least one special essay. The papers published by several foreign governments have been of great importance, particularly the treatises by Grimm, upon the fishes and fisheries of Russia, and by Apostolides, upon those of Greece. Those issued officially by the exhibition have been numerous, and, if the truth must be told, by no means of equal merit. None, however, are without value; and several, especially those by Huxley, Levi, Hubrecht, Lankester, and Day, are important contributions to science.

The official catalogue, edited by Mr. A. J. R. Trendell of the South Kensington museum, well known in America as the secretary of the British commission to our exhibition in 1876 at Philadelphia, is in itself a contribution to knowledge, and a model for the guidance of future exhibition administrations. Each section is introduced by an essay by some recognized authority, and signed. Much serious work has been done by the English periodicals in recording the teachings of the exhibition. *Nature*, under the head of 'Zoölogy at the fisheries exhibition,' has had a review of the vertebrates by Professor Giglioli, and of the invertebrates by Professor Ray Lankester; also a paper on the present state of fish-culture as illustrated at the exhibition, by Mr. Earll. The birds have been considered by Mr. Howard Saunders in the *Ibis*, and by Mr. J. E. Harting in the *Zoölogist*. Mr. Gwynn Jeffreys described the molluscan collections in the *Annals and magazine of natural history*. Mr. Dunell, Mr. W. B. Tegetmeier, Mr. Senior, and others have reviewed the technological features in the *Field*, and Mr. Fell Woods, the oyster-collections in *Land and water;* while *Engineering* has had an elaborate series of illustrated papers upon the vessels and scientific instruments, devoting several numbers to describing the U. S. steamer Albatross and its equipment, and to American devices for the exploration of the depths of the sea.

An official review, elaborately illustrated, of the exhibition and its teachings, is being prepared for the British government by Hon. Spencer Walpole, governor of the Isle of Man, well known as the colleague of Huxley and Buckland in the various fishery commissions from time to time instituted by Parliament.

Nearly every European government has sent hither specialists to report upon special subjects. Among the most eminent of these men of science have been Dr. Steindachner of Vienna, Dr. Sauvage of Paris, Dr. Möbius of Kiel, Professor Benecke of Königsberg, Professor Hubrecht and Dr. Van Bemmelen of Utrecht, Professor Giglioli of Florence, Dr. von Grimm of St. Petersburg, Dr. Malmgren of Finland, Professor Torell of Stockholm, Dr. Buch of Christiania, Mr. E. P. Ramsay of Sydney, Capt. Comerma of the Spanish navy, and Col. Sola of Madrid. The reports yet to be published will perhaps swell the literature of the exhibition to double its present bulk, and will be of interest to investigators in every department.

The exhibition was formally closed on the 31st of October by the Prince of Wales, who in his speech upon this occasion made certain very fitting allusions to the work of his father, Prince Albert, in the promotion of international exhibitions. G. BROWN GOODE.

A FOUR-DAYS' CRUISE OF THE ALBATROSS.[1]

WE left Wood's Holl at 4.10 P.M., Sept. 29, for an offshore dredging-trip. The weather was clear and pleasant, with light southerly winds and smooth sea.

At 9.02 A.M. the following day, we sounded in 1,342 fathoms, — bottom, globigerina ooze; latitude 39° 29′ north, longitude 70° 58′ 40″ west, — and at 9.38 put over the beam-trawl, veering to 1,900 fathoms of rope. It was up again at 1.03 P.M., the net containing a large number of specimens. [Station 2,095.]

The trawl was cast again at 2.44 P.M., in 1,451 fathoms, latitude 39° 22′ 20″ north, longitude 70° 52′ 20″ west. The bottom specimen brought up in the Sigsbee cup was the same as that of the former cast: but the trawl contained a granite stone weighing a hundred and seventy pounds, several small stones, small pieces of cinder, and lumps of hard clay; there were also several small specimens of what appeared to be oxidized iron. The haul was very successful, being particularly rich in foraminifera. [Station 2,096.]

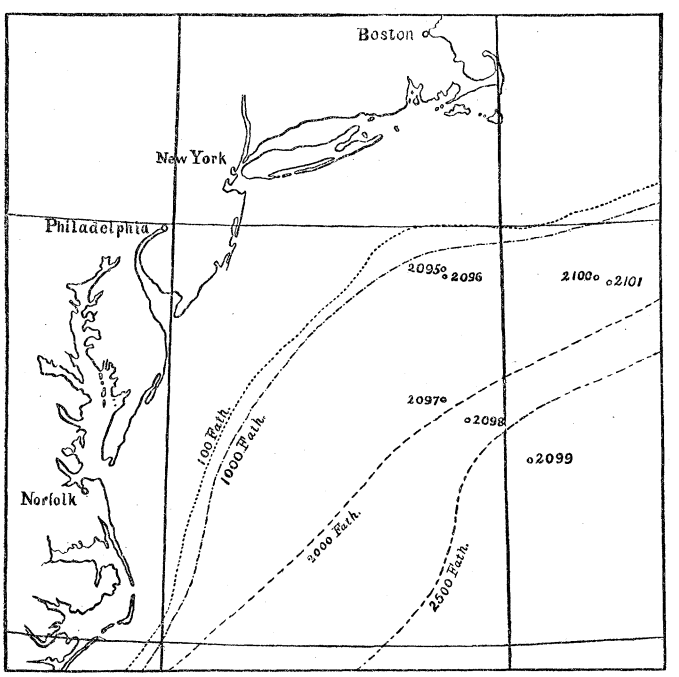
As soon as the trawl was up, a set of serial temperatures and specific gravities was taken to 1,000 fathoms. A temperature of 66° was found at 25 fathoms, 65½° at 60 fathoms, and 57½° at 40 fathoms. These strata of cold and warm water are the rule rather than the exception, in this locality; but, thinking that possibly the observation at 40 fathoms had been read incorrectly, it was verified, using another instrument, which registered 55½°.

At 8.22 P.M. we started ahead south ⅞ west

[1] Report to Prof. S. F. BAIRD, U. S. commissioner of fish and fisheries, by Lieut.-Commander Z. L. TANNER, U.S.N., commanding U. S. fish-commission steamer, Albatross, kindly placed at our service by Professor Baird. Some of the appendices are abbreviated to save repetition.

(magnetic), running on that course till 5.30 A.M., Oct. 1, when we sounded in 1,917 fathoms, — latitude 37° 56′ 20″ north, longitude 70° 57′ 30″ west; bottom, globigerina ooze, — and at 6.18 put the beam-trawl over, veering to 2,600 fathoms. It was on the bottom at 8.04; and at 9.04 we began heaving in, landing it on the deck at 10.42 A.M., having made a successful haul. [Station 2,097.]

At 2.08 P.M. the beam-trawl was lowered again in 2,221 fathoms, latitude 37° 40′ 30″ north, longitude 70° 37′ 30″ west. It was down, with 3,000 fathoms of rope out, at 4.03 P.M., dragged till 5.14 P.M., and was landed, after a successful haul, at 7.24 P.M. [Station 2,098.]



At 7.34 P.M. started ahead south-south-east (magnetic), ran till 3.26 A.M., and lay to until daylight (about 5.30 A.M.), when we sounded in 2,949 fathoms, — bottom, globigerina ooze; latitude 37° 12′ 20″ north, longitude 69° 39′ west, — near the centre of the Gulf Stream. The sinker, sixty-four pounds weight, was thirty-four minutes in reaching the bottom; and the specimen-cup came up in thirty-six minutes. The thermometer registered at some intermediate depth not far from the surface, having capsized in some way in its descent. [Station 2,099.] The net of the beam-trawl was examined with great care, and every foreign substance removed, so that there should be no doubt as to whether specimens found were taken during the haul, or were in the net when it went down.

At 7.14 A.M. the trawl was put over, reaching the bottom at 10.13½, having veered 4,100 fathoms of rope. At 0.54 P.M. began heaving up, and at 3.18 P.M. it was landed on deck. It was a successful haul in every respect.

The moderate breeze of the morning increased to a strong wind with heavy swell before the trawl was up, making it doubtful whether we should succeed in landing it. A set of serial temperatures and specific gravities was attempted after finishing the haul; but the strong current, high wind, rugged sea, and threatening weather forced us to give it up after having veered 300 fathoms of rope. The method adopted to regulate the drift was at least original. The current of the stream was so strong that the trawl would not take the bottom; and, to effect this object, an officer was stationed on the forecastle with a dredging quadrant, constantly observing the angle of the dredge-rope, the engines being moved with sufficient speed to maintain it within certain prescribed limits.

At 4.30 P.M., moderate gale from south-west; hove to under fore storm-staysail, head to the southward, drifting rapidly with the stream about north-east by east. At midnight it was blowing a moderate gale with heavy sea, barometer 29.76, the air exceedingly sultry, and incessant flashes of lightning in every direction. At 1.40 A.M., 3d inst., started ahead, course north, and ran under moderate speed till 11.05 A.M., when, wind and sea having moderated, we sounded in 1,628 fathoms, globigerina ooze, — latitude 39° 22′ north, longitude 68° 34′ 30″ west, — and at 12.13 P.M. put the beam-trawl over, veering to 2,300 fathoms. There was still a fresh breeze from north-west, with heavy swell and very strong stream. The trawl was down at 1.59, dragged till 3.08, and was landed at 4.25 P.M. There were some interesting specimens, but most of the things were washed out of the net on the way up. [Station 2,100.]

At 4.31 P.M. we sounded in 1,686 fathoms, globigerina ooze, — latitude 39° 18′ 30″ north, longitude 68° 24′ west, — and at 5.15 P.M. put the trawl over, veering to 2,650 fathoms. It was on the bottom at 7.10, began heaving up at 8.15, and landed it on deck at 9.39 P.M. The heavy swell and strong stream combined washed a large proportion of the specimens from the net, but several new or rare species were secured. [Station 2,101.]

A course was laid to the northward as soon as the haul was finished, and the speed registered so as to strike the 100-fathom line in longitude 67° 50′ west, at daylight, when we proposed setting a trawl-line for tile-fish. We were on the ground at the proper time; but the weather was so boisterous that it was not considered prudent to lower a boat. It was too rough even for dredging; and, as our coal-supply was nearly exhausted, we started for port.

We encountered strong head-winds during the day, finally anchoring in Tarpaulin Cove at 10.40 P.M., where we remained till 6 A.M. on the 5th, when we got underway, and arrived at Wood's Holl at 6.40, making fast to our moorings.

List of fishes obtained.

BY ENSIGN R. H. MINER, U.S.N.

Station 2,095. — Bathysaurus Agassizii, Stomias ferox, Macrurus asper, Coryphaenoides carapinnis, Halosaurus macrochir, Haloporphyrus viola, Cyclothone lusca, and one new species.

Station 2,096. — Eurypharynx, Haloporphyrus viola, Macrurus asper, Synaphobranchus pinnatus, Halosaurus macrochir, Coryphaenoides carapinnis.

Station 2,097. — Berycid (new species), Macrurus asper, Cyclothone lusca, Scopelus.

Station 2,098. — Macrurus asper.

Station 2,099. — Cyclothone lusca, Scopelus, Berycid (new species), two new species.

Station 2,100. — Cyclothone lusca, Scopelus, Forcepicthys.

Station 2,101. — Berycid (new species), Eurypharynx, Cyclothone lusca, Argyropelicus Olfersii, Sternoptyx diaphana, Scopelus, two new species.

Register of invertebrates captured.

BY J. E. BENEDICT.

The results obtained were good, notwithstanding the sea was quite rough much of the time. The surface-nets were in use when practicable, and a number of fine specimens were taken in them. As heretofore, schools of squid were seen in the water, illuminated by the arc-light. One of the crew captured

Dredging and trawling record.

Date.	Station.	Locality. Latitude, north.	Locality. Longitude, west.	Hour.	Temperature. Air.	Temperature. Surface.	Temperature. Bottom.	Depth in fathoms.	Kind of bottom.	Wind. Direction.	Wind. Force.	Drift. Direction.	Drift. Distance.	Trawl used.
1883.														
Sept. 30. .	2,095	39° 29′ 00″	70° 58′ 40″	9.02 A.M.	71½	69½	..	1,342	Glob. oz.	S.S.W. .	3	S. . .	2′.0	Beam.
" 30. .	2,096	39 22 20	70 52 20	2.07 P.M.	70	69	37½	1,451	" "	" .	2	S.W. .	1 .5	"
Oct. 1. .	2,097	37 56 20	70 57 30	5.30 A.M.	73	72½	..	1,917	" "	S.W. . .	3	S ¾W..	1 .5	"
" 1. .	2,098	37 40 30	70 37 30	1.08 P.M.	73	72½	..	2,221	" "	N.W.. .	4	W.×S.,	2 .0	"
" 2. .	2,099	37 12 20	69 39 00	5.30 A.M.	71	82	..	2,949	" "	S.E. . .	6	S.S.W.	2 .0	"
" 3. .	2,100	39 22 00	68 34 30	11.05 A.M.	63	69	37½	1,628	" "	W.N.W.,	3	E. . .	2 .0	"
" 3. .	2,101	39 18 30	68 24 00	4.31 P.M.	61	67	37	1,686	" "	W.S.W..	3	S. . .	2 .0	"

Meteorological record.

Date.	Barometer. Maximum.	Barometer. Minimum.	Air. Maximum.	Air. Minimum.	Wet bulb. Maximum.	Wet bulb. Minimum.	Surf'ce water. Maximum.	Surf'ce water. Minimum.	State of weather.	Wind. Direction.	Wind. Force.	State of sea.
1883.												
Sept. 29. .	30.32	30.18	71	56	69	56	64	57	Passing clouds	E., N.W., S.	1-3	Smooth.
" 30. .	30.18	29.92	72	64	72	64	70	60	" "	S., S.S.W.	2-4	"
Oct. 1. .	30.06	29.86	80	66	78	65	75	71	" "	S.S.W., N.W., N.E. .	2-4	Moderate.
" 2. .	30.10	29.76	82	67	81	65	83	76	" " squally . . .	N.E., S.E., S.W. . .	2-8	Rough.
" 3. .	30.12	29.76	78	61	77	57	82	67	" " " . . .	N.N.W., W.N.W. .	3-7	"
" 4. .	30.36	30.12	64	45	62	43	66	55	Clear and pleasant	N.N.W., W.N.W. .	4-7	Rough, then moderate.

three of them with the squid-jig. Several land-birds were seen far out at sea. A pair of kingfishers (Ceryle alcyon) flew about near station 2,096. A pair of fish-hawks (Pandion haliaetus) acted as if they were at home near station 2,099, 250 miles from land. A golden-winged woodpecker (Colaptes auratus) and a song-sparrow (Melospiza melodia) came on board to rest, at station 2,100.

The principal invertebrates taken were as follows:—

Station 2,095. — The sounding-cup brought up ooze containing foraminifera from a depth of 1,342 fathoms. The beam-trawl was put over with wings attached. Among its invertebrates were twenty-five holothurians (Benthodites), many large Zoroasters, several cup-corals (Flabellum), a shrimp nine inches long with very large eggs, three specimens of a crab (? Galacantha). Some of the holothurians were placed in picric acid before putting them into weak alcohol. A portion of the eggs were taken from the large shrimp, and preserved in Müller's fluid for the study of the embryos, which were plainly visible within.

Station 2,096.— Again the sounding-cup brought up ooze with foraminifera, this time from a depth of 1,451 fathoms. Strange to say, a large stone, weighing upward of a hundred and seventy pounds, was brought up with sponges and worm-tubes attached. This would, I think, preclude the possibility of its being below the surface of the foraminiferous ooze, which came up in quantity sufficient to yield two quarts of clean foraminifera. The principal ingredients found in the stone were quartz, hornblende, and iron. Eighteen holothurians (Benthodites), many specimens of a small ophiuran, a few large shrimp, and some small shells, made up the bulk of the material.

Station 2,097. — Bottom, ooze, with foraminifera from a depth of 1,917 fathoms. One amphipod three inches and a half long, shrimp, Epizoanthus on hermit-crabs (species unknown), Urticina concors Verr. on Sympagurus pictus Smith, Ophioglypha convexa Lym. and Ophiomusium armigerum Lym. in small numbers, a starfish remarkable for its large madreporic plate and ambulacral feet, small ascidians coated with foraminifera.

Station 2,098.— Depth, 2,221 fathoms. Epizoanthus, Urticina concors Verr. on Sympagurus pictus Smith, Ophioglypha convexa Lym. and Ophiomusium armigerum Lym., also a few shells.

Station 2,099. — This haul was remarkable from the fact that the sounding was in a depth of 2,949 fathoms. This is perhaps the deepest water ever successfully invaded by a large trawl: certainly it is the deepest we have record of with any trawl. The trawl went down more than three miles at the end of upwards of four miles and a half of wire rope without capsizing, and that in the middle of the Gulf Stream, while the water was quite rough. That there might be no question as to the specimens brought up, the captain had the net thoroughly cleaned before it was put over the side. The amount of material brought up was not large. The only specimens from the bottom were a species of Boltenia, and many fragments of a bryozoan we had not seen before. A fine large schizopod, with several species of shrimp and small crustacea, were taken in good condition. These, with a cephalopod and the fish, made it one of the best hauls.

Station 2,100, with a depth of 1,628 fathoms, and station 2,101 with a depth of 1,686 fathoms, brought us only shrimp and fish.

Specific gravities of sea-water.

BY P. A. SURGEON, C. G. HERNDON, U.S.N.

DATE.	Station.	Depth.	Temperature air.	Temperature by attached thermometer.	Temperature of specimen at time specific gravity was taken.	Specific gravity.	Reduced to 60°.
12 M.							
Sept. 30 .	2,095	Surface.	71°	69°	71°	1.0251	1.026706
" 30 .	2,095	5	71	67	71	1.0251	1.026706
6 P.M.							
Sept. 30 .	2,096	Surface.	70	70	72	1.0251	1.026864
" .	2,096	5	70	67 .5	72	1.0251	1.026864
" .	2,096	10	70	68	72	1.0251	1.026864
" .	2,096	15	70	68	72	1.0252	1.026964
" .	2,096	20	70	67	71	1.0253	1.026906
" .	2,096	25	70	66	67	1.0257	1.026687
" .	2,096	40	70	57 .5	67	1.0264	1.027387
" .	2,096	60	70	55 .5	67	1.0266	1.027587
" .	2,096	100	70	55 .5	84	1.0236	1.027512
" .	2,096	200	70	47	85	1.0235	1.027600
7 P.M.							
Sept. 30 .	2,096	300	70	40 .5	85	1.0235	1.027600
" .	2,096	400	70	40	85	1.0235	1.027600
" .	2,096	500	70	40	85	1.0235	1.027600
" .	2,096	600	70	39 .5	86	1.0233	1.027616
" .	2,096	700	70	39 .5	85	1.0235	1.027600
" .	2,096	800	70	38 .5	85	1.0236	1.027700
" .	2,096	900	70	39	86	1.0235	1.027816
8 P.M.							
Sept. 30 .	2,096	1,000	70	38 .5	86	1.0235	1.027816
6 P.M.							
Oct. 1 .	2,097	Surface.	66	69	75	1.0233	1.027565
" .	2,097	5	66	68	75	1.0253	1.027565
2 P.M.							
Oct. 2 .	2,098	Surface.	79	74	76	1.0248	1.027232
" .	2,098	5	79	72	76	1.0248	1.027232
7 P.M.							
Oct. 3 .	2,101	Surface.	63	68	75	1.0246	1.026865
" .	2,101	5	63	69	73	1.0248	1.026724

THE ZOÖLOGICAL STATION OF HOLLAND.[1]

FOR some years past, zoölogical science has been pursuing a course abounding in brilliant discoveries. The examination, however minute, of animals preserved in collections, no longer satisfies the naturalist: he must study the living animal. Zoölogy has become experimental. On all sides, maritime stations are being established. Numerous works on anatomy and embryology have cleared up the philosophical theory of the transformation of animals by showing that the metamorphoses, which, less than half a century ago, were almost unknown, are very common among marine animals.

Holland, which has produced so many great anatomists and such patient naturalists, seemed to be tardy in following the example of neighboring nations, when, on the 4th of December, 1875, at the instiga-

[1] Translated from *La Nature* of Sept. 8.