.0	30.188	3	.....	Cir. str.	SE.	2	....	...do ...	Do.
		8	.....	70.0	73.9	73.9	73.5	0.4	98.0	30.306	74.2	30.184	5	.....	Cir. cu .	SE.	2	....	...do ...	Do.
G. 11, No. 126	39° 39′ 0″ N., 71° 5′ 0″ W.	9	.....	70.3	74.6	74.9	73.6	1.3	92.7	30.306	75.0	30.175	9	.....	Cir. cu .	SSE.	3	....	...do ...	McNeill.
		*10	L.10–47	70.0	75.6	75.9	74.0	1.9	90.6	30.305	75.2	30.180	2	Cir. str.	.....	SSE.	3	....	...do ...	Do.
		*11	... .	70.4	80.0	80.2	76.1	4.1	82.4	30.302	76.0	30.175	1	Cir. str.	.....	SE.	3	....	...do ...	Do.
G. 10, No. 127	39° 49′ 0″ N., 71° 3′ 0″ W.	*12	.....	70.1	80.3	80.3	76.1	4.2	82.4	30.304	77.2	30.174	0	.....	.....	SE.	3	...	...do ...	Do.
		*13	.....	71.5	78.7	78.4	75.0	3.4	84.2	30.300	77.5	30.169	0	.....	.....	SSE.	3	†.50	...do ...	Magie.
G. 9, No. 128	39° 52′ 0″ N., 71° 0′ 0″ W.	*14	.....	72.3	80.6	80.6	76.8	3.8	82.4	30.292	78.0	30.159	0	.....	.....	SSE.	3	....	...do ...	Do.
		*15	.....	73.5	80.8	80.8	76.5	4.3	80.4	30.280	77.5	30.148	0	.....	.....	SSE	3	....	...do ...	Do.
		16	H. 4–20	73.4	77.6	77.5	75.0	2.5	88.5	30.274	77.0	30.144	0	.....	.....	SSE.	3	....	...do ...	Do.
G. 8, No. 129	40° 2′ 0″ N., 71° 2′ 0″ W.	17	.....	73.3	76.2	76.1	75.0	1.1	95.2	30.276	77.4	30.142	0	.....	.....	SSE.	3	....	...do ...	McNeill.
		18	.....	72.8	74.9	75.0	73.9	1.1	95.1	30.278	76.2	30.151	0	.....	.....	SSE.	3	....	...do ...	Do.
G. 7, No. 130	40° 13′ 0″ N., 71° 1′ 30″ W.	19	.....	72.9	73.9	74.1	73.8	0.3	97.5	30.302	76.0	30.175	0	.....	.....	SSE.	3	...	...do ...	Do.
		20	.....	73.3	73.6	73.9	73.8	0.1	100.0	30.298	75.5	30.172	0	.....	.....	S.	3	....	...do ...	Do.
G. 6, No. 131	40° 22′ 0″ N., 71° 1′ 0″ W.	21	.....	73.0	73.5	73.7	73.2	0.5	97.5	30.284	75.8	30.158	0	.....	.....	S.	4	..	Mod. sw.	Libbey.
		22	.....	71.7	73.2	73.4	73.0	0.4	97.5	30.286	75.0	30.161	0	.....	.....	S.	5	....	...do ..	Do.
		23	L.11–42	68.6	71.8	72.0	71.5	0.5	97.5	30.282	74.2	30.160	0	.....	.....	S.	4	....	...do ...	Do.
G. 5, No. 132	40° 32′ 0″ N., 71° 0′ 0″ W.	24	.....	68.3	71.2	71.4	71.2	0.2	100.0	30.276	74.0	30.154	0	.....	.....	S.	3	....	...do ...	Do.

* Sun on thermometer box.

† Evaporation.

TABLE 25.

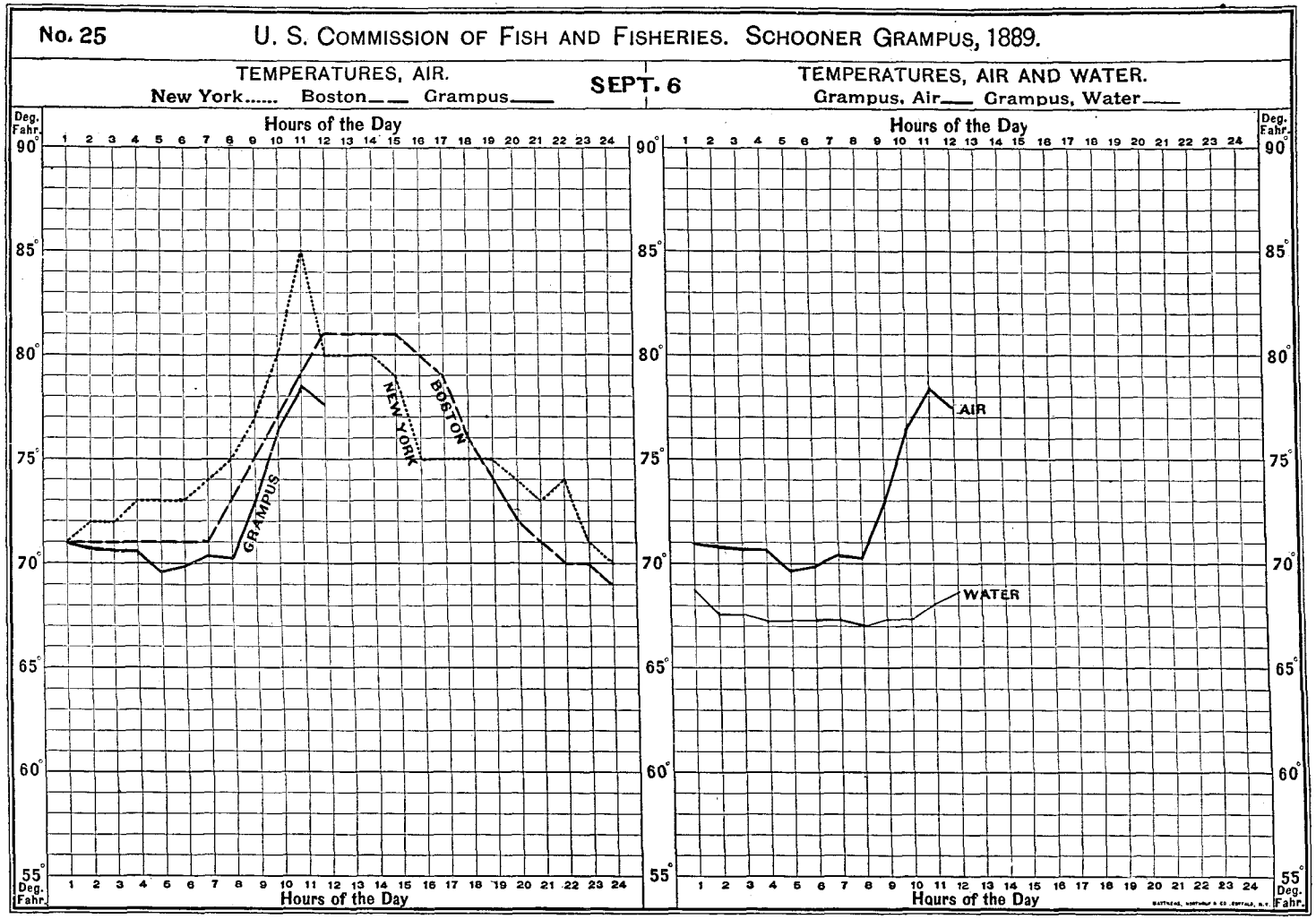
Date, September 6, 1889. Solar radiation thermometer, 129° F. Maximum temperature, 79.6° F. Six's, 80° F.
Terrestrial radiation thermometer, 67° F. Minimum temperature, 68.8° F. Six's, 69.5° F.

Station.	Position.	Hour.	Tide.	Temperature.						Barometer.			Clouds.			Wind.		Rain.	State of sea.	Observer.
				Water.	Air.	Dry bulb.	Wet bulb.	Difference.	Relative humidity.	Reading.	t.	=32°.	0—10.	Upper.	Lower.	Direction.	Force.			
																		In.		
		1	.....	68.8	71.0	71.0	70.6	0.4	97.4	30.254	73.7	30.133	0	.....	.....	S. by W.	3	....	Calm ..	Magie.
G. 4, No. 133	40° 42′ 0″ N., 71° 0′ 0″ W.	2	.....	67.6	70.9	71.0	71.0	0.0	100.0	30.232	74.0	30.110	0	.....	.....	S. by W.	3	....	...do ...	Do.
		3	.....	67.5	70.6	70.6	70.6	0.0	100.0	30.232	73.0	30.113	0	.....	.....	S. by W.	3	....	...do ...	Do.
		4	.....	67.2	70.5	70.0	70.0	0.0	100.0	30.230	72.8	30.112	0	.....	.....	S. by W.	2	....	...do ...	Do.
G. 3, No. 134	40° 51′ 0″ N., 71° 0′ 0″ W.	5	H. 5–9	67.2	69.5	69.9	69.9	0.0	100.0	30.228	73.7	30.107	0	.....	Str ...	S.	2	....	...do ...	McNeill.
		6	.....	67.2	69.8	70.0	70.0	0.0	100.0	30.241	73.0	30.122	0	.....	.....	S.	2	....	...do ...	Do.
		7	.....	67.2	70.3	70.7	70.7	0.0	100.0	30.250	73.0	30.131	0	.....	.....	S.	2	....	...do ...	Do.
G. 2, No. 135	41° 0′ 0″ N., 71° 0′ 0″ W.	8	.....	67.0	70.2	70.4	70.0	0.4	97.4	30.238	73.0	30.119	0	.....	.....	S.	2	....	...do ...	Do.
		*9	.....	67.2	73.0	73.0	72.3	0.7	95.0	30.278	74.5	30.155	0	.....	.....	S.	2	....	...do ...	Libbey.
		*10	.....	67.3	76.4	76.7	74.7	2.0	90.6	30.260	75.0	30.135	0	.....	.....	S.	2	....	...do ...	Do.
		*11	L. 11–40	68.0	78.5	78.4	74.0	4.4	79.9	30.264	76.2	30.137	0	.....	.....	S.	2	....	...do ...	Do.
G. 2, No. 136*	41° 9′ 0″ N., 71° 0′ 0″ W.	12	.....	68.5	77.4	77.4	73.9	3.5	83.8	30.252	76.3	30.125	0	.....	.....	S.	2	†.12	...do ...	Do.
		13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..	.....	.....	.....	..	...	.....	
		14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..	.....	.....	.....	..	...	.....	
		15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..	.....	.....	.....	..	...	.....	
		16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..	.....	.....	.....	..	...	.....	
		17	H. 5–14	.....	.....	.....	.....	.....	.....	.....	.....	.....	..	.....	.....	.....	..	...	.....	
		18	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..	.....	.....	.....	..	...	.....	
		19	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..	.....	.....	.....	..	...	.....	
		20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..	.....	.....	.....	..	...	.....	
		21	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..	.....	.....	.....	..	...	.....	
		22	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..	.....	.....	.....	..	...	.....	
		23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..	.....	.....	.....	..	...	.....	
		24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..	.....	.....	.....	..	...	.....	

* Sun on thermometer box.

† Evaporation.

PLATE CXLVIII.

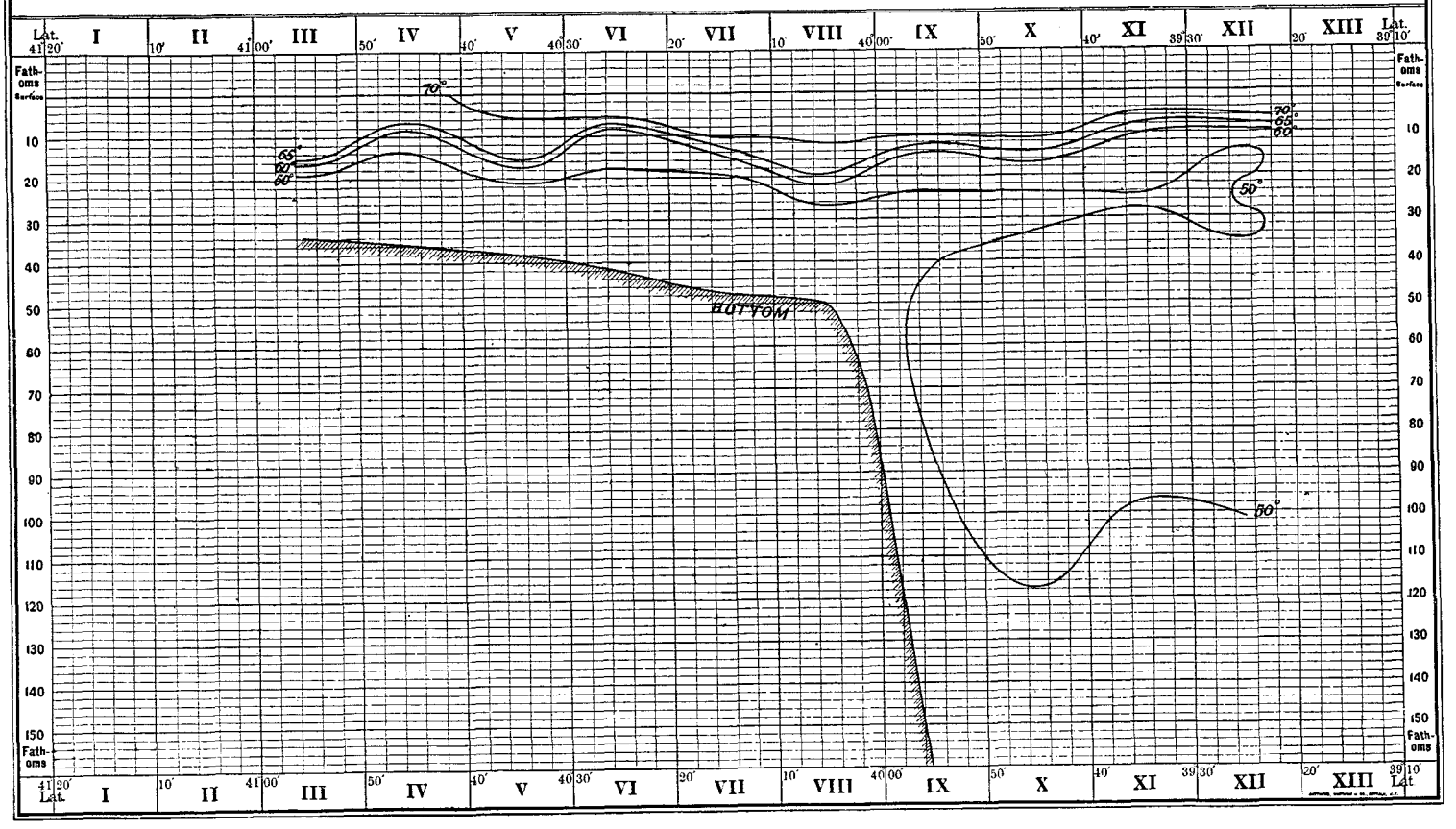


Bull. U. S. F. C. 1889.—(To face page 450.) Libbey.

PROFILE No. 1.

U. S. COMMISSION OF FISH AND FISHERIES. SCHOONER GRAMPUS, 1889.

WATER TEMPERATURE CURVES ON SECTION K. LONGITUDE 71° 30′. AUGUST 20 & 21, 1889.



EXPLANATION OF PROFILE NO. 1.—WATER TEMPERATURE CURVES ON LINE K.

The Roman numerals at the top and bottom of the plate represent the corresponding spaces on the general chart. The data upon which the curves are based are shown in the following table of temperature observations.

Depth (fathoms).	STATIONS.											
	I.	II.	III. Depth 34 fath.	IV. Depth 35 fath.	V. Depth 38 fath.	VI. Depth 40 fath.	VII. Depth 47 fath.	VIII. Depth 50 fath.	IX. Depth 150 fath.	X.	XI.	XII.	XIII.
0			69.2	69.9	71.4	71.8	71.9	71.8	71.3	72.3	72.4	74.8	
5			69.4	68.7	70.4	71.5	71.7	70.9	70.9	71.9	70.7	72.2	
10			68.0	55.3	68.0	53.5	70.9	70.9	71.1	71.9	60.5	58.9	
15			67.0	48.4	67.8	50.4	59.2	68.7	57.9	64.0	54.0	47.2	
20			45.4	45.4	51.2	49.7	48.1	64.4	60.2	55.1	52.3	49.6	
25			45.3	44.4	45.2	46.0	46.3	51.5	45.4	48.6	49.8	51.1	
30			44.4	44.4	44.4	46.1	45.4	46.9	49.6	49.1	50.2	49.1	
40						44.9	44.8	45.9	49.1	52.2	52.6	50.8	
50								48.6	53.0	54.0	54.5	52.8	
75									52.1	53.8	53.5	53.1	
100									46.4	51.7	49.7	50.1	
150									44.7	46.8	46.8	45.5	
200										43.9	44.3	43.2	
250										41.5	41.6	41.6	
300										40.0	40.5	40.2	
400										39.5	39.7	39.5	
500										39.2	39.7	39.0	
Bottom			44.7	43.9	44.3	44.9	45.9	48.6	44.7				

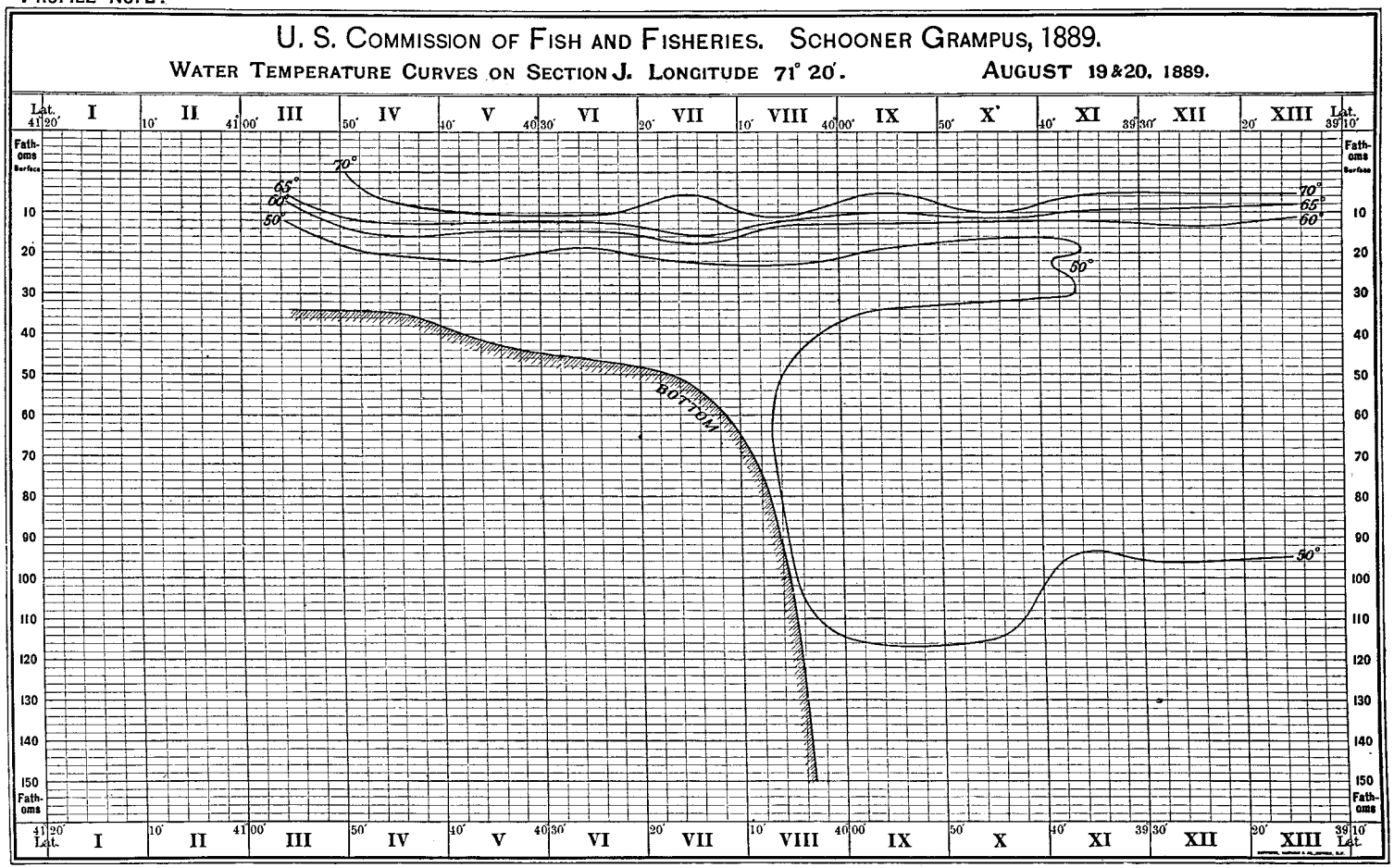
EXPLANATION OF PROFILE NO. 2.—WATER TEMPERATURE CURVES ON LINE J.

The Roman numerals at the top and bottom of the plate represent the corresponding spaces on the general chart. The data upon which the curves are based are shown in the following table of temperature observations.

Depth (fathoms).	STATIONS.												
	I.	II.	III. Depth 34 fath.	IV. Depth 35 fath.	V. Depth 42 fath.	VI. Depth 46 fath.	VII. Depth 52 fath.	VIII. Depth 102 fath.	IX. Depth 380 fath.	X.	XI.	XII.	XIII.
0	.....	.....	68.8	70.5	71.2	71.0	71.2	71.0	71.5	72.0	72.3	71.5	71.0
5	.....	.....	68.7	70.3	70.9	70.7	70.7	70.7	71.0	71.2	71.8	71.6	71.4
10	.....	.....	52.3	69.7	70.9	71.3	67.3	71.2	64.9	71.7	64.6	63.1	61.9
15	.....	.....	48.0	61.7	60.0	71.0	67.9	54.3	57.6	52.0	55.5	58.6	55.0
20	.....	.....	46.8	50.2	52.0	48.2	54.2	57.5	47.4	46.9	51.7	55.6	49.8
25	.....	.....	45.2	48.2	47.8	46.4	45.9	45.9	47.8	47.1	52.2	55.0	49.8
30	.....	.....	.....	47.8	51.0	45.9	46.8	45.8	48.2	49.4	51.9	54.7	49.7
40	.....	.....	.....	.....	44.5	44.2	47.3	46.9	52.5	51.8	53.9	53.0	52.5
50	.....	.....	.....	.....	.....	.....	47.2	50.9	53.5	55.2	54.3	53.6	53.2
75	.....	.....	.....	.....	.....	.....	.....	52.0	52.8	53.9	52.0	53.2	53.1
100	.....	.....	.....	.....	.....	.....	.....	49.8	52.2	51.2	49.4	49.5	49.3
150	.....	.....	.....	.....	.....	.....	.....	.....	53.2	47.1	47.3	44.6	45.7
200	.....	.....	.....	.....	.....	.....	.....	.....	43.9	44.8	44.7	42.6	44.2
250	.....	.....	.....	.....	.....	.....	.....	.....	41.8	42.0	41.3	41.8	41.7
300	.....	.....	.....	.....	.....	.....	.....	.....	40.0	40.6	40.5	40.3	40.0
400	.....	.....	.....	.....	.....	.....	.....	.....	.....	39.5	39.3	39.4	39.6
500	.....	.....	.....	.....	.....	.....	.....	.....	.....	39.2	39.1	39.1	39.2
Bottom	.....	.....	45.1	47.8	44.5	44.2	47.2	49.8	39.6	.....	.....	.....	.....

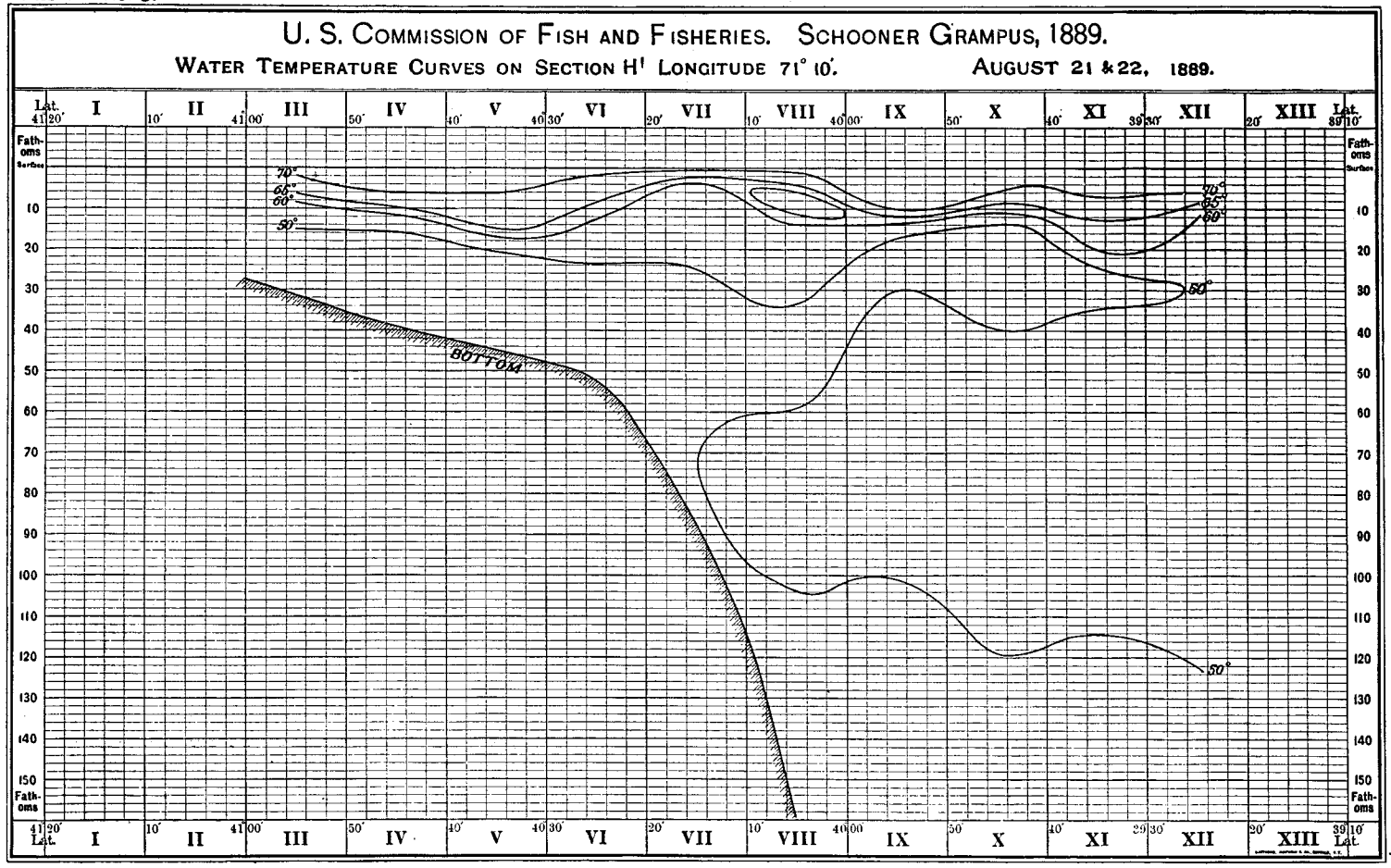
PLATE CL.

PROFILE No. 2.



Bull. U. S. F. C. 1889.—(To face page 452.) Libbey.

PROFILE No. 3.


U. S. COMMISSION OF FISH AND FISHERIES. SCHOONER GRAMPUS, 1889.
WATER TEMPERATURE CURVES ON SECTION H' LONGITUDE 71° 10'. AUGUST 21 & 22, 1889.
Lat. 41 20' I
10' II
41 00' III
50' IV
40' V
40 30' VI
20' VII
10' VIII
40 00' IX
50' X
40' XI
39 30' XII
20' XIII
Lat. 39 10'
Fathoms
Surface
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
70°
65°
60°
50°
BOTTOM

EXPLANATION OF PROFILE No. 3.—WATER TEMPERATURE CURVES ON LINE H[1].

The Roman numerals at the top and bottom of the plate represent the corresponding spaces on the general chart. The data upon which the curves are based are shown in the following table of temperature observations.

Depth (fathoms).	STATIONS.												
	I.	II.	III. Depth 32 fath.	IV. Depth 39 fath.	V. Depth 45 fath.	VI. Depth 52 fath.	VII. Depth 87 fath	VIII. Depth 160 fath.	IX. Depth 453 fath.	X.	XI.	XII.	XIII.
0	.....	.....	70.6	72.8	73.2	72.0	71.8	70.8	72.0	72.9	73.4	74.2	.....
5	.....	.....	69.3	71.4	71.0	67.9	56.9	64.4	71.0	71.7	70.8	71.3	.....
10	.....	.....	55.9	64.9	67.6	63.9	55.0	67.0	70.3	62.7	69.0	62.2	.....
15	.....	.....	50.7	51.3	65.2	57.2	52.0	58.0	52.1	47.1	60.5	55.5	.....
20	.....	.....	46.1	46.8	50.7	56.0	51.5	57.0	47.5	45.8	60.8	53.7	.....
25	.....	.....	44.9	44.9	46.9	47.8	50.0	52.2	47.9	46.6	47.7	52.0	.....
30	.....	.....	45.3	44.1	46.1	46.8	47.4	55.5	49.9	49.0	48.8	51.9	.....
40	.....	.....	.....	.....	45.4	45.3	46.7	48.5	56.8	49.9	51.5	53.1	.....
50	.....	.....	.....	.....	.....	44.9	47.0	47.3	55.4	54.2	53.7	54.4	.....
75	.....	.....	.....	.....	.....	.....	50.7	54.7	53.1	54.3	54.0	53.8	.....
100	.....	.....	.....	.....	.....	.....	.....	50.3	50.1	52.0	51.2	52.8	.....
150	.....	.....	.....	.....	.....	.....	.....	46.4	45.1	46.7	47.4	47.8	.....
200	.....	.....	.....	.....	.....	.....	.....	.....	43.3	45.0	44.7	42.9	.....
250	.....	.....	.....	.....	.....	.....	.....	.....	40.8	42.1	41.7	41.2	.....
300	.....	.....	.....	.....	.....	.....	.....	.....	39.7	40.9	40.4	40.9	.....
400	.....	.....	.....	.....	.....	.....	.....	.....	39.7	39.9	39.7	40.1	.....
500	.....	.....	.....	.....	.....	.....	.....	.....	.....	39.4	39.3	39.3	.....
Bottom	.....	.....	45.3	45.2	45.4	44.9	50.7	46.4	39.7	.....	.....	.....	.....

EXPLANATION OF PROFILE NO. 4.—WATER TEMPERATURE CURVES ON LINE G[1].

The Roman numerals at the top and bottom of the plate represent the corresponding spaces on the general chart. The data upon which the curves are based are shown in the following table of temperature observations.

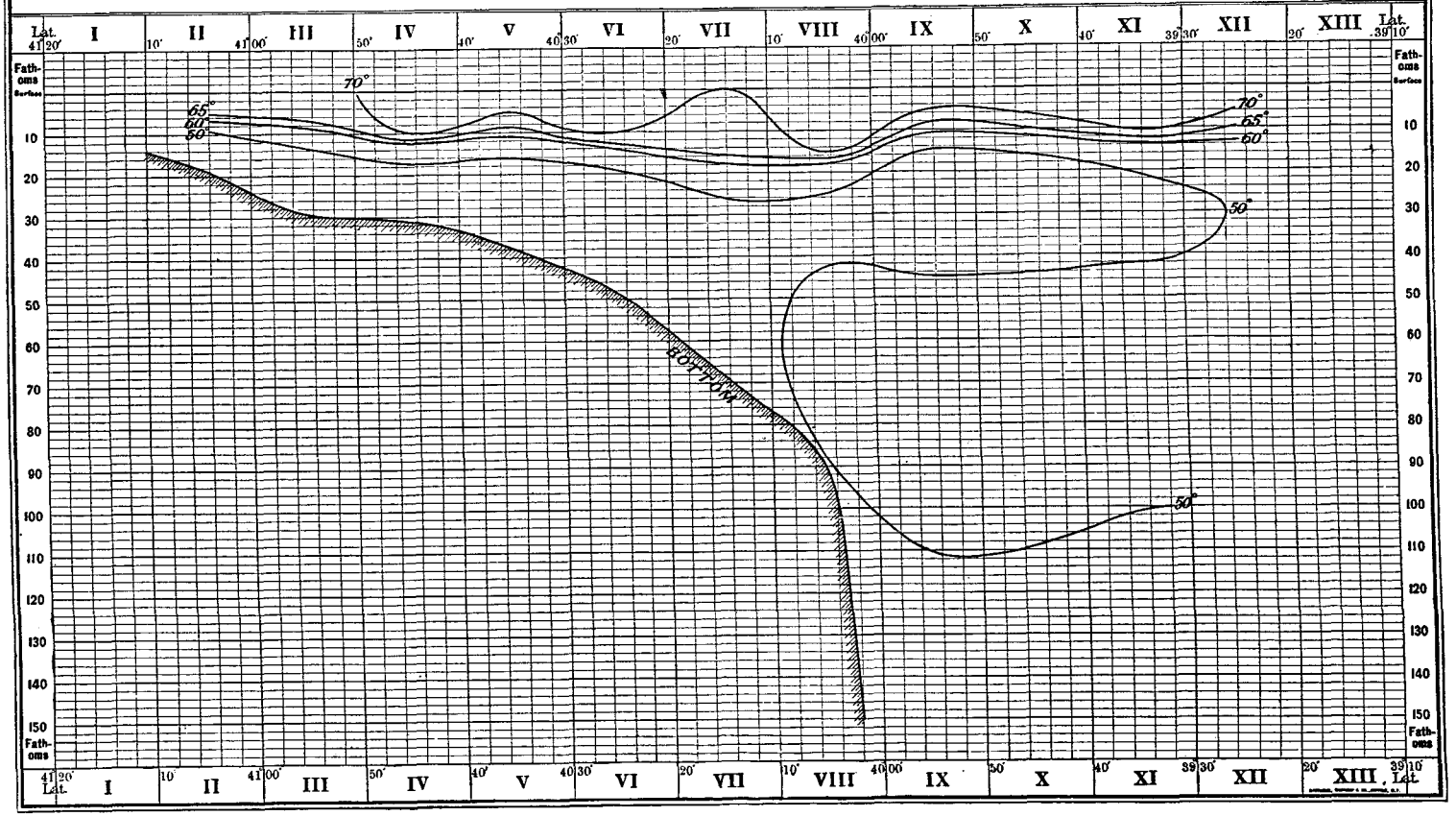
Depth (fathoms).	STATIONS.												
	I.	II. Depth 18 fath.	III. Depth 29 fath.	IV. Depth 31 fath.	V. Depth 38 fath.	VI. Depth 48 fath.	VII. Depth 67 fath.	VIII. Depth 90 fath.	IX. Depth 300 fath.	X.	XI.	XII.	XIII.
0	.....	68.2	69.3	70.4	71.2	70.2	70.0	70.0	70.4	.....	73.2	73.2	.....
5	.....	69.2	68.7	70.2	70.9	70.7	69.5	70.8	70.2	.....	71.8	71.0	.....
10	.....	49.8	57.4	70.1	62.8	70.4	68.7	70.6	62.3	.....	71.8	64.7	.....
15	.....	49.6	48.3	52.0	50.9	58.3	65.9	70.6	49.8	.....	56.5	57.8	.....
20	.....	.....	47.0	48.0	47.8	48.6	53.7	54.7	45.1	.....	50.9	51.4	.....
25	.....	.....	.....	45.4	46.6	59.6	50.5	50.1	45.1	.....	46.3	50.8	.....
30	.....	.....	.....	.....	45.9	48.1	46.6	46.8	47.8	.....	47.8	51.0	.....
35	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
40	.....	.....	.....	.....	.....	46.6	46.4	49.3	49.0	.....	48.2	52.8	.....
50	.....	.....	.....	.....	.....	.....	47.3	52.0	50.8	.....	54.6	54.2	.....
75	.....	.....	.....	.....	.....	.....	.....	53.8	53.3	.....	54.6	53.5	.....
100	.....	.....	.....	.....	.....	.....	.....	.....	51.0	.....	50.1	50.0	.....
150	.....	.....	.....	.....	.....	.....	.....	.....	45.9	.....	46.9	45.4	.....
200	.....	.....	.....	.....	.....	.....	.....	.....	43.9	.....	45.6	43.2	.....
250	.....	.....	.....	.....	.....	.....	.....	.....	40.9	.....	.....	41.7	.....
300	.....	.....	.....	.....	.....	.....	.....	.....	39.8	.....	40.5	40.7	.....
400	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	39.4	39.5	.....
500	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	38.9	39.1	.....
Bottom	.....	49.6	47.0	45.4	44.9	45.4	44.4	51.0	39.8	.....	.....	.....	.....

PLATE CLII.

PROFILE No. 4.

U. S. COMMISSION OF FISH AND FISHERIES. SCHOONER GRAMPUS, 1889.

WATER TEMPERATURE CURVES ON SECTION G¹ LONGITUDE 71° 00′. AUGUST 17 & 18, 1889.

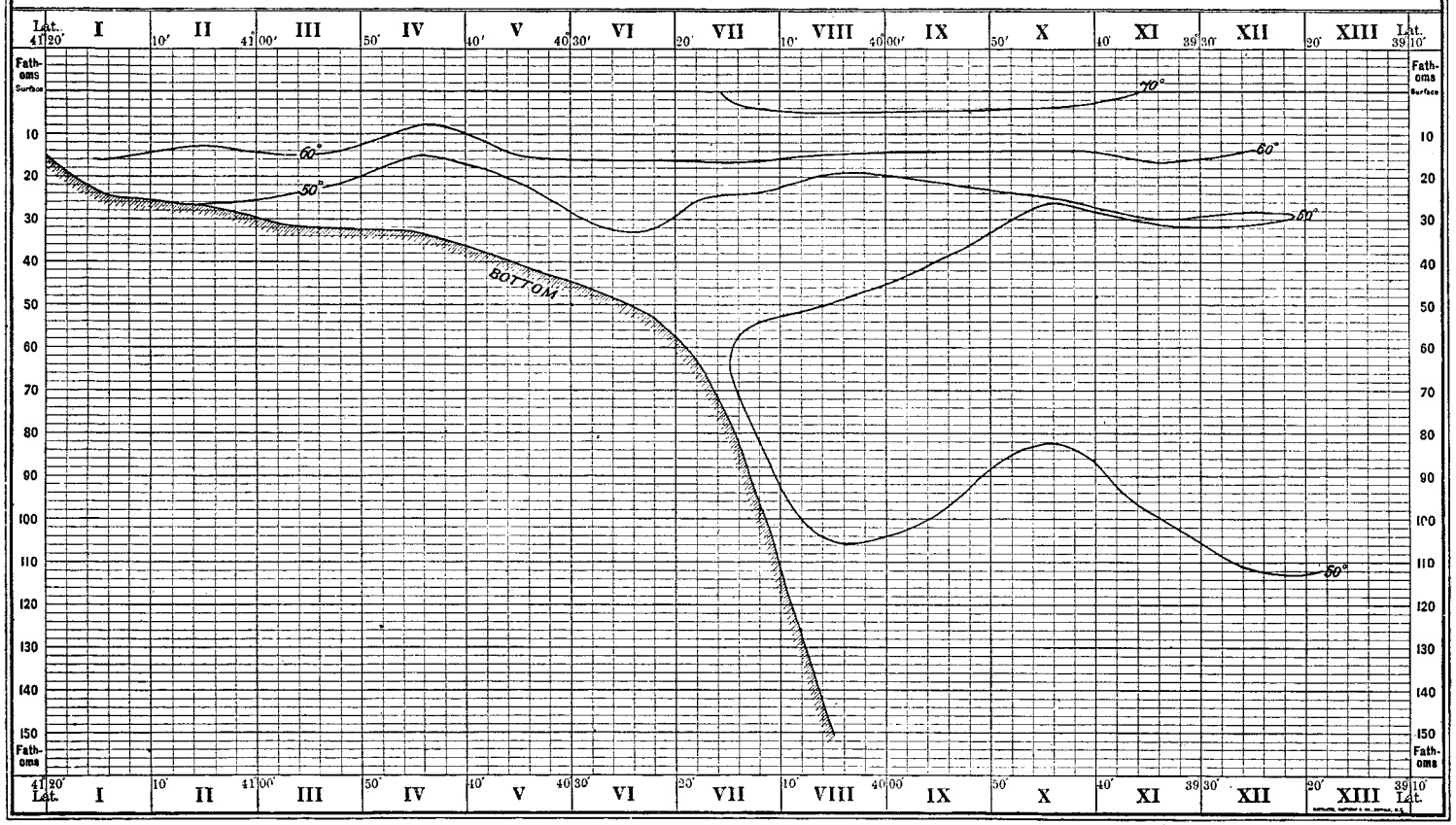


Bull. U. S. F. C. 1889.—(To face page 454.) Libbey.

PROFILE No. 5.

U. S. COMMISSION OF FISH AND FISHERIES. SCHOONER GRAMPUS, 1889.

WATER TEMPERATURE CURVES ON SECTION H.[2] LONGITUDE 71° 10'. SEPT. 3 & 4, 1889.



EXPLANATION OF PROFILE NO. 5.—WATER TEMPERATURE CURVES ON LINE H^2.

The Roman numerals at the top and bottom of the plate represent the corresponding spaces on the general chart. The data upon which the curves are based are shown in the following table of temperature observations.

Depth (fathoms).	STATIONS.												
	I. Depth 23 fath.	II. Depth 27 fath.	III. Depth 32 fath.	IV. Depth 33 fath.	V. Depth 40½ fath.	VI. Depth 49 fath.	VII. Depth 76 fath.	VIII. Depth 151 fath.	IX.	X.	XI.	XII.	XIII.
0	65.2	65.5	65.1	65.7	67.8	67.6	70.2	69.6	.....	72.2	69.9	69.1	.....
5	64.0	64.7	65.3	65.9	66.3	66.7	69.7	70.0	.....	69.5	69.8	68.8	.....
10	62.6	64.4	63.9	56.6	65.6	67.5	70.2	66.0	.....	68.0	68.5	68.8	.....
15	61.2	57.0	60.1	50.2	60.2	65.7	64.9	60.2	.....	57.9	61.9	57.6	.....
20	56.0	54.8	52.0	48.2	50.4	57.1	53.8	48.1	.....	54.0	56.8	54.5	.....
25	.....	51.5	49.2	47.5	48.4	54.9	49.1	47.7	.....	49.8	51.8	50.5	.....
30	.....	.....	47.3	46.7	46.7	51.8	48.9	46.2	.....	52.0	50.1	49.7	.....
40	.....	.....	.....	.....	46.3	45.1	46.5	46.8	.....	55.1	54.7	53.8	.....
50	.....	.....	.....	.....	.....	.....	49.0	50.0	.....	53.8	55.6	54.3	.....
75	.....	.....	.....	.....	.....	.....	50.6	51.7	.....	51.0	52.8	53.9	.....
100	.....	.....	.....	.....	.....	.....	.....	50.5	.....	47.5	49.9	51.0	.....
150	.....	.....	.....	.....	.....	.....	.....	45.8	.....	46.8	54.0	46.5	.....
200	.....	.....	.....	.....	.....	.....	.....	.....	.....	42.1	44.2	43.9	.....
250	.....	.....	.....	.....	.....	.....	.....	.....	.....	40.6	42.0	41.2	.....
300	.....	.....	.....	.....	.....	.....	.....	.....	.....	39.8	40.1	40.3	.....
400	.....	.....	.....	.....	.....	.....	.....	.....	.....	39.7	40.0	39.8	.....
500	.....	.....	.....	.....	.....	.....	.....	.....	.....	38.8	39.2	39.3	.....
Bottom	56.0	51.5	47.3	46.7	46.3	45.7	50.6	45.8	.....	.....	.....	.....	.....

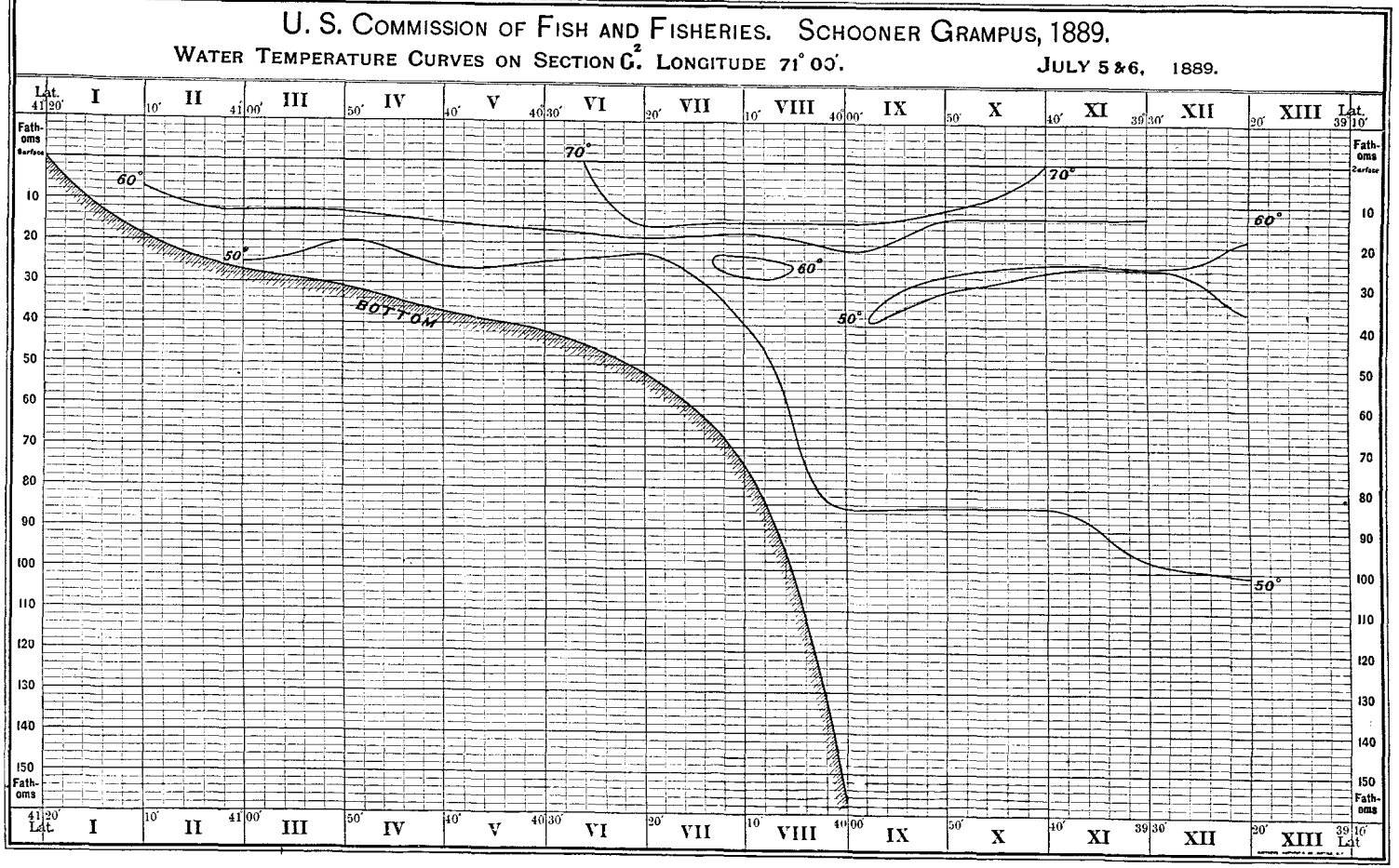
EXPLANATION OF PROFILE NO. 6.—WATER TEMPERATURE CURVES ON LINE G².

The Roman numerals at the top and bottom of the plate represent the corresponding spaces on the general chart. The data upon which the curves are based are shown in the following table of temperature observations.

Depth (fathoms).	STATIONS.												
	I. Depth 19 fath.	II. Depth 27 fath.	III. Depth 31 fath.	IV. Depth 37 fath.	V. Depth 41 fath.	VI. Depth 52 fath.	VII. Depth 74 fath.	VIII. Depth 157 fath.	IX. Depth 472 fath.	X.	XI.	XII.	XIII.
0	68.0	67.0	67.1	67.6	68.5	73.0	72.9	73.3	72.3	70.1	70.3	69.5	
5	63.0	65.9	66.1	67.4	68.2	72.7	71.7	72.0	71.9	68.7	69.0	69.4	
10	56.3	64.2	64.2	67.1	67.5	72.8	73.0	73.0	72.3	69.0	68.6	69.8	
15	56 0	56.4	55.8	60.4	65.1	72.8	69.8	71.0	57.6	55.6	56.2	54.0	
20		52.1	49.4	52.0	54.0	55.8	51.0	61.6	53.3	53.0	52.5	46.6	
25		49.9	49.4	50.3	49.8	47.8	66.0	57.2	50.4	49.8	50.4	47.4	
30				48.5	48.1	47.1	55.9	57.1	49.6	50.4	57.7	48.7	
40					46.5	47.7	49.5	51.9	51.8	53.3	56.2	50.9	
50						46.7	54.0	52.9	53.8	53.1	55.8	53.0	
75								51.0	51.1	51.3	52.8	53.1	
100								48.5	48.1	48.3	49.8	50.1	
150								45.7	45.9	44.0	45.9	45.9	
200									44.9	41.6	42.6	43.6	
250									41.3	40.6	40.9	41.5	
300									40.7	39.7	39.8	40.1	
400c									39.6	39.4	39.7	39.7	
500										39.0	39.0	39.0	
Bottom	56.0	49.9	45.7	46.2	46.5	46.7	49.4	45.7	39.6				

PLATE CLIV.

PROFILE No. 6.

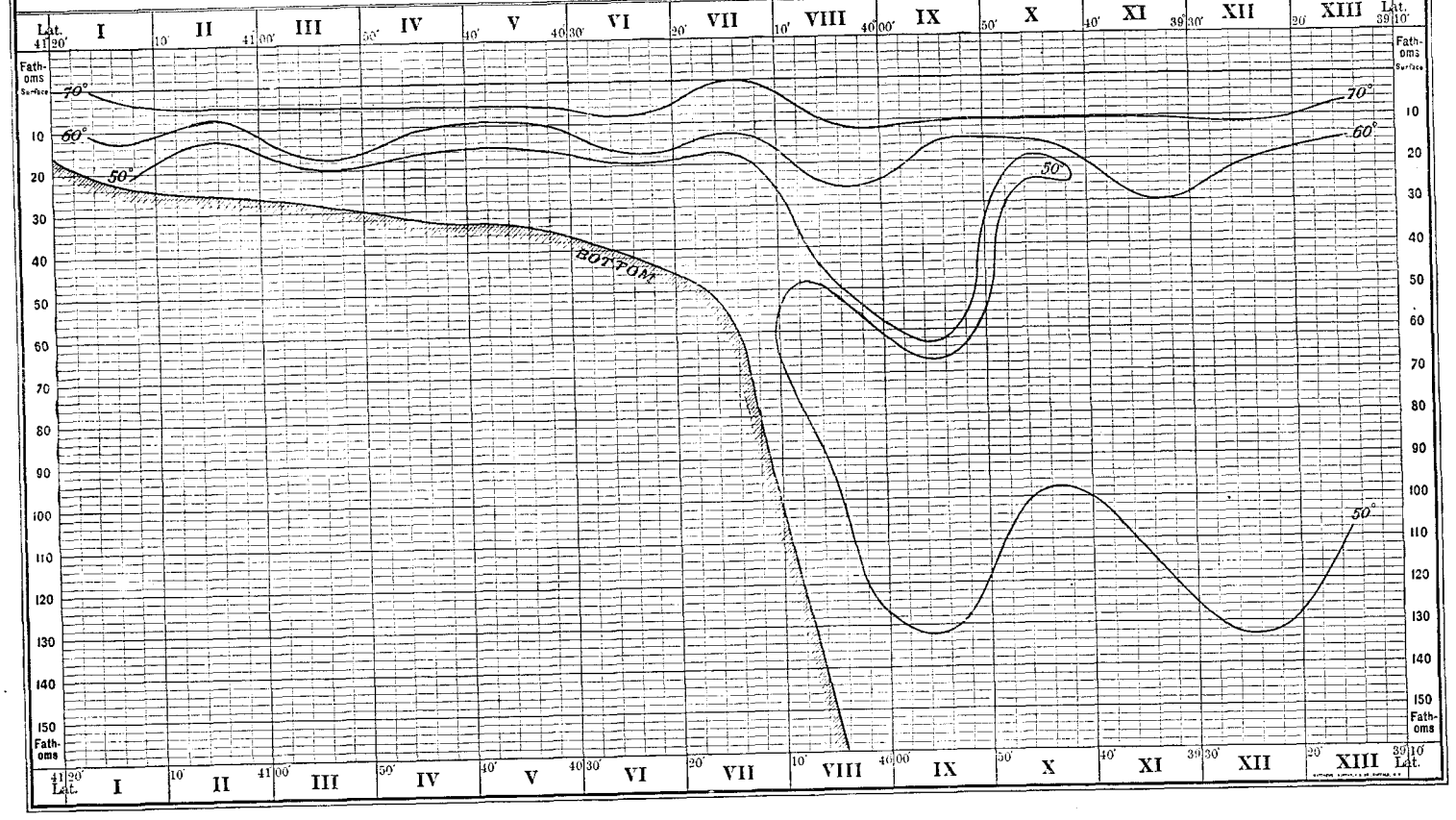


Bull. U. S. F. C. 1889.—(To face page 456.) Libbey.

PROFILE No. 7.

U. S. COMMISSION OF FISH AND FISHERIES. SCHOONER GRAMPUS, 1889.

WATER TEMPERATURE CURVES ON SECTION D. LONGITUDE 70° 30′. AUGUST 8 & 9, 1889.



EXPLANATION OF PROFILE NO. 7.—WATER TEMPERATURE CURVES ON LINE D.

The Roman numerals at the top and bottom of the plate represent the corresponding spaces on the general chart. The data upon which the curves are based are shown in the following table of temperature observations.

Depth (fathoms).	STATIONS.												
	I. Depth 22 fath.	II. Depth 26 fath.	III. Depth 28 fath.	IV. Depth 32 fath.	V. Depth 34 fath.	VI. Depth 41 fath.	VII. Depth 54 fath.	VIII. Depth 150 fath.	IX. Depth 350 fath.	X.	XI.	XII.	XIII.
0	71.0	71.2	74.6	73.6	72.6	71.5	70.0	70.3	72.9	72.2	71.4	71.9	71.8
5	68.8	70.2	71.1	71.7	71.4	71.4	69.9	70.1	72.1	71.7	71.7	71.8	71.6
10	66.9	52.5	61.0	62.2	58.2	63.2	69.6	70.1	72.1	71.1	70.5	72.1	67.1
15	53.0	48.6	67.7	50.9	50.1	69.0	55.1	69.2	59.9	61.7	65.9	64.5	60.6
20	51.3	47.6	47.7	48.7	49.3	46.8	47.3	63.7	57.8	48.0	65.2	62.9	56.1
25	.....	48.0	47.2	46.6	47.3	46.2	46.9	60.5	54.3	50.0	66.5	51.1	57.9
30	.....	.....	.....	46.9	.....	45.8	46.9	54.9	.....	50.9	58.8	50.8	54.8
40	.....	.....	.....	.....	.....	44.9	46.8	54.1	.....	51.0	55.6	53.9	54.5
50	.....	.....	.....	.....	.....	.....	46.8	51.0	57.8	53.8	54.1	54.0	55.2
75	.....	.....	.....	.....	.....	.....	.....	52.5	49.7	53.2	53.6	52.7	54.3
100	.....	.....	.....	.....	.....	.....	.....	48.6	57.1	49.9	50.8	51.6	50.4
150	.....	.....	.....	.....	.....	.....	.....	44.7	44.4	46.0	47.6	49.2	47.7
200	.....	.....	.....	.....	.....	.....	.....	.....	.....	42.8	45.1	45.3	45.0
250	.....	.....	.....	.....	.....	.....	.....	.....	41.0	.....	42.1	43.0	42.8
300	.....	.....	.....	.....	.....	.....	.....	.....	.....	40.7	40.5	42.1	41.2
400	.....	.....	.....	.....	.....	.....	.....	.....	.....	40.0	39.6	39.9	40.0
500	.....	.....	.....	.....	.....	.....	.....	.....	.....	39.1	39.1	39.6	39.3
Bottom	51.3	48.0	47.2	46.9	46.3	44.9	46.8	44.7	39.5	.....	.....	.....	.....

EXPLANATION OF PROFILE NO. 8.—WATER TEMPERATURE CURVES ON LINE C.

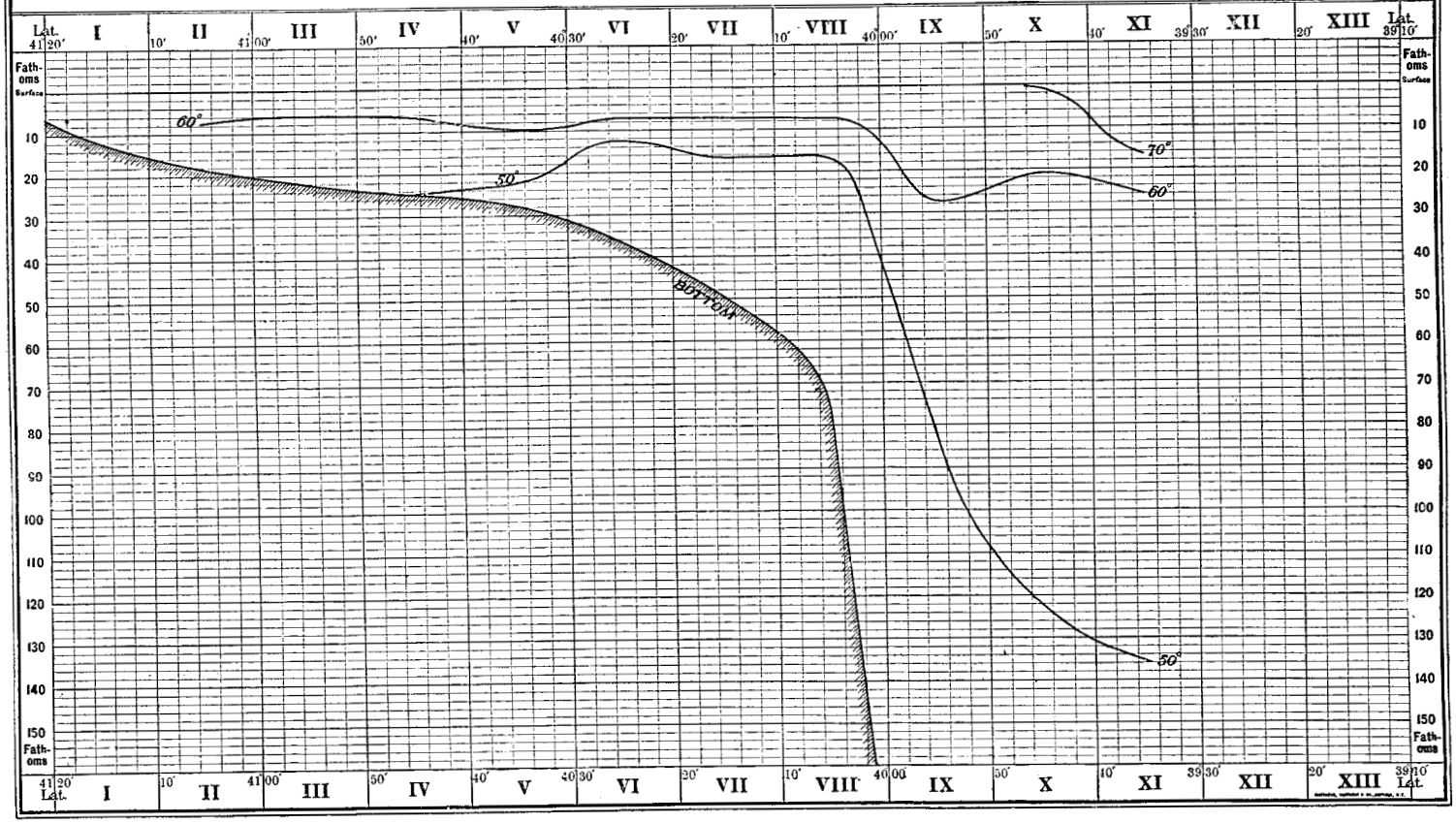
The Roman numerals at the top and bottom of the plate represent the corresponding spaces on the general chart. The data upon which the curves are based are shown in the following table of temperature observations.

Depth (fathoms).	STATIONS.												
	I.	II. Depth 15 fath.	III. Depth 20 fath.	IV. Depth 24 fath.	V. Depth 28 fath.	VI. Depth 34 fath.	VII. Depth 50 fath.	VIII. Depth 76 fath.	IX.	X.	XI.	XII.	XIII.
0	.....	65.5	65.4	68.0	68.5	68.0	67.0	64.8	69.0	70.2	71.3	.....	.....
5	.....	63.9	62.3	67.8	.....	.....	.....	.....	.....	.....	.....	.....	.....
10	.....	56.3	53.4	53.2	62.1	59.6	56.9	58.4	.....	.....	.....	.....	.....
15	.....	63.3	52.1	50.5	55.0	49.0	51.1	.....	.....	64.9	71.4	.....	.....
20	.....	.....	.....	.....	52.8	.....	47.1	46.0	.....	.....	.....	.....	.....
25	.....	.....	.....	50.6	54.5	49.0	.....	.....	.....	.....	.....	.....	.....
30	.....	.....	.....	.....	.....	.....	45.6	44.9	.....	52.4	55.8	.....	.....
40	.....	.....	.....	.....	.....	.....	45.2	45.9	.....	.....	.....	.....	.....
50	.....	.....	.....	.....	.....	.....	42.5	48.9	52.7	53.5	55.8	.....	.....
75	.....	.....	.....	.....	.....	.....	.....	45.3	50.3	54.0	53.4	.....	.....
100	.....	.....	.....	.....	.....	.....	.....	.....	49.0	52.2	53.5	.....	.....
150	.....	.....	.....	.....	.....	.....	.....	.....	45.7	47.2	48.5	.....	.....
200	.....	.....	.....	.....	.....	.....	.....	.....	41.9	45.5	46.5	.....	.....
250	.....	.....	.....	.....	.....	.....	.....	.....	41.1	41.5	45.5	.....	.....
300	.....	.....	.....	.....	.....	.....	.....	.....	39.7	43.8	45.4	.....	.....
400	.....	.....	.....	.....	.....	.....	.....	.....	.....	39.7	39.7	.....	.....
500	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bottom	.....	63.3	.....	50.6	54.5	46.2	42.5	45.3	.....	.....	.....	.....	.....

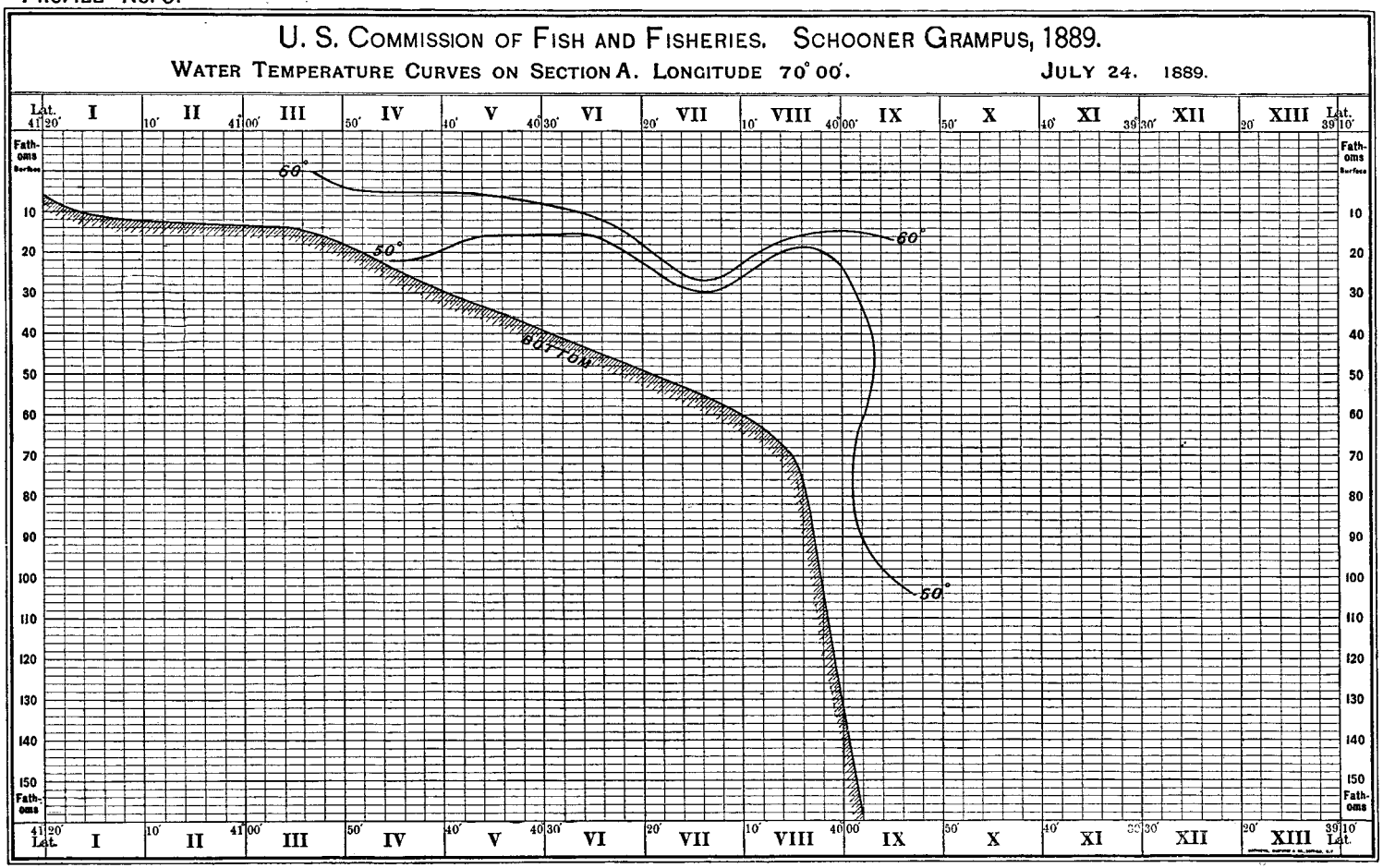
PROFILE No. 8.

U. S. COMMISSION OF FISH AND FISHERIES. SCHOONER GRAMPUS, 1889.

WATER TEMPERATURE CURVES ON SECTION C. LONGITUDE 70° 20'. JULY 25 & 26, 1889.



PROFILE No. 9.


U. S. COMMISSION OF FISH AND FISHERIES. SCHOONER GRAMPUS, 1889.
WATER TEMPERATURE CURVES ON SECTION A. LONGITUDE 70° 00′. JULY 24. 1889.
Lat. 41° 20′
I
10′
II
41° 00′
III
50′
IV
40′
V
40° 30′
VI
20′
VII
10′
VIII
40° 00′
IX
50′
X
40′
XI
39° 30′
XII
20′
XIII
Lat. 39° 10′
Fathoms
Surface
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
60°
50°
60°
50°
BOTTOM

RHODE ISLAND

MASSACHUSETTS

BUZZARD'S BAY

VINEYARD SOUND

NEWPORT

Sakonnet Pt.

Pt. Judith

Penikese Id.

Nashawena Id.

Cuttyhunk Id.

Pasque Id.

Naushon Id.

ELIZABETH IDS.

Woods Holl

Nobska Pt.

West Chop

East Chop

Vineyard Haven

C. Poge

MARTHA'S VINEYARD

Edgartown

Gay Head

No Man's Land

Monomoy Id.

Great Pt.

Muskeget Id.

Tuckernuck Id.

Nantucket

NANTUCKET ID.

BLOCK ID.

K J H G F E D C B A

I II III IV V VI VII VIII IX X XI XII XIII

40° 30′ 20′ 10′ 71° 00′ 50′ 40′ 30′ 20′ 10′ 70° 00′

41° 00′ 50′ 40′ 30′ 20′ 10′

100 FATHOMS

Explanation of Chart.

The circles indicate approximately the positions of the stations. The numbers above the circles are the serial numbers of the stations. The corresponding numbers below the same indicate the depth of water in fathoms.

Two sets of numbers indicate that the station was occupied at two different times.

The index letters at the top and the Roman numerals on the right-hand margin of the chart refer to the temperature profile sections and also serve to locate all the stations given in the records.

U.S Commission of Fish and Fisheries
M. McDonald, Commissioner.

CHART SHOWING
THE
POSITIONS OF THE STATIONS
OCCUPIED BY THE
U.S FISH COMMISSION SCHR. GRAMPUS,
JULY, AUGUST AND SEPTEMBER. 1889.

Scale of Miles.

EXPLANATION OF PROFILE NO. 9.—WATER TEMPERATURE CURVES ON LINE A.

The Roman numerals at the top and bottom of the plate represent the corresponding spaces on the general chart. The data upon which the curves are based are shown in the following table of temperature observations.

Depth (fathoms).	STATIONS.												
	I.	II. Depth 13 fath.	III. Depth 14 fath.	IV. Depth 24 fath.	V. Depth 34 fath.	VI. Depth 44 fath.	VII. Depth 54 fath.	VIII. Depth 70 fath.	IX. Depth 230 fath.	X.	XI.	XII.	XIII.
0	.....	61.9	59.4	62.8	66.9	67.5	66.8	66.5	68.2	.....	.....	.....	.....
5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10	.....	.....	.....	.....	.....	65.4	64.8	65.9	.....	.....	.....	.....	.....
15	.....	.....	.....	.....	50.9	51.8	66.7	66.1	.....	.....	.....	.....	.....
20	.....	.....	.....	.....	.....	48.4	64.2	48.7	.....	.....	.....	.....	.....
25	.....	.....	.....	.....	46.7	46.0	64.5	.....	55.8	.....	.....	.....	.....
30	.....	.....	.....	.....	.....	45.2	45.6	46.9	.....	.....	.....	.....	.....
40	.....	.....	.....	.....	.....	45.7	45.6	45.7	.....	.....	.....	.....	.....
50	.....	.....	.....	.....	.....	.....	45.3	46.7	51.7	.....	.....	.....	.....
75	.....	.....	.....	.....	.....	.....	.....	.....	53.6	.....	.....	.....	.....
100	.....	.....	.....	.....	.....	.....	.....	.....	47.6	.....	.....	.....	.....
150	.....	.....	.....	.....	.....	.....	.....	.....	42.9	.....	.....	.....	.....
200	.....	.....	.....	.....	.....	.....	.....	.....	41.7	.....	.....	.....	.....
250	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
300	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
400	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
500	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bottom	.....	61.8	57.2	49.2	46.2	45.2	44.1	47.4	.....	.....	.....	.....	.....