Prog. Oceanog. Vol. 14, pp. 463–483, 1985.
Printed in Great Britain.

0079-6611/85 $0.00 + 0.50

Drifting Derelicts in the North Atlantic 1883–1902

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Abstract – In December 1883 the U.S. Navy Hydrographic Office began to publish monthly Pilot Charts. These showed the positions and drifts of abandoned derelict sailing vessels and other dangers to navigation in the North Atlantic. During the years 1887–93 a total of 1,628 derelict sightings were made. The repeated sightings of 200 derelicts identified by name gave the first large-scale and long-term measurement of ocean trajectories. A new chart of these trajectories between 1883 and 1902 is presented showing features of the general ocean circulation and early evidence of the variability of ocean currents.

1. INTRODUCTION

IN DECEMBER 1883 the U.S. Navy Hydrographic Office, a branch of the Bureau of Navigation of the Navy Department, began to publish monthly Pilot Charts for the North Atlantic. Earlier, beginning in 1847 Maury had produced some summary survey charts showing ocean currents, winds, sailing routes, and the locations of whales. The new charts were unique in that they showed updated positions of derelict vessels and other drifting debris. From this series of positions of identified derelicts the first ocean trajectories were obtained. Much of this information has been forgotten during the last 80–100 years, and good collections of the Pilot Charts are rare. (The only complete collection that I could find is held by the Defense Mapping Agency.) This paper is a recompilation and description of these early trajectories and a discussion of the usefulness of the Pilot Charts. It also provides a glimpse of a little known part of maritime history – the last days of wooden sailing vessels.

2. THE PILOT CHART

The new Pilot Charts were prepared to supply a reliable plotting sheet and a graphic presentation of recent and general summary information for mariners (HAYDEN, 1888). The charts were issued free to navigators in return for their reporting recent navigational and weather information. The success of the Pilot Charts was due to the large number of observers who contributed information for each month's chart and to the charts' rapid distribution to ships. In the late 1800's reports were collected from nearly 3000 voluntary observers, mariners who crossed the North Atlantic and who patrolled its waters. These observers' reports of marine meteorology and dangers to navigation were collected at 11 branch offices and forwarded to headquarters in Washington where the latest positions of wrecks and derelicts were plotted on a large blackboard. The Pilot Charts incorporating these data were published and distributed at the beginning of each month. In November 1893 the office received no less than 400 reports daily from vessels in the North Atlantic alone. In New York during 1886–87, 6,739 vessels were visited, 3,601 reports were forwarded to Washington, nautical information was furnished to 83,345 masters of vessels and others, and 10,397 Pilot Charts were distributed (HAYDEN, 1888).

A section of the Pilot Chart of March 1888 is shown in Fig. 1. It includes (1) the general

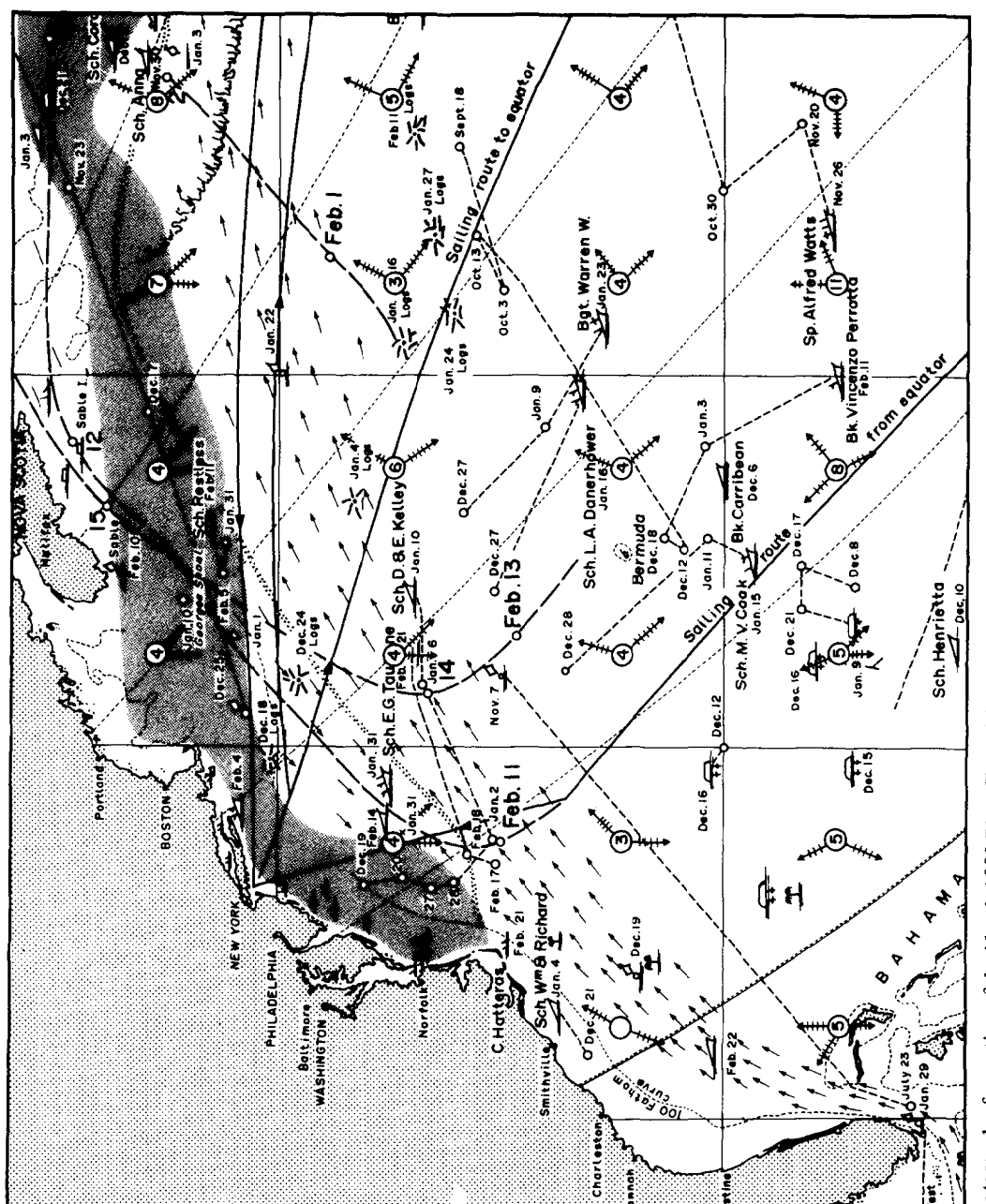

FIG. 1. Photograph of a portion of the March 1888 Pilot Chart. This chart shows the trajectories of ten derelicts and three buoys. Symbols indicate schematically the condition of each derelict – stern down, bottom up, masts standing, etc. In addition to these are steamship routes, current vectors, fog belts, limits of ice, wrecks, waterspouts, whales, storm tracks, prevailing winds, etc.

drift of currents, (2) a meteorological forecast for the month – fogs, winds, calms, (3) information collected during the preceding month – derelict vessels, wrecks, drifting buoys, whales, water spouts, storm tracks, and (4) a written description of aids and dangers to navigation, lists of charts published, and other information of this kind. In March 1888, a larger number of derelicts than usual had been sighted; these were caused by the unusually stormy weather of the previous month. Trajectories of ten of these derelicts and also three drifting buoys are shown in Fig. 1. This chart notes that the transatlantic steamship routes as well as the Gulf Stream were obstructed with derelicts. A large number of vessels had been recently abandoned near the eastern end of the transatlantic routes – two ships, five barks, and two unknown vessels between 7–18 February. The positions of large clusters of logs are also plotted. After breaking apart from a log raft in December 1887, these were drifting eastward in the Gulf Stream and dispersing throughout the North Atlantic.

3. DERELICTS

A derelict is a vessel abandoned at sea. Derelicts that survived more than a few days at sea were usually wooden sailing vessels, and the longest surviving of these were often lumber schooners. From the point of view of a ship captain, a derelict vessel is a formidable obstruction to navigation. A collision with a derelict at night or in fog could damage or sink a ship. In our age of metal ships it is not generally recognized how many derelicts there were nor how long they remained afloat. The Atlantic was literally strewn with numerous *Mary Celestes* in various stages of disintegration (see Appendix 1).

The number of reported derelict sightings reached a maximum toward the end of the 19th century (HYDROGRAPHIC OFFICE, 1894). During 1893, a year of particularly numerous derelicts, there were 732 reports of 418 different derelicts (Table 1). Of these 418, 106 were identified by name. All but two or three were wooden. Over a seven-year period, 1887–93, a total of 1,628 derelicts were sighted – an average of 19 per month, 232 annually (Fig. 2).

TABLE 1. REPORTED DERELICTS 1887–1893

	1887	1888	1889	1890	1891	1892	1893	Total
January	16	17	9	18	14	20	38	132
February	11	12	5	14	12	18	33	105
March	8	19	8	16	18	31	33	133
April	11	8	29	12	19	27	25	131
May	9	11	13	12	17	19	35	116
June	10	3	17	11	16	15	22	94
July	8	8	13	24	22	15	14	104
August	16	8	9	12	22	25	44	136
September	18	10	35	17	18	19	63	180
October	14	11	29	21	31	20	54	180
November	12	17	30	22	37	18	29	175
December	15	11	25	25	14	34	18	141
Total	148	135	222	204	240	261	418	1,628

NOTE: These numbers represent the first reports of individual derelicts not the numbers of individual reports. Of the total 1,628 derelicts, 1,146 were unidentified. Of the 482 identified derelicts, 33% were American, 27% British, and 20% Norwegian. Approximately 30% of the derelicts were floating bottom up (from HYDROGRAPHIC OFFICE, 1894).

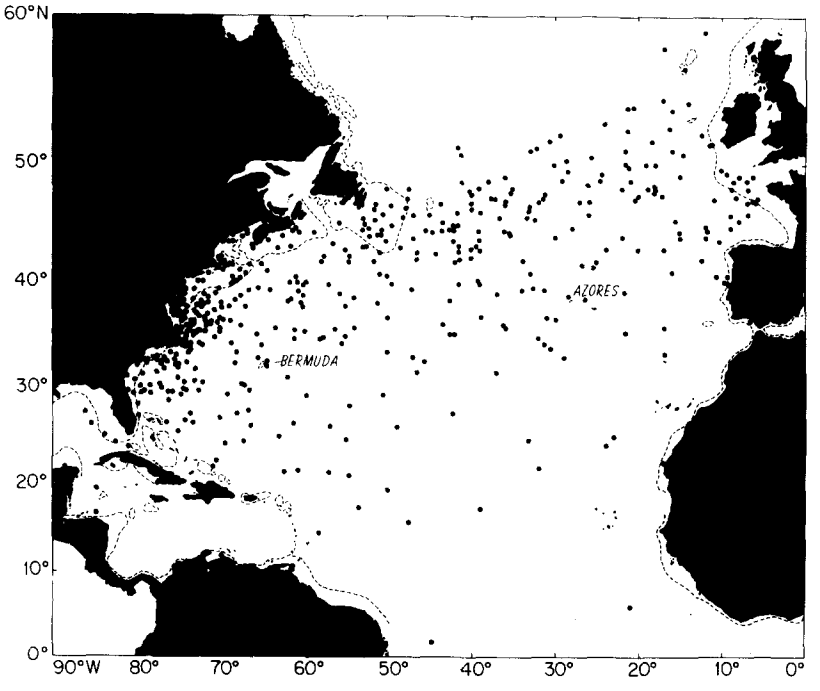

FIG. 2. First reported positions of all the identified derelicts, 1887–93. Values were taken from an 1894 Hydrographic Office listing that included 270 derelicts reported once and 212 derelicts reported more than once – a total of 482 identified derelicts. An additional 60 vessels were listed as "never heard from" or "abandoned at sea" with no position.

This suggests that at any one time at least 19 derelicts were afloat in the North Atlantic. Derelicts remained afloat for an average of 30 days [Fig. 3(a)], estimated conservatively by assuming that a derelict remained afloat one day after its last reported sighting or three days for for a single sighting. During 1887–93, there were 1,944 reports of the 482 identified derelicts, giving an average of four sightings per derelict [Fig. 3(b)]. The greatest number of derelicts were first reported in September–November and were the result of severe storms. Most were located in the Gulf Stream off the U.S. coast. The numbers of sightings gradually decreased eastward along the transatlantic steamer routes (Fig. 2). Many of the large number of derelicts observed during the fall of 1893 were caused by a series of three severe hurricanes in August of that year (see Appendix 1).

During 1887–93, there were 28 reported collisions with derelicts. Six vessels were abandoned (creating new derelicts) or lost by sinking and 15 were considerably damaged. Because of the hazard they created, derelicts were actively sought and towed into port or set afire (see Appendix 1). Unfortunately, searching for a derelict at sea was time-consuming, difficult, and often unsuccessful. During 1887–93 41 derelicts were towed in and another 76 were set on fire successfully destroying all but four. One derelict was destroyed by torpedoes and ramming. The rest continued to drift until they broke apart or eventually became so waterlogged and encrusted with barnacles that they sank.

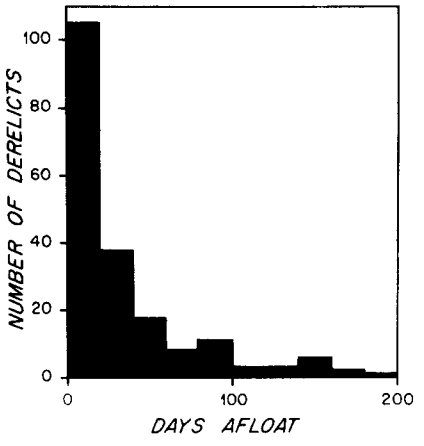

FIG. 3(a). Frequency plot of the lifetime of drifting derelicts (data from HYDROGRAPHIC OFFICE, 1894). Eighteen derelicts floated longer than 200 days. The average length of time a derelict remained afloat is estimated to be 30 days.

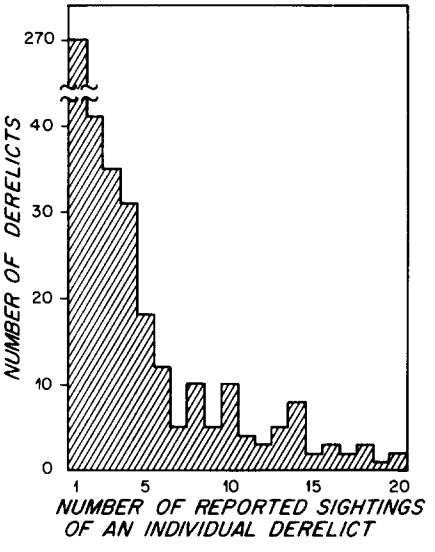

FIG. 3(b). Frequency plot of the number of sightings of drifting derelicts (data from HYDROGRAPHIC OFFICE, 1894). Twelve derelicts were sighted more than 20 times. The average time between sightings of the derelicts that were tracked more than 200 days was about 20 days.

4. LOG RAFT

In addition to derelicts, other debris was reported drifting in the North Atlantic. In December 1887, a large raft of logs being towed by steamship *Miranda* from Nova Scotia to New York broke apart and began to disperse across the North Atlantic (Fig. 4). The raft consisted of 27,000 trunks of trees from 30–100 ft long, bound with chains into a cigar shaped raft, 560 ft long by 65 ft wide and 38 ft deep, drawing 20 ft of water and weighing 11,000 tons. On December 18, *Miranda* encountered a severe storm. The 15-inch towing hawser parted, the 10-inch hawser carried away the steamer's bits and parts of her deck, and the raft went adrift

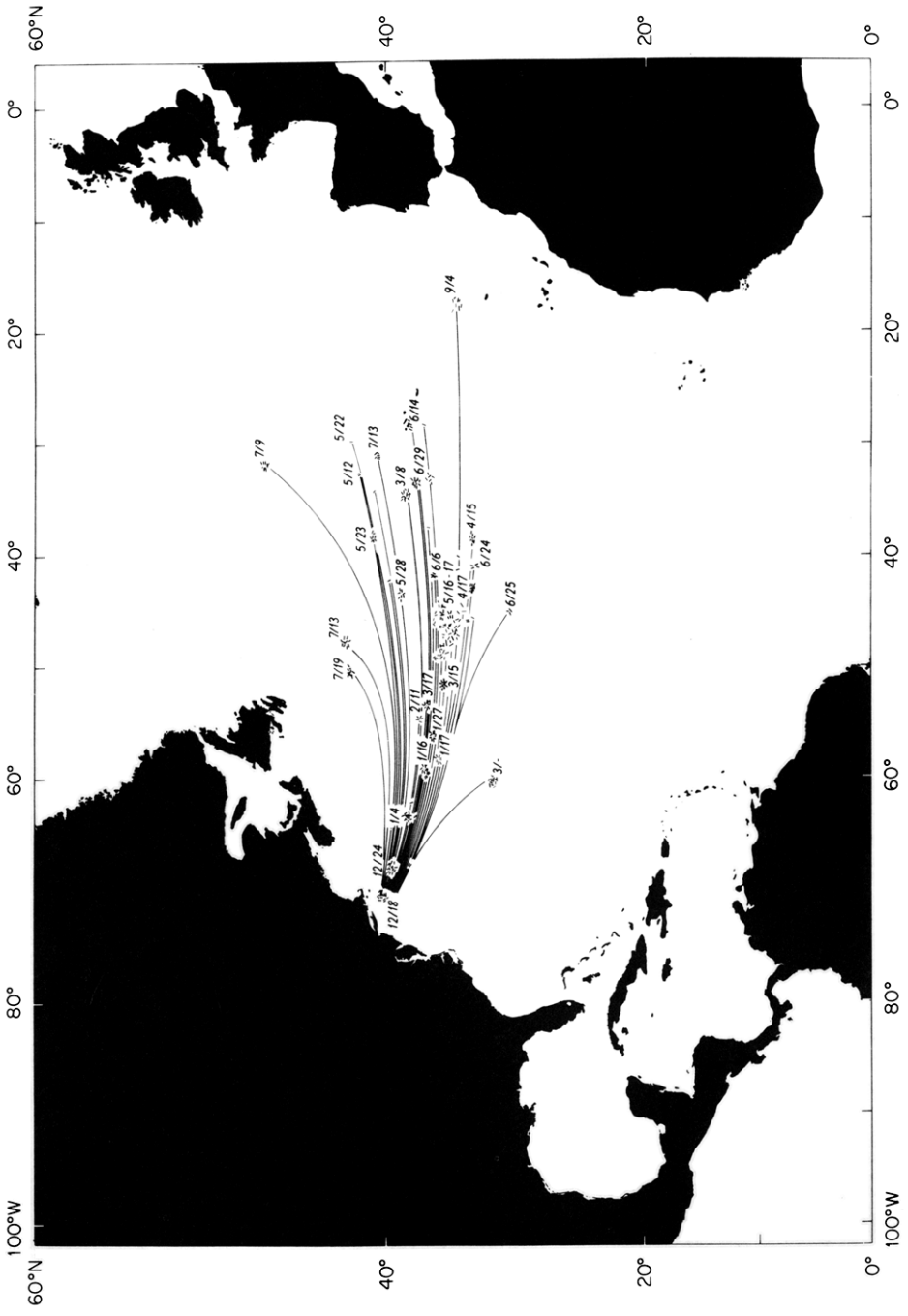

FIG. 4. The drift and dispersion of a gigantic log raft originally 560 ft long, 65 ft wide, and 38 ft deep, drawing 20 ft of water and weighing 11,000 tons. This raft broke apart December 18, 1887, and clusters of logs drifted eastward. (Reported in 1888 Pilot Charts.)

in the track of commerce. By December 24, the raft had been searched for, but only remnant logs were found scattered over a wide area near 39°33'N, 68°10'W. No vessel was reported lost because of these logs, although the German bark *Bremen*, in the midst of logs for five days near 39°N, 62°W, had her sheathing torn and rudder damaged.

This log raft was the second of its kind on the East Coast. The first one arrived safely in New York. The logs were spruce pilings for use in building docks and in the foundation work for large buildings. This was an important schooner trade and the schooner owners and captains were delighted when the loss of the second raft put an end to this serious threat to their livelihood (W. J. Lewis Parker, *pers. commun.*).

5. DERELICT TRAJECTORIES

Numerous derelicts remained afloat over half a year and were reported often enough to give long and interesting ocean trajectories (Table 2, Fig. 5). Six drifted longer than a year – (a) schooner *Fannie E. Wolston* 1100 days, (b) schooner *Wyer G. Sargent* 615 days, (c) bark *Telemach* 551 days, (d) bark *Vincenzo Perrotta* 536 days, (e) schooner *Ethel M. Davis* 370 days, (f) schooner *James B. Drury* 367 days. Figure 6 shows the trajectories of the bow and stern of the *Fred B. Taylor*, which was cut in two during a collision with another vessel. The two parts drifted in very different directions.

Trajectories of 11 of the longest lasting and farthest drifting derelicts are shown in Fig. 5. One of the best known of these was the three-masted lumber schooner *W. L. White*, belonging to A. F. Ames of Rockland, Maine. She was abandoned off Delaware Bay during the great blizzard of March 13, 1888 (see Appendix 1). A telegram dated Stornoway, Hebrides Islands, Scotland, January 23, 1889, marked the termination of the *White's* 310 day transatlantic drift – she ended stranded upon Haskeir Island in the Hebrides.

The *White* began her drift southward under the influence of the inshore current and northwest gale, with masts and portions of her sails standing. Upon reaching the Gulf Stream she turned and followed a eastnortheast course at an average speed of about 32 miles per day. From May to November 1888 she looped and zigzagged east of Newfoundland directly within a major shipping lane. During this six months she was reported by 36 vessels, three of which sighted her in a single day. In her cruise of 10 months and 10 days, she traversed a distance of 5,900 miles and was reported 45 times.

Although the detailed paths of these long-lived derelicts differ markedly, some similarities might be described as patterns (Fig. 5). Eight of the derelicts moved eastward in the Gulf Stream until they reached 50°W where their paths diverged. Three derelicts continued eastward and crossed the Atlantic in an average time of 10 months. The *White* took 310 days, the *Twenty-one Friends* took 255 days and the *Hunt* took 347 days. Six derelicts drifted southward from the Gulf Stream near 40°W. The *Drury* and the *Hill* both made tight turns and drifted westward just south of the Gulf Stream. The *Wolston* made a complete circuit of the gyre during its three-year drift. This derelict drifted south to 25°N, westward to the Bahamas and then northeastward into the Gulf Stream again, crossing its earlier path. The 1.5-year-long trajectory of the *Telemach* is similar to part of the *Wolston's*. Two derelicts drifted erratically but in a general southwestward direction through the Sargasso Sea and grounded on the Bahama Islands.

Most derelicts looped as they drifted. The *Sargent* and *Wolston* made large, 500 km, loops with a characteristic period of 10 months near 30°N, 40°W. Several other derelicts made frequent smaller scale loops – the *Perrotta* and *Francis* in the Sargasso Sea and the *White* east of Newfoundland.

TABLE 2. DERELICTS THAT DRIFTED LONGER THAN 200 DAYS (1885–1894)

Name	Type	Size (feet)	Gross Tons	Built	First Reported			Last Reported			Drift		No. of Times Rept'd	Age When Abandoned
					Date	Lat.	Lon.	Date	Lat.	Lon.	Miles	Days		
Twenty-one Friends	Schooner	108 × 31 × 9	221	1872, Mays Landing, N.J.	Mar 24, 1885	36°41′	72°40′	Dec 4, 1886	45°00′	08°00′	3,525	255	22	13
Ida Francis	Schooner	151 × 34 × 11	407	1883, Waldoboro, Maine	Mar 16, 1886	34°15′	65°10′	Jan 6, 1887	N side Abaco Is		2,715	297	22	3
Manantico	Schooner	–	89	1880, Dorchester, N.J.	Dec 8, 1886	39°10′	72°00′	Jul 12, 1887	28°10′	36°15′	2,600	206	8	6
Vincenzo Perrotta	Bark	151 × 31 × 20	669	1875, Castellamare, Italy	Sep 17, 1887	36°00′	54°00′	Apr 4, 1889	Watling Island		2,950	536	27	12
Telemach	Bark	141 × 29 × 17	623	1873, Grinstad, Norway	Oct 13, 1887	37°00′	39°00′	Apr 15, 1889	35°50′	56°30′	3,150	551	17	14
William and Richard	Schooner	109 × 25 × 11	253	1864, St. George, Maine	Jan 11, 1888	33°00′	78°00′	Aug 25, 1888	37°30′	52°00′	1,375	228	8	24
Rowland Hill	Bark	178 × 35 × 21	856	1877, Quaco, N.B.	Feb 27, 1888	41°10′	55°00′	Nov 12, 1888	36°20′	57°20′	2,820	258	17	11
W. L. White	Schooner	157 × 35 × 17	626	1884, Rockland, Maine	Mar 13, 1888	38°50′	73°10′	Jan 23, 1889	57°42′	07°42′	5,910	310	45	4
Ethel M. Davis	Schooner	135 × 32 × 10	290	1884, Yarmouth, Maine	Nov 29, 1888	35°04′	70°52′	Dec 4, 1889	43°49′	27°52′	4,400	370	27	4
David W. Hunt	Schooner	135 × 32 × 10	349	1881, Bath, Maine	Nov 30, 1888	34°30′	72°30′	Nov 12, 1889	32°43′	17°00′	4,800	347	41	7
James B. Drury	Schooner	145 × 33 × 16	429	1872, East Boston, Mass.	Jan 29, 1889	35°00′	75°05′	Feb 1, 1890	35°57′	45°56′	1,720	367	15	17
Mabel L. Phillips	Schooner	173 × 40 × 17	831	1879, Bath, Maine	Oct 25, 1889	35°48′	74°40′	Jun 8, 1890	32°25′	62°55′	1,860	228	11	10
Carricks	Bark	186 × 34 × 22	916	1867, Workington, England	Dec 5, 1890	35°54′	61°09′	Oct 15, 1891	36°51′	66°06′	2,420	314	12	23
Wyer G. Sargent	Schooner	131 × 32 × 11	325	1881, Sedgwick, Maine	Mar 31, 1891	34°52′	74°10′	Dec 6, 1892	35°20′	38°00′	5,500	615	32	10
Fannie E. Wolston	Schooner	120 × 30 × 10	295	1882, Bath, Maine	Oct 15, 1891	36°13′	74°00′	Oct 21, 1894	39°10′	61°50′	8,965	1,100	46	9
May Gibbon	Schooner	90 × 25 × 10	132	1990, Port Medway, N.S.	Aug 21, 1892	39°30′	60°52′	Jul, 19, 1893	25°33′	52°00′	2,940	333	10	2
Ocean	Bark	–	–	–	Sep 15, 1892	34°26′	55°27′	Jul 21, 1893	30°07′	57°11′	1,350	324	14	
Navarch	Bark	174 × 36 × 22	994	1877, Clare, N.S.	Sep 15, 1892	4 miles NW of Flores, Azores		Dec 21, 1893	17°46′	55°50′	2,175	359	14	15
Unexpected	Schooner	91 × 25 × 9	117	1883, Canning, N.S.	Jan 27, 1893	40°00′	60°00′	Aug 14, 1893	36°00′	35°00′	1,765	200	9	10
Caleb S. Ridgeway	Schooner	142 × 34 × 12	404	1879, Wilmington, Delaware	Jan 27, 1893	36°19′	73°47′	Sep 29, 1893	35°19′	50°08′	1,420	218	16	14
Robt. P. Chandler	Schooner	132 × 30 × 8	281	1892, Bath, Maine	Jul 7, 1893	50 miles west of Matanzas		Feb 4, 1894	35°15′	51°20′	2,980	212	18	1

Information concerning the individual vessels comes from the Record of American and Foreign Shipping, the summary drift information comes from HYDROGRAPHIC OFFICE (1894) and the Pilot Charts.

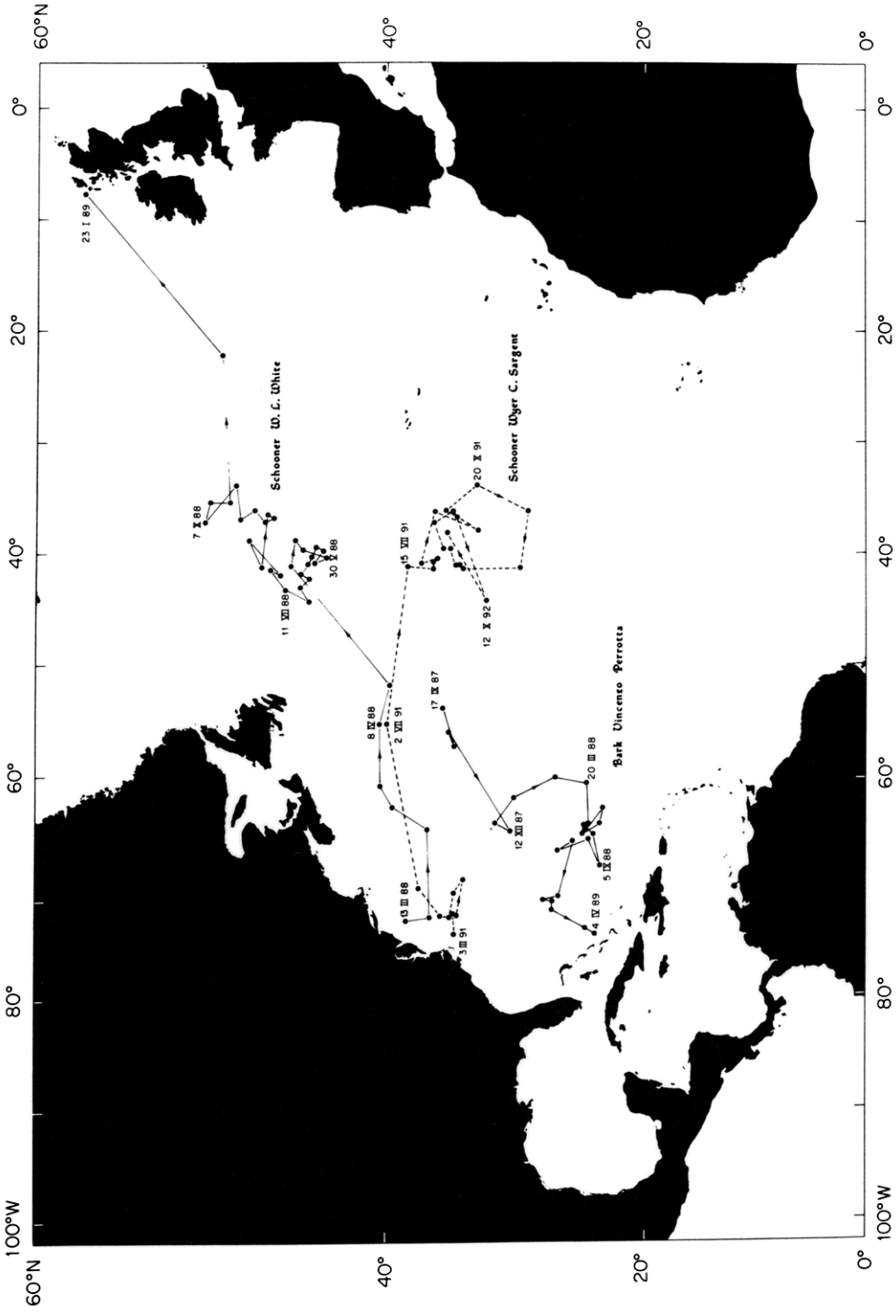

FIG. 5. Trajectories of 11 derelicts that drifted for long periods of time and distances.

FIG. 5(a). Trajectories of (1) the schooner *W. L. White* from March 13, 1888, to January 23, 1889, a drift of 5,910 miles and 310 days; (2) the schooner *Wyer C. Sargent* from March 3, 1891, to December 6, 1892, a drift of 5,500 miles and 615 days; and (3) the bark *Vincenzo Perrotta* from September 17, 1887,

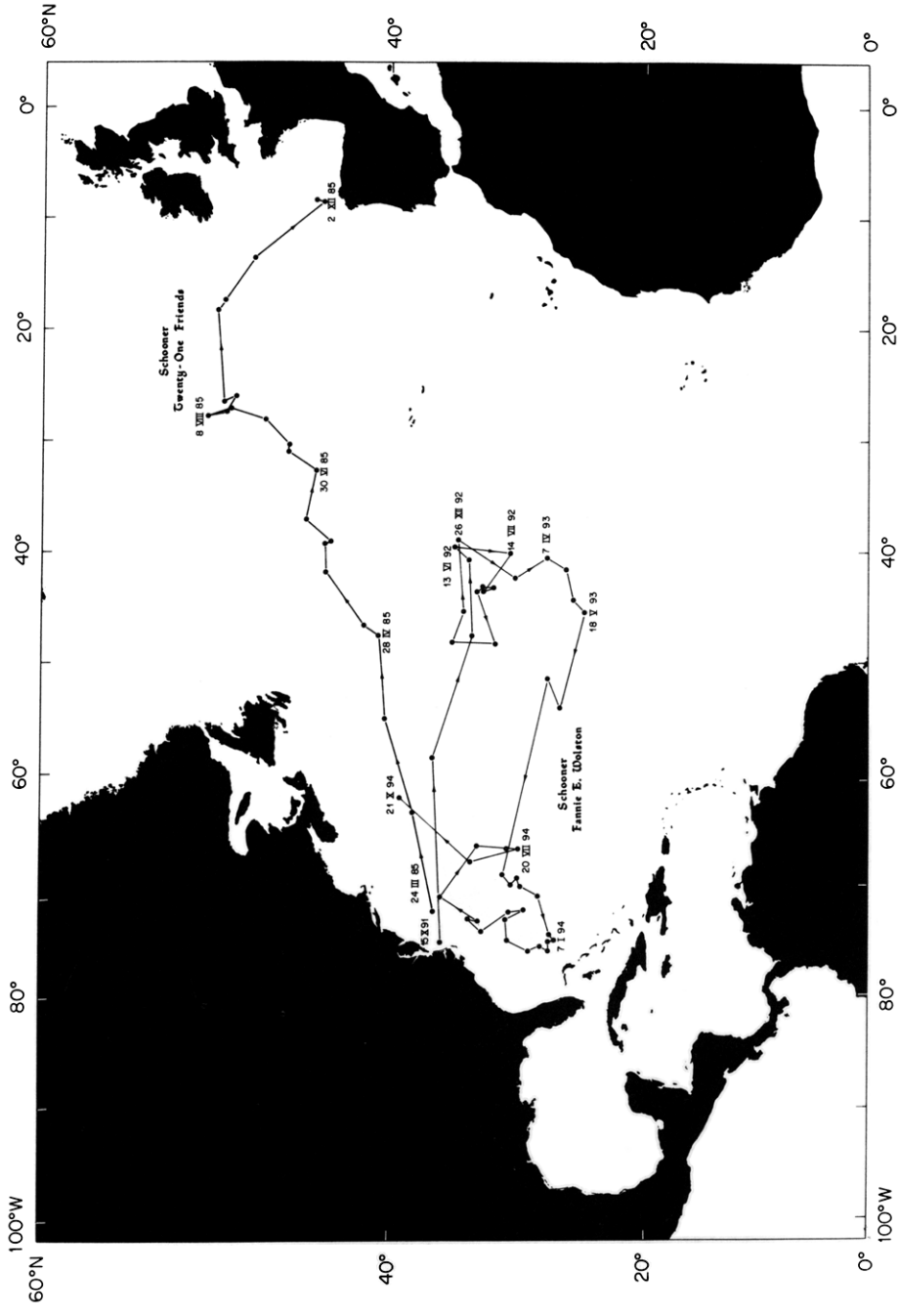

FIG. 5(b). Trajectories of (1) the schooner *Twenty-One Friends* from March 24, 1885, to December 4, 1885, a drift of 3,525 miles and 255 days; and (2) the schooner *Fannie E. Wolston* from October 15, 1891, to October 21, 1894, a drift of 7,025 miles and 1,100 days.

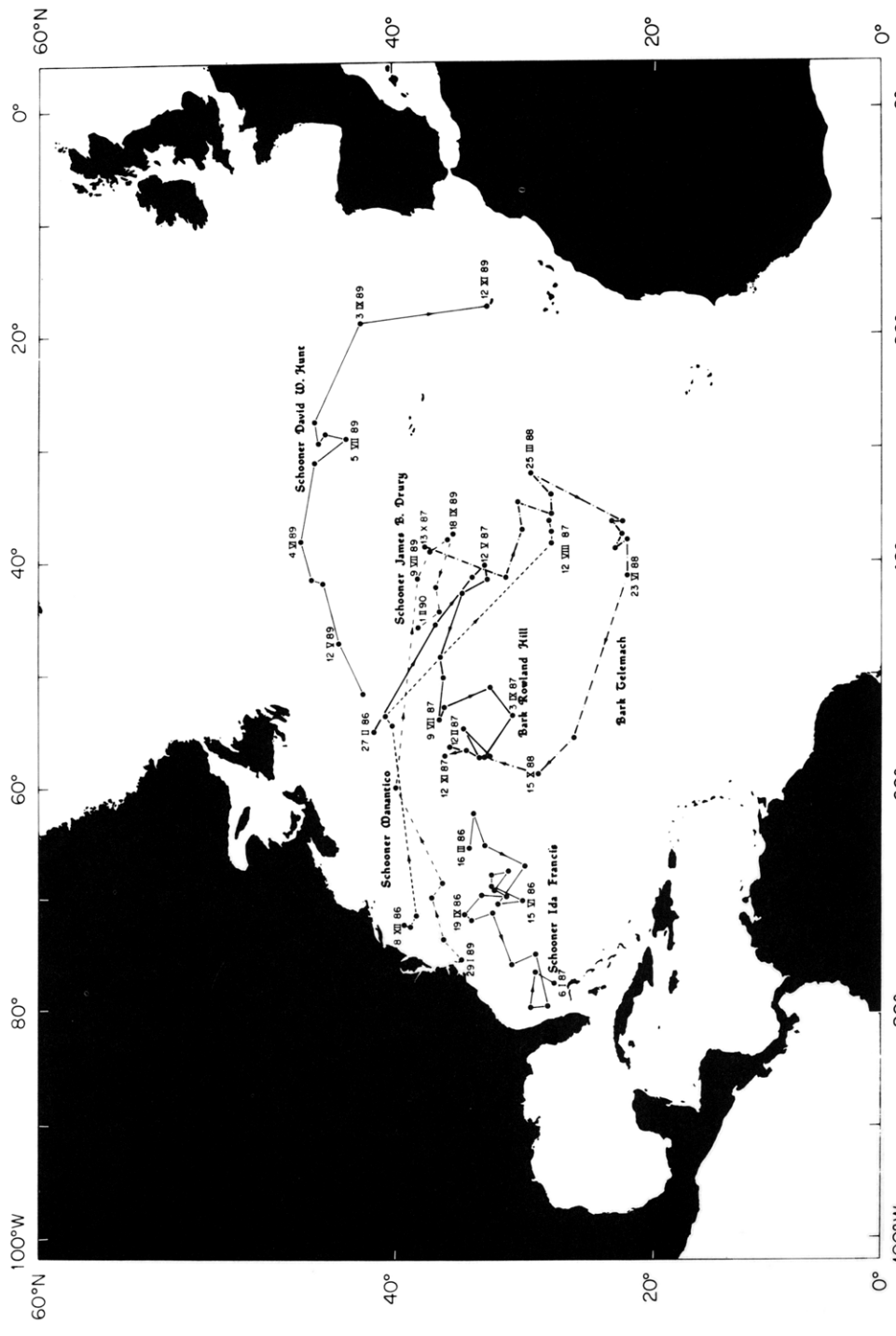

FIG. 5(c). Trajectories of (1) the schooner *David W. Hunt* from November 30, 1888, to November 12, 1889, a drift of 4,800 miles and 347 days (end of trajectory shown); (2) schooner *James B. Drury* from January 29, 1899, to February 1, 1890, a drift of 1,720 miles and 367 days; (3) schooner *Manantico* from December 8, 1886, to July 12, 1887, a drift of 2,600 miles and 206 days; (4) bark *Telemach* from October 13, 1887, to April 15, 1889, a drift of 3,150 miles and 551 days; (5) bark *Rowland Hill* from February 27, 1886, to November 12, 1886, a drift of 2,820 miles and 258 days; and (6) schooner *Ida Francis* from

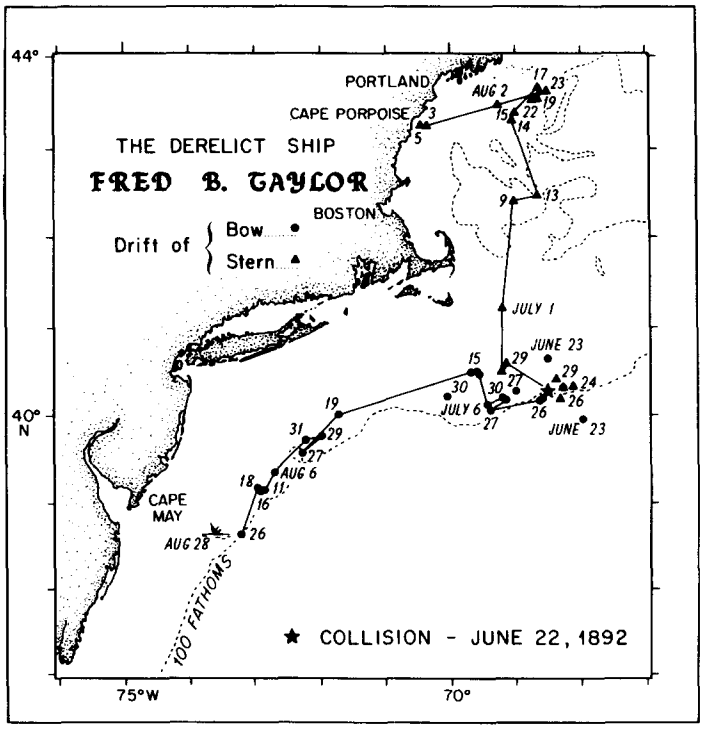

FIG. 6. Drift of the bow and stern of the *Fred B. Taylor*. On June 22, 1892, the *Trane* collided with the *Taylor* and the latter was cut in two. The forward and after parts separated and drifted in entirely different directions, due, perhaps, to the different areas then presented to winds and ocean currents (from Pilot Chart, September 1892). The bow went 340 miles during 93 days and was reported 47 times. The stern went in another direction 350 miles during 47 days and was reported 20 times.

6. SUPERIMPOSED TRAJECTORIES

Figure 7 is a summary diagram that shows 200 derelict trajectories reported in the Pilot Charts from 1883–1902.* Derelict vessels that first appeared near the United States coast south of Long Island and north of Hatteras usually drifted southward following the inshore current until they reached Hatteras. There they entered the Gulf Stream and drifted eastward. In general, derelicts entered the Gulf Stream north of 30°N, and moved eastward in the Stream. When they reached the area south of the Grand Banks, near 40°N, 50°W, they split into two bands. The first band reaches northeastward and then eastward, passing north of the Azores between 40–50°N. The second extends southeastward and then westward near 25°N. Six derelicts moved southward between the Azore Islands and Spain and Portugal. The general pattern indicated by the collected trajectories is of a large clockwise gyre split into two branches, one branch located north and the other southwest of the Azores. The splitting of the Gulf Stream near the Grand Banks has been confirmed by more recent measurements (MANN,

*Earlier but less complete charts showing trajectories of derelicts have been given: (1) in the supplements of Feburary 1889 and 1893 to the Pilot Charts, (2) by HYDROGRAPHIC OFFICE (1894), and (3) by HAUTREUX (1897).

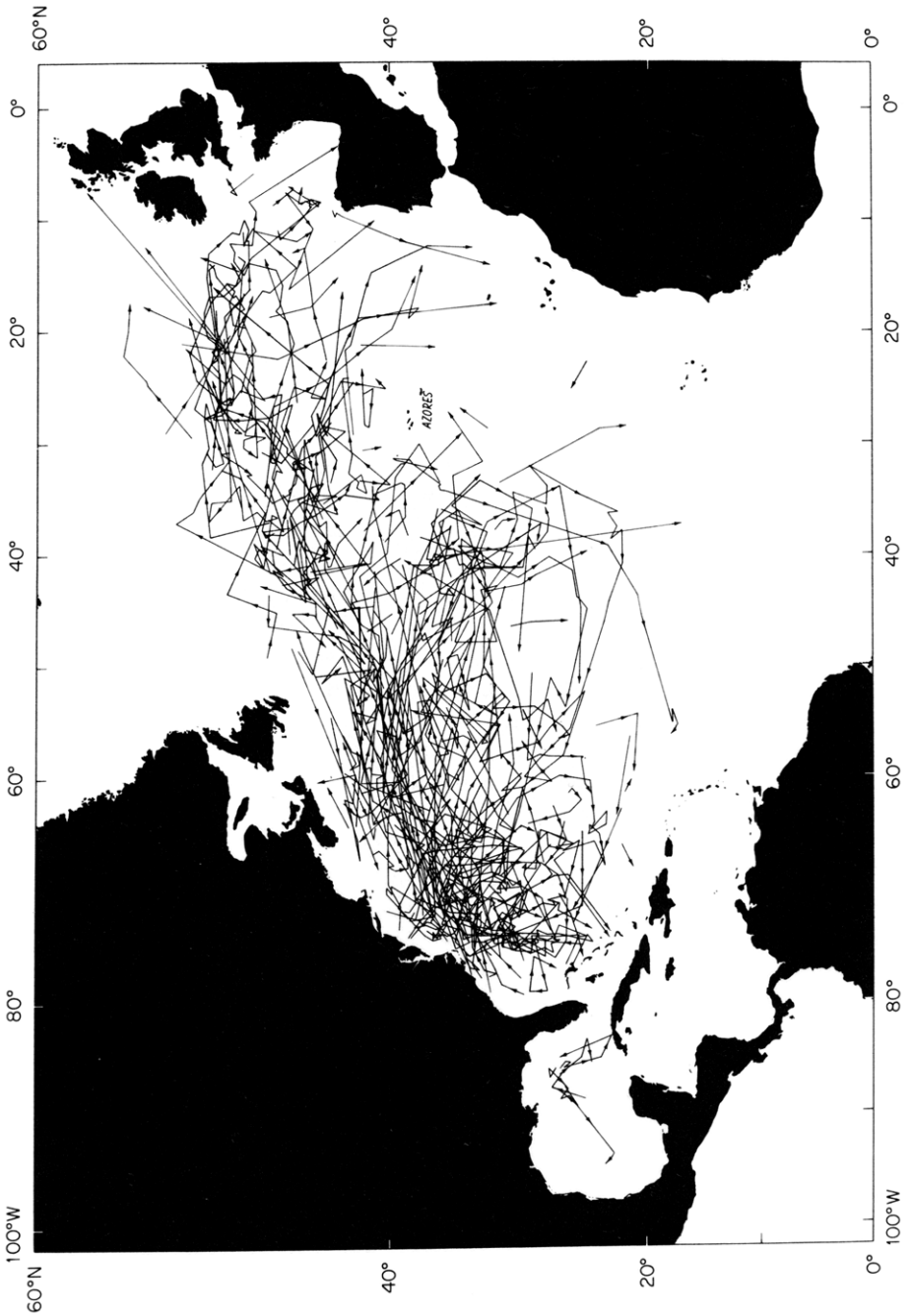

FIG. 7. Superposition of drifting derelict trajectories plus a few drifting buoys during 1883–1902, as given by the monthly Pilot Charts. A few derelict trajectories close to the U.S. East Coast were omitted for clarity. The general pattern shows the large scale ocean circulation. Convolutions of trajectories and those that cross each other show the time variability of ocean currents.

1967; CLARKE, HILL, REINIGER and WARREN, 1980), but it is still controversial (WORTHINGTON, 1976).

Superimposed on the large-scale, long-term general circulation pattern can be seen considerable current variability. The derelicts did not often smoothly follow the large-scale gyre; instead they drifted in convoluted trajectories that often crossed each other. The convoluted paths give an early Lagrangian measure of mesoscale eddies and longer period current fluctuations. We now know that the ocean is populated by energetic eddies that are usually much stronger than the mean currents (SCHMITZ, HOLLAND and PRICE, 1983; ROBINSON, 1983). The importance of these eddies to the general circulation has been recognized recently, and they have been studied intensively. Because of these eddies, the mean circulation becomes recognizable only by averaging a great quantity of observations in space and time, as can be done by eye in the summary trajectory figure. In the Gulf Stream, the North Atlantic Current, and the North Equatorial Current, one clearly sees the general drift in spite of the eddies. In the Sargasso Sea, the trajectories are dominated by mesoscale eddy motion.

One should be cautious about interpreting all the motion indicated by trajectories as being due to water movement. Derelict ships varied in size, weight, and state of damage when abandoned. Some were total dismasted and filled to the gunwales with water. These, along with the 30% of the sightings that were of vessels turned bottom up, probably provided a good indication of the speed and trajectory of near-surface water. Derelicts with masts standing and those riding high in the water were no doubt influenced by the winds blowing directly on the masts and exposed hull.

Additional problems are position errors of the reporting ship, misidentification of derelicts, and infrequent sightings. With the available information, it is difficult to evaluate the accuracy of details of trajectories. The average number of days between sightings was about 20 – sufficiently small that we can see some aspects of mesoscale eddies but seldom small enough to resolve individual loops. Nevertheless, the collection of the trajectories represents a realistic view of the general Lagrangian circulation and of current variability.

The other chief source of 19th century information concerning surface currents was the set and drift of ships underway. These measurements began to be made in the late 18th century, after the introduction of chronometers had sufficiently improved man's ability to determine longitude at sea. The first good charts and description of ship drift velocities in the North Atlantic was published in 1832 by Rennell. On these charts, the individual velocity vectors often disagree with adjacent vectors. This is due to the time variability of currents plus windage and navigational errors. Only by averaging large quantities of these data could the mean currents be reasonably estimated. A second good chart and synthesis of a larger collection of ship drift velocities was published in 1868 at the British Admiralty (ROYAL NAVY HYDROGRAPHIC DEPARTMENT, 1868). As these larger data sets were accumulated the huge numbers of observations became troublesome to handle quantitatively. Therefore, most early summary charts of ship drift observations, such as shown on the Pilot Charts, were schematic and presented qualitative results. Only recently, with the advent of high speed computers, have people published quantitative and statistical analyses of the ship drift data (WYRTKI, MAGAARD and HAGER, 1976; HAGER, 1978).

Because of the strong ocean variability (and errors and winds), ship drift velocities individually or in averaged form do not provide a good measure of where the water actually goes. This key bit of information was provided by drifting derelicts, which followed the water and gave an integrated measure of the surface currents. In this way the derelict trajectories strongly complemented measurements of ship drift velocity. Taken together, the

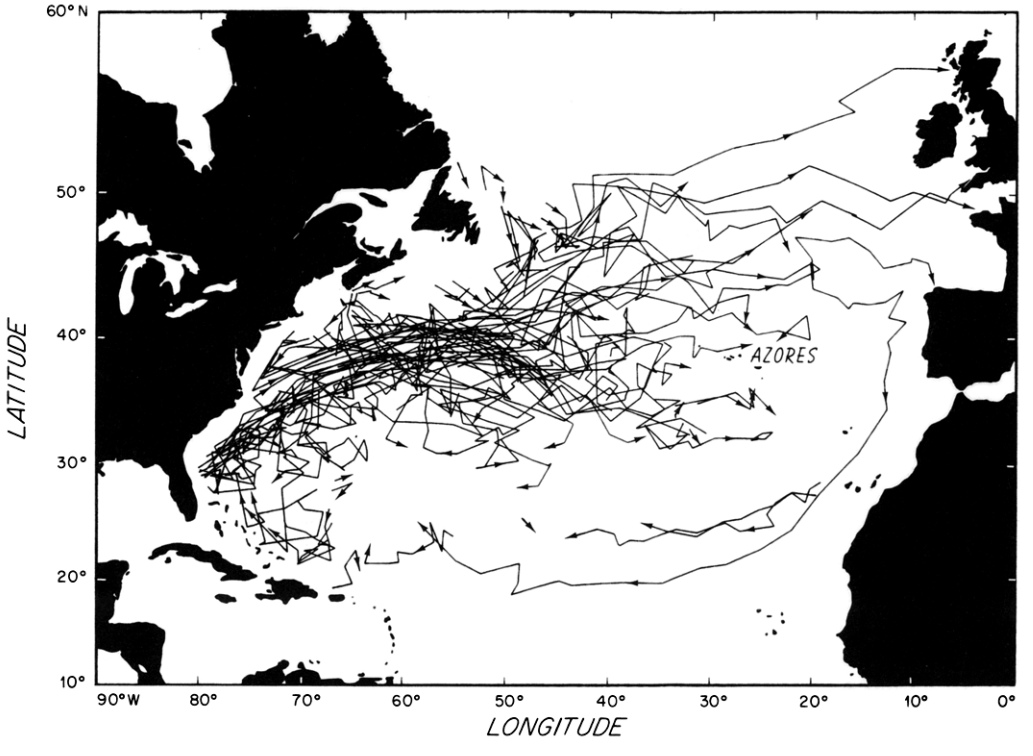

FIG. 8. Superposition of 110 freely-drifting satellite-tracked buoys from 1971–81. Positions were subsampled at 20 day intervals.

trajectories and ship drift velocities contributed a large part of our knowledge of the near-surface ocean circulation.

Within the last decade, freely drifting buoys remotely tracked by satellite have begun to be used in large numbers to measure velocities and trajectories of near-surface currents. Although known trajectories of derelicts as yet outnumber those of buoys, the newer measurements have the advantage of several fixes per day and a higher positional accuracy. From a collection of these measurements, we have been able to obtain a more quantitative picture of aspects of the general circulation and of the geography of ocean variability (RICHARDSON, 1983). A summary figure of the buoy trajectories (Fig. 8) shows general patterns very similar to those of the derelict trajectories.

7. DECLINE OF DERELICTS

The number of drifting derelicts diminished rapidly at the end of the 19th century. Relatively few derelict trajectories are found in the Pilot Charts after 1900. This decline is due to two main factors. The first is the gradual decline of sail and the rise of iron, steel and steam. The second is the successful search for and destruction of derelicts by Revenue Cutters and Naval Vessels.

The decline of British sail tonnage is shown in Fig. 9; by 1880, steam tonnage superceded sailing tonnage which was decreasing at an ever increasing rate (MOYSE-BARTLETT, 1946).

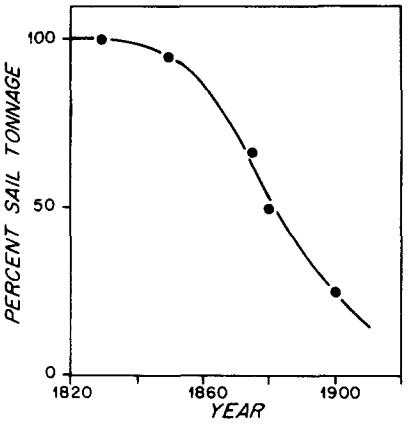

FIG. 9. The decline in time of the percentage tonnage carried by British sailing vessels. By 1880 steam tonnage superceded sailing tonnage, which was declining at an ever increasing rate (estimates from MOYSE-BARTLETT, 1946). In 1880, the carrying power of Great Britain was about 18×10^6 tons and of the United States 9×10^6 tons (HAYDEN, 1888).

By 1880, clipper ships could no longer compete with steamships as a means of fast transport and were being replaced as they went out of commission. By 1900, the steamship had practically ousted the full-rigged sailing ship from every important trade route on the seas. The triumph of the steamship was a result of the introduction of iron hulls and then steel hulls, the development of the screw propeller, and finally the triple expansion engine, which came rapidly into use after 1880. These developments resulted in stronger ships with more predictable speeds. The newer ships were abandoned less often and those that were abandoned tended to sink, not remain afloat as derelicts.

The transition from sail to steam was more gradual in America than in Britain. It was not until 1894 that American steam tonnage surpassed sail in the coasting trade. The coasting sail tonnage continued to grow until 1907 when it reached its absolute peak and when sail represented 39 percent of the total coasting tonnage (PARKER, 1948). By far the major part of this fleet of coastwise sailing was made up of wooden vessels.

All but six of the twenty-one derelicts that were tracked over 200 days were coasting schooners (Table 2); nine of these had been built in Maine shipyards, four in Bath, Maine. Most of these schooners were laden with hard pine from Georgia for ports north of Cape Hatteras (PARKER, 1972). The hard pine was used for frames of brick face factories, houses, bridges, railroad trestles, planking and ceiling in new schooners, and railroad ties. Schooners continued to dominate this trade until the timber resources were depleted during World War I.

A study of the casualty pages of the New York Marine Register shows that a great many of these vessels continued to be abandoned waterlogged after 1900 (PARKER, *pers. commun.*). The reason these vessels did not continue to appear as derelicts on the Pilot Charts after 1900 in such large numbers as before was a more vigorous and systematic program of derelict destruction by Revenue Cutters and also by Naval Vessels. The advent of wireless communication made the problem of locating a derelict at sea much easier. Positions of derelicts were sent by radio to the Cutters so the derelicts could be quickly found and destroyed. Before this method of communication at sea, derelict hunting was at best a haphazard occupation. In 1907, a new Revenue Cutter, the *Seneca*, was built expressly for finding derelicts and destroying them, or if salvageable, towing them to port.

Derelict sightings and trajectories have been viewed here as giving interesting information about ocean currents. We should not forget that this information came with a tragic loss of life and shipping. Toward the end of the 19th century, 12,000 lives and 2,200 vessels were lost at sea each year worldwide (supplement to February 1893 Pilot Chart). Each severe storm encountered at sea left new derelicts in its path and added new names to the long list of vessels and men who left port but were never heard of again. The plots of derelict sightings are a sad reminder of lost vessels, suffering and death.

8. SUMMARY

Pilot Charts, published monthly during the last two decades of the 19th century, reveal a rare, interesting, and tragic glimpse of maritime history by detailing observations of drifting derelict ships. The large collection of derelict sightings was made possible by the extensive and rapid reporting system established by the U.S. Navy Hydrographic Office. Numerous voluntary observers reported dangers to navigation which were quickly incorporated into the next month's chart. By 1900, the number of derelict trajectories declined. This is partly due to the decline of wooden sailing ships and partly due to the increased efficiency in finding and destroying derelicts at sea.

Drifting derelicts gave some first examples of ocean trajectories. They showed the general pattern of circulation in the North Atlantic Ocean, including the bifurcation of the Gulf Stream near the Grand Banks of Newfoundland. The trajectories gave an early indication of current variability. Coupled with set and drift measurements from ships underway, these derelict trajectories provided much of the early knowledge of near-surface ocean currents.

Acknowledgements – A. Green kindly made available the Defense Mapping Agency's collection of Pilot Charts, 1883–1902. Capt. W. J. Lewis Parker critically read an earlier version of the manuscript and generously provided helpful information on the history of schooners. Funds were provided by the National Science Foundation under Grant OCE81-09145. This is contribution number 5385 from the Woods Hole Oceanographic Institution.

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APPENDIX 1: SOME HISTORICAL BACKGROUND INFORMATION CONCERNING DERELICTS FROM THE PILOT CHARTS

A1.1. *Notable derelicts in the North Atlantic (from Pilot Chart, July 1889)*

Of the many wrecks afloat this month in the North Atlantic Ocean, none has as interesting a history as the Italian bark *Vincenzo Perrotta*. Abandoned September 18, 1887, this vessel has been represented graphically on every edition of the Pilot Chart published since that time. Her wonderful drift began in about latitude 36°N, longitude 54°W; and on April 4, 1889, when last reported, she was about 60 miles north of Watling's island, in the Bahamas. She has thus made good a distance of about 1,400 miles in a general SW by W direction, in 1 year, 6 months and 16 days. She has been reported 27 times in all, and when last seen had mizzenmast and about 10 ft of mainmast standing, foremast gone, end of jibboom broken off and port anchor on bow.

On November 26, 1888, the schooner *Ethel M. Davis* was capsized in a hurricane, in latitude 35°04′N, longitude 70°52′W. Her crew was rescued, after having been adrift 4 days. The schooner eventually righted, and began a long voyage, unguided, in the general direction of the Gulf Stream. She was last seen June 8, 1889, in latitude 42°36′N, longitude 57°38′W, and at that time had about 3 feet freeboard in waist, forecastle and poop well above water. Her poop-house is painted white, and shows out well. Mainmast gone, bowsprit and 10 feet of foremast standing. General drift about 900 miles NE, by E; time, 6 months, 18 days; number of times reported, 15.

The same hurricane that wrecked the *Ethel M. Davis* also brought disaster to the schooner *David W. Hunt*. This vessel was abandoned November 25, 1888, in latitude 34°30′N, longitude 72°30′W; she was last reported May 26, 1889, in latitude 45°30′N, longitude 41°30′W, at which time she had her bowsprit and jibboom complete, stumps of two masts broken off about 15 feet from deck. General drift, ENE, about 2,000 miles; time, 6 months; number of times reported, 22.

A1.2. *The August cyclones (from Pilot Chart, October 1893)*

Since the publication of the September Pilot Chart a great number of reports received from vessels that encountered the terrible tropical cyclones that raged in August verify the extreme violence of each of these storms. The numerous derelicts left in their paths, the many reports of disasters to shipping, and the large loss of life will mark the month of August, 1893, as one long to be remembered.

On Aug. 12 a cyclone originated about lat. 12°N, lon. 30°W, moved slightly to the north of west, and on the night of Aug. 15 passed over the southern end of Guadeloupe. The rainfall at

Roseau, Dominica, Aug. 15–16, was 6.14 ins. From Guadeloupe the center moved NW'ly about 250 miles per day till Aug. 20, when, at 5 p.m. (G.M.T.) of that day, lat. 30°N, lon. 76°W, it curved to the N'd and E'd. Several vessels were in the vicinity of the center at this time and all had a terrible experience. The wind blew with hurricane force, torrents of rain fell, heavy thunder and lightning, and a tremendous sea was running. Barometer 28.30 ins. On Aug. 21 the storm passed up the coast in a N NE'ly direction with rapidly increasing velocity. A great number of vessels felt the full effects of its fury on this day, and, almost without exception, the vessels within 120 miles of the center recorded the force of winds as 11 or 12. A curious feature of this cyclone was that after following the usual parabolic trajectory from the tropics to lat. 53°N, lon. 46°W, where it was central Aug. 23, it curved sharply to the SSE, recrossed the transatlantic steamer routes near the 40th meridian and then lost its energy.

On Aug 16 the British bark *Ancyra*, in lat. 14°N, lon. 42°W, encountered a cyclone of great violence. During the afternoon of that day and on the morning of the 17th the wind shifted from ENE. through SE. (force 12) and South to SW. During the night there were fierce squalls of rain, the wind blowing with hurricane force. At midnight the wind died out till it was nearly calm, but at 2 a.m. it came out again from South and blew with force 11. This cyclone crossed the 60th meridian near lat. 21°N, during the night of Aug. 20, and was central at noon (G.M.T.) of that day about lat. 23°N, lon. 64°W. The Br. S.S. *Carib Prince* was just south of center at that time, wind west, force 12, barometer 28.60 ins. The vessel was lying heavily over and the atmosphere was thick with driving rain and spray. Oil was used from the port water closets and bathrooms, and oil bags were put over and kept supplied, which had a very marked effect in preventing the heaving seas from breaking on board. (Castor oil was used throughout.)

On Aug. 23 the storm curved to the NNW, and at noon (G.M.T.) of that day was central about 200 miles SE from Hatteras. During the night of the 23rd several vessels between the 70th meridian and the coast reported the wind as blowing with full hurricane force; barometer 28.84. On the morning of Aug. 24 the storm center passed over New York City. Considerable damage was done to shipping in this vicinity and many lives were lost. The storm lost its energy very rapidly after striking the coast, and by Aug. 25 had disappeared down the St. Lawrence valley.

On the 26th a cyclone was about 100 miles NE from Nassau, N.P., and during the night of the 27th struck the coast between Savannah, Ga., and Beaufort, S.C. At midnight at Savannah the wind was blowing with force 10, barometer 28.29 ins. The violence of the storm and the rise of the waters caused great damage to shipping and also a frightful loss of life among the inhabitants of the low-lying islands along the coasts of South Carolina and Georgia. The loss of life is estimated at about 1,200, although the exact number will never be known. The greatest damage was done in the vicinity of Beaufort. After passing inland a short distance the storm curved to the NNE in the direction of the mouth of the St. Lawrence, where it disappeared Aug. 30.

A1.3. *Vessels totally lost in collision with derelicts* (from HYDROGRAPHIC OFFICE, 1894)

(1) June 13, 1887. Schooner *Joseph Baymore* struck a derelict off the coast of North Carolina, became water-logged, and was abandoned.

(2) June 8, 1889. Spanish gunboat *Paz* struck a derelict off Tarifa and was sunk.

(3) March 18, 1890. Schooner *Francis L. Godfrey* struck a derelict off Fenwick Island, stove in her bow, and filled.

(4) December 22, 1891. Schooner *Orrie V. Drisko* struck a derelict in the Gulf of Mexico and was wrecked on the coast of Florida.

(5) Feburary 24, 1892. Bark *Jan Pieterszoon-koen* struck an unknown object, filled, and was abandoned in latitude 24°10′N, longitude 69°28′W.

(6) May 20, 1893. Steamship *Crayside* struck a derelict off Whitehead, Nova Scotia, and was sunk.

A1.4. *Dangerous derelicts towed in (from Pilot Chart, April 1893)*

The Br.S.S. *Exeter City*, Capt. Weiss, which towed into New York, March 10, the derelict 4-masted schooner *Agnes Manning* removed from the principal highway of commerce a most dangerous obstruction. The *Agnes Manning* was abandoned about 60 miles east from George's Shoal, Feb. 24, her crew being taken off by the Br.S.S. *Nestorian*, Capt. Hughes. Drifting southeast the schooner soon reached the vicinity of the transatlantic steamship routes, and on March 1st was reported on the track of the west-bound vessels. From then till the time she was taken in tow by the *Exeter City*, lat. 40°31′N, long. 64°42′W, she was reported each day by transatlantic steamers. Fortunately no fog prevailed during this interval in this region, but no doubt many vessels passed close to her during darkness. When abandoned the *Manning* had her decks awash, masts standing, and a cargo of 1,575 tons of coal. Had this vessel continued to float about in the direct path of transatlantic vessels bound to and from New York, she would have been a constant menace to navigation. Fortunately her career was a short one.

A1.5. *A derelict destroyed (from HYDROGRAPHIC OFFICE, 1893)*

October 22, 1893, the abandoned American three-masted schooner *Drisko*, of 248 tons, lumber laden and waterlogged, was sighted by the U.S.S. *San Francisco*. It having been found impossible to tow the derelict (the next morning) three 34-pound gun-cotton torpedoes were attached to her keel and exploded, doing great damage but leaving her still afloat. Five more torpedoes were exploded under her keel, which broke her back and frames.

The *San Francisco* then rammed the *Drisko* violently amidships. The blow broke her in two parts, released her cargo, and she commenced to sink. As it was getting dark and the derelict sinking, the *San Francisco* fired a few shells into her stern, scattering her fragments, and resumed her course to Key West.

A1.6. *A few reports of the W. L. White (from Pilot Chart, February 1889)*

March 13. – Schooner *W. L. White*, lumber-laden, was abandoned, water-logger, about 80 miles ESE from Absecon light. All masts standing, two reefs in mainsail, American flag (union down) in mizzen cross-trees, burgee about half way up mizzen rigging. Wind NNW, very heavy for 24 hr before and after abandoning the vessel. – Mr. George Phillips, Second Officer, schooner *W. L. White*.

March 19. – In latitude 37°N, longitude 73°37′W, saw schooner with signals of distress flying. Passed close to her and found her to be the *W. L. White*, of Rockland, lumber-laden, water-logged and abandoned. All spars standing, two reefs in mainsail, flag (union down) in rigging. Wind at time, N, moderate; March 19, wind NW, gale; March 20, wind S, light. – Capt. Graham, Am. b'k *Glad Tidings*.

March 31. – In latitude 40°04′N, longitude 61°W, saw a three-masted schooner, painted

green; foremast gone by deck, parts of main and mizzen masts standing; *W. L. White* on quarter. Derelict flush with water, sea going right over her. Foremast hanging over the sides, and part of mizzen trysail over the quarter. Apparently not long in the water. – Captain Garvie, British steamship *California*.

April 17. – In latitude 39°39′N, longitude 51°11′W, passed close to a bark, abandoned and water-logged, about 800 tons; foremast gone at deck, main and mizzen masts standing; painted black; apparently flush deck. No signs of cargo working out nor spars alongside. Very dangerous, as she shows very little above water, except spars. – Captain Hale, American bark *Sarah*.

August 28. – In latitude 47°56′N, longitude 36°45′W, passed the derelict *W. L. White*. The foremast, bowsprit, and deck were gone; lower parts of main and mizzen masts standing; hull covered to water line with grass and barnacles. – Captain Walker, British steamship *Cephalonia*.