BRITISH LOGBOOKS IN UK ARCHIVES
20th Century
A survey of the range, selection and suitability of British logbooks and related documents for climatic research

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Any revisions, corrections or new material added to future releases of this report will be in blue print

Contents

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Introduction

This report discusses the range, availability and suitability of 20th century ships' logbooks in British archives to yield high resolution, instrumental climatic data. The temporal range of the report is presently from 1900 to just after the end of the Second World War (a separate report, Wilkinson 2009, discusses earlier UK logbooks). The decades following the Second World War will be the subject of later report revisions. However (as discussed e.g. in Woodruff et al. 1998) logbook data (or meteorological forms) have been exchanged internationally, and regularly under the World Meteorological Organization's (WMO) Voluntary Observing Ship (VOS) Programme since about 1963 (in addition to telecommunicated data). This exchange probably applies primarily to merchant shipping as opposed to UK Royal Navy data. As well as the range and availability of the logbooks in the first half of the 20th century, the report will also discuss the types of data recorded, and indicate sources of information on changes in observational and recording practise during the period.

1. Scope, Range and Organization of the Collections

In the United Kingdom, the two chief repositories of 20th century ships' logbooks are the National Archives (TNA) and the National Meteorological Archive (NMA). Each archive holds a distinct group of logbooks. The National Archives hold the Royal Navy ships' logbooks or deck logs kept by the officer of the watch. In addition, a significant number of 20th century meteorological registers are to be found in the National Meteorological Archive(NMA). The NMA is part of the National Meteorological Archive and Library of the Met Office. The Library is located at the Met Office itself, while the Archive is housed a short distance away at the Devon Record Office (DRO)

The National Archives (http://www.nationalarchives.gov.uk/)

The National Archives are located at Kew in southwest London. Best access is by tube from central London via the District Line. The National Archives are the chief repository of papers and documents generated by the activities of the British state from medieval times to the present. The collection of ships' logbooks is in original manuscript form. They form a continuation of the series ADM 53, stretching back to 1799. In addition to these there are submarine logbooks in series ADM 173 from 1915 onwards

National Meteorological Archive (http://www.metoffice.gov.uk/corporate/library)

The National Meteorological Archive is located within the Devon Record Office on the outskirts of Exeter and within easy walking distance of the Met Office. Access is by bus from Exeter city centre or Exeter St. David's railway station, which provides regular services to London Paddington. The meteorological logs covering the 20th century are a continuation of the extensive collection beginning in 1854. The earlier documents are usually described as meteorological registers and sometimes weather books. They are different in format but record the same data. At the present time (2009) the met registers/logs have not been subject to a detailed inventory and these differences in format, and the nomenclature used, require further investigation (see Wilkinson 2009, section 9.3). Unlike ships' logbooks the meteorological logs do not record detailed navigational data or shipboard events. They record the ship's position and detailed tabulated meteorological data, and in some cases extensive metadata (e.g., instrumental characteristics). There are a handful of Royal Navy logbooks covering the period of WWI. For the period 1936 to 1948 there are 812 meteorological logbooks (Rhodes, 1994). Vessels kept meteorological logs whenever a meteorological officer was part of the crew establishment, for example on board aircraft carriers and flagships (see section 10 below) as well as dedicated weather ships. The meteorological logs are only available for these vessels.

Temporal and Geographic range

The Royal Navy logbooks held in the National Archive ADM 53 and ADM 173 series run through to 1976. Logbooks are subject to a thirty-year exclusion rule and thus at this writing, those prepared since 1976 remain confidential. There are an estimated 135,000 covering the 20th century. The geographic range of the logbooks is global. The North Atlantic, West Indies and Mediterranean are particularly well represented but the Royal Navy was also active in the South Atlantic and Indian Oceans, including the Red Sea, Bay of Bengal the Arabian Sea and Persian Gulf. Coverage of these areas is good though less dense than the North Atlantic particularly in times of peace. The Pacific Ocean is the least well represented. Parts of the western Pacific are covered by the Far Eastern fleet whose ships were based in Indonesia, China and Australia. Vessels operating from Vancouver, Valparaiso and Callao represent the eastern Pacific in the early part of the century. The NMA meteorological logs reflect the same geographic coverage as the TNA logbooks.

2. National Archives, ADM 53 Ships' Logbooks - Organization

2.1 Organization, binding and condition 1900-1938

The Royal Navy ships' logbooks form a subdivision of the Admiralty records (ADM). These Admiralty documents consist of the administrative and operational records of the Royal Navy from the 17th century to the recent past. The logbooks are organized into the groups ADM 50 to ADM 55 inclusive. Only ADM 53, the ship's logbooks, cover the 20th century.

The ADM 53 ships' logbooks are distinct from captains' and masters' journals (ADM 51 & 52) and were kept by the officer of the watch. They run from 1799 to 1976 (current public availability). There are 180,548 separate logbooks of which approximately 113,000 are for the 20th century. It should be clearly noted however that this large quantity for the 20th century is not directly comparable with the number of ADM 53 logbooks available for 19th century. The earlier logbooks cover at least one year and sometimes much longer periods. By the 1920s, and frequently prior to that date, most logbooks were of one month's duration. They are found either as separate documents or sometimes several logbooks (for the same vessel) are bound together. The number of logbooks for 20th century surface vessels available prior to the World War II period is outlined in Table 1.

Date Range	Total Number of Logbooks	Notes
1902-1913	15,843	Figures include 3,450 torpedo boats generally used in coastal waters
1914-1919	37,280	Figures include 2,553 torpedo boats and 1,267 motor launches generally used in coastal waters.
1920-1938	37,502	

Table 1 ADM 53 Logbooks for surface ships 1902-1938

These logbooks (as separate bindings) vary in length from yearly to quarterly, bi-monthly or monthly. Their organization reflects this varied binding. For the first part of the century, the logbooks are organized under the name of the vessel irrespective of the period covered by the volume. For instance the five volumes of logbooks for HMS *Fox* (ADM 53/21057-61) cover the period May 1908 to November 1913, and the next two volumes, (ADM 53/42070-1) cover the period November 1913 to March 1915. From April 1915 onwards the logbooks are separate documents covering one month only (ADM 53/42072-104, April 1915-Nov 1917). For the WWII period the organization is again different, as is discussed in section 2.2 below. All of the logbooks appear to be in excellent condition.

2.2 Organization of WWII Logbooks 1939-1946

The WWII logbooks in the National Archive are arranged and catalogued first by year and then by the name of the ship, a different arrangement to the logs of earlier periods. This is because each logbook covers one month allowing runs of consecutive manuscript numbers under any one ship name. Thus in any given year, the monthly logbooks of each ship are numbered consecutively. The catalogue then goes to the next ship in the alphabetical sequence for that year. This arrangement means that within any given year, all of the logbooks for a particular ship are grouped together, thus making the ordering of the logbooks more efficient. It will be noted however that some of these sets of logbooks apparently commence and cease for no apparent reason even though the vessel remained in existence. This is because some vessels were transferred from one national navy to another. For instance, late in the war, several escort carriers built or fitted out at Tacoma and Seattle on the American Pacific coast were transferred to the British Royal Navy and were then returned to US authority at the conclusion of hostilities. Likewise several Royal Navy cruisers were transferred to the navies of Australia and New Zealand. In the latter case, the logbooks of these ships can be found in the state archives of those countries.

- National Archives of Australia –(http://www.naa.gov.au)
  See in particular the online document 'Series notes for series SP551/1'
- Archives of New Zealand – (http://archway.archives.govt.nz)

The numbers of ADM 53 Royal Navy logbooks available for the WWII period and the immediate post-war period are listed in Table 2.

Year	No. of Logbooks	Year	No. of Logbooks
1939	4,045	**1945**	1,760
1940	2,207	**1946**	1,122
1941	1,723	**1947**	787
1942	1,564	**1948**	897
1943	1,941	**1949**	2,070
1944	2,025	**1950**	2,027

Table 2. ADM 53 Logbooks of Surface Vessels 1939-1950

For the WWII period, the availability of logbooks after the first few months of 1940 is limited according to the type of vessel. This accounts for the substantial reduction in

the number of logbooks available after 1939. Before February 1940, logbooks for all types of naval vessels can be found in the National Archives, after this month, only the logbooks of major surface vessels and submarines were retained. As a rule the logbooks of destroyers, corvettes, frigates, minesweepers, minelayers, escort vessels and other smaller vessels were not archived. Nevertheless, a very few logbooks, for destroyers and torpedo boats can be found for the period after 1940 and it is always worthwhile to check the catalogue. General availability by type of vessel is presented in the Table 3.

Logbooks retained after Feb. 1940	**Logbooks not retained after Feb. 1940**
Aircraft Carriers	Destroyers*
Assault Carriers	Frigates
Escort Carriers	Corvettes
Light Fleet Carriers	Escort Vessels
Battleships	Minelayers
Cruisers	Minesweepers
Armed Merchant Cruisers	Patrol vessels
Submarines	Torpedo Boats*
Anti-Aircraft ships	River Patrol Vessels
Air Transport Vessels	Whalers (in RN service)
Survey Ships	Trawlers (in RN service)
Depot Ships	
Accommodation Ships	* A few were retained.

Table 3. General Availability of WWII Logbooks by vessel type

3. ADM 53 Surface Vessel Logbooks - Format and Contents

3.1 Front Cover

Each logbook, whether an individual item, or one of several bound into a volume, has a pre-printed paper cover and pre-printed pages. The cover gives the name of the vessel, the month and the year and is signed by either the captain or the navigating officer. The cover also provides the designation and history of the pre-printed logbook form. The logbook of HMS *Orcoma*, June 1917 (ADM 53/53587), for instance, carries the form designation S-321b. This logbook type was established in October 1884 and revised in October 1902 and September 1913. The logbook type was in use throughout WWI. The logbooks for the WWII period are very similar and have the designation S-321 (late S321b,) and revised in October 1938. Once sufficient 20th century logbooks have been imaged it will be possible to document these changes and revisions in detail, thus providing clear indications of when observational practice changed, for instance the introduction of time zones, the

change from magnetic to true courses and wind directions and the change to the Douglas Scale to indicate sea state. This is important because unlike any other form of documentation regarding these matters, the logbooks themselves reflect actual practice. Findings will appear in a future revision of this report.

The covers of the WWII period logbooks (S-321) provide additional information over the former S-321b documents. The type of vessel is described, for example 'Escort Carrier', and the tonnage is given. This is displacement tonnage and usually a round number rather than the precise figure given in reference books. The tonnage of armed merchant cruisers is gross tonnage. The difference between displacement and gross tonnage is discussed in more detail below (section 11.2.2). Engine horsepower is also stated along with a brief description of the main guns. Often the office of the commander in chief, or officer in charge, was stamped the front cover indicating the station the ship was assigned to, for example the South Atlantic fleet. This provides a useful check of the region covered by the logbook.

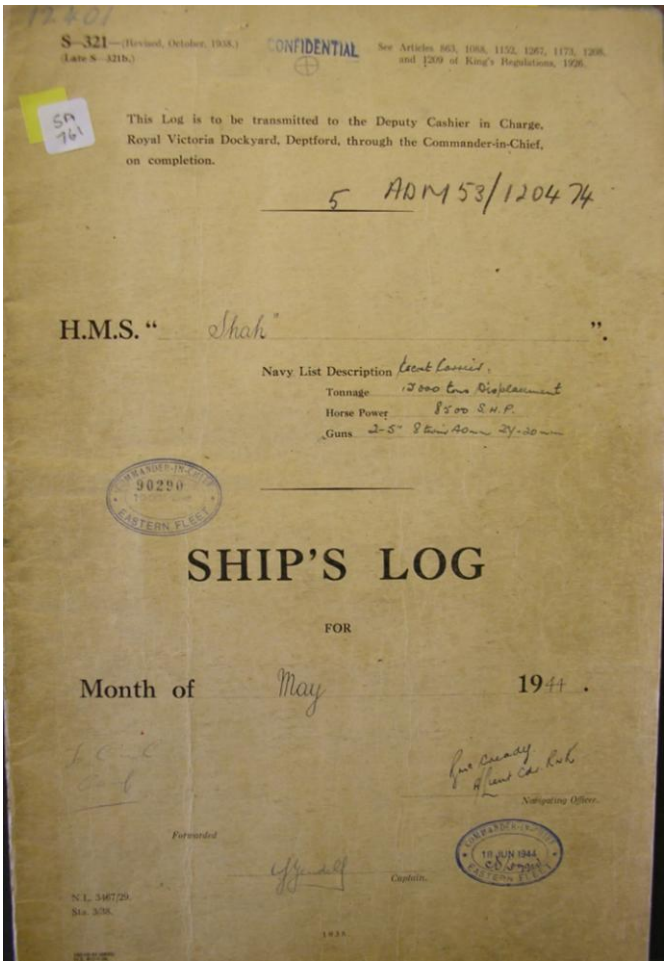
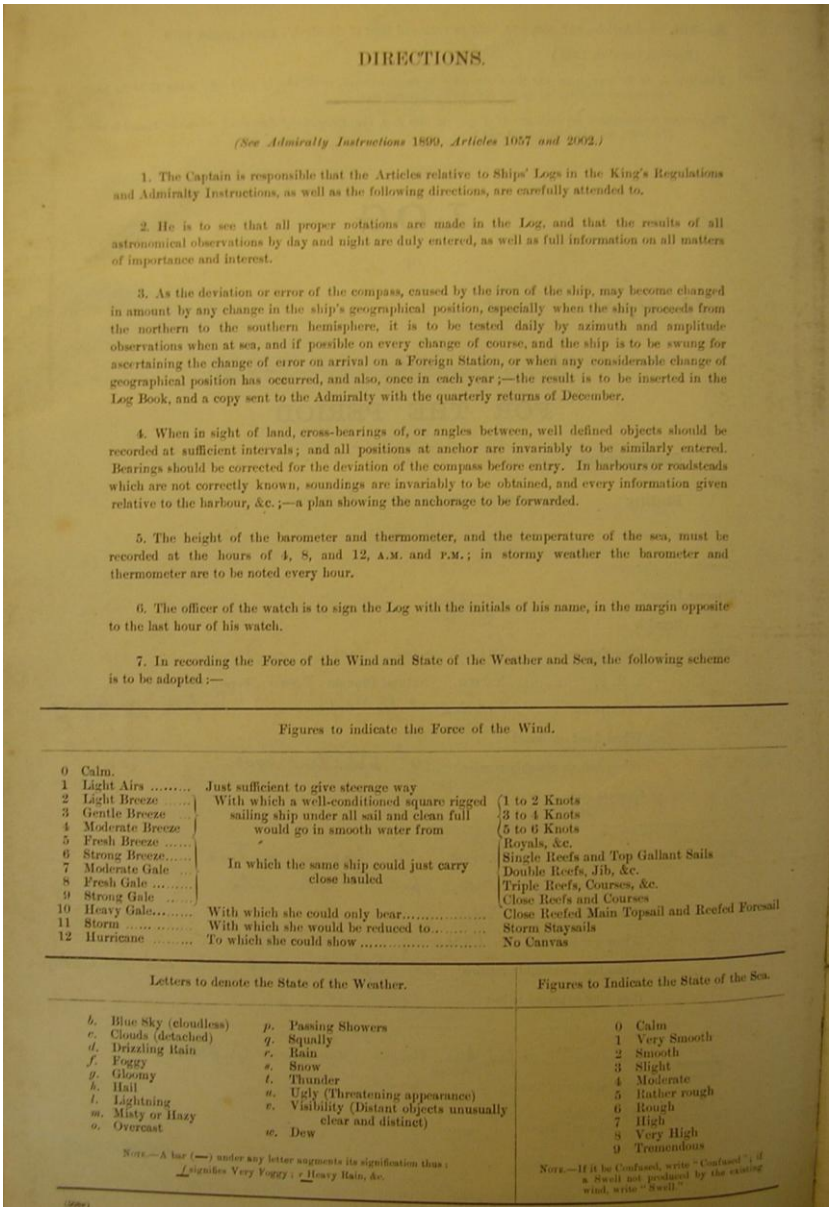


Fig. 1 Logbook Cover HMS *Shah*, May 1944 – ADM 53/120474

3.2 Inside Cover – Directions

Inside each logbook, before the pre-printed logbook pages, there is a set of instructions and a page for recording the detail of the meteorological instruments. *Note that these pages are absent from logbooks by the time of WWII.* The instructions detail the responsibilities of the commanding officer with regard to the keeping of the logbook. The directions also give an indication of the nature of the data recorded. The following image is from the directions printed in the logbook of HMS *Pyramus* in 1909.



DIRECTIONS.

(See Admiralty Instructions 1899, *Articles* 1057 *and* 2002.)

1. The Captain is responsible that the Articles relative to Ships' Logs in the King's Regulations and Admiralty Instructions, as well as the following directions, are carefully attended to.

2. He is to see that all proper notations are made in the Log, and that the results of all astronomical observations by day and night are duly entered, as well as full information on all matters of importance and interest.

3. As the deviation or error of the compass, caused by the iron of the ship, may become changed in amount by any change in the ship's geographical position, especially when the ship proceeds from the northern to the southern hemisphere, it is to be tested daily by azimuth and amplitude observations when at sea, and if possible on every change of course, and the ship is to be swung for ascertaining the change of error on arrival on a Foreign Station, or when any considerable change of geographical position has occurred, and also, once in each year;—the result is to be inserted in the Log Book, and a copy sent to the Admiralty with the quarterly returns of December.

4. When in sight of land, cross-bearings of, or angles between, well defined objects should be recorded at sufficient intervals; and all positions at anchor are invariably to be similarly entered. Bearings should be corrected for the deviation of the compass before entry. In harbours or roadsteads which are not correctly known, soundings are invariably to be obtained, and every information given relative to the harbour, &c.;—a plan showing the anchorage to be forwarded.

5. The height of the barometer and thermometer, and the temperature of the sea, must be recorded at the hours of 4, 8, and 12, A.M. and P.M.; in stormy weather the barometer and thermometer are to be noted every hour.

6. The officer of the watch is to sign the Log with the initials of his name, in the margin opposite to the last hour of his watch.

7. In recording the Force of the Wind and State of the Weather and Sea, the following scheme is to be adopted:—

Figures to indicate the Force of the Wind.

0	Calm.		
1	Light Airs	Just sufficient to give steerage way	
2	Light Breeze	With which a well-conditioned square rigged sailing ship under all sail and clean full would go in smooth water from	1 to 2 Knots
3	Gentle Breeze		3 to 4 Knots
4	Moderate Breeze		5 to 6 Knots
5	Fresh Breeze	In which the same ship could just carry close hauled	Royals, &c.
6	Strong Breeze.....		Single Reefs and Top Gallant Sails
7	Moderate Gale		Double Reefs, Jib, &c.
8	Fresh Gale		Triple Reefs, Courses, &c.
9	Strong Gale		Close Reefs and Courses
10	Heavy Gale.....	With which she could only bear.....	Close Reefed Main Topsail and Reefed Foresail
11	Storm	With which she would be reduced to.....	Storm Staysails
12	Hurricane	To which she could show	No Canvas

Letters to denote the State of the Weather.				Figures to Indicate the State of the Sea.
b.	Blue Sky (cloudless)	*p.*	Passing Showers	0 Calm
c.	Clouds (detached)	*q.*	Squally	1 Very Smooth
d.	Drizzling Rain	*r.*	Rain	2 Smooth
f.	Foggy	*s.*	Snow	3 Slight
g.	Gloomy	*t.*	Thunder	4 Moderate
h.	Hail	*u.*	Ugly (Threatening appearance)	5 Rather rough
l.	Lightning	*v.*	Visibility (Distant objects unusually clear and distinct)	6 Rough
m.	Misty or Hazy			7 High
o.	Overcast	*w.*	Dew	8 Very High
				9 Tremendous

Note.—A bar (—) under any letter augments its signification thus: *f* signifies Very Foggy; *r* Heavy Rain, &c.

Note.—If it be Confused, write "Confused"; if a Swell not produced by the existing wind, write "Swell."

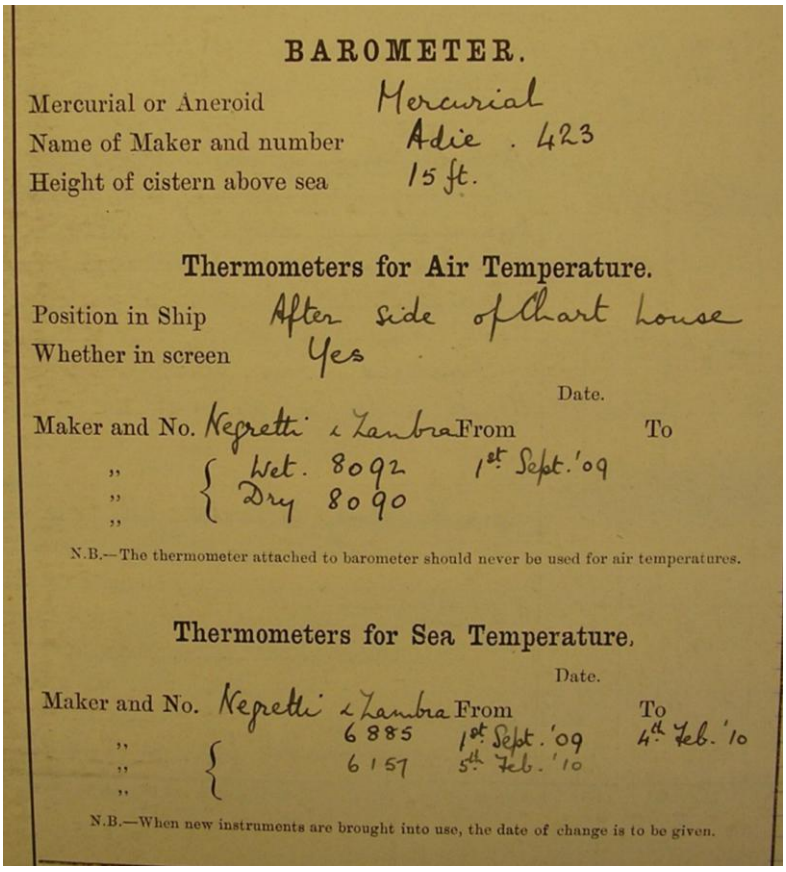
Fig.2 Directions for Completing the Log HMS Pyramus 1909, ADM 53/25053
Note. If viewing an electronic copy, the directions can be read clearly by enlarging the page.

Summary of Directions (italics are the author's)

- The deviation of the compass is checked by daily azimuth and amplitude observations while at sea and recorded in the logbook.
- Bearings to landmarks or objects are corrected for compass deviation. *(This does not indicate that courses or wind directions were true instead of magnetic. The compass was being corrected for local deviation*)
- Barometric pressure, air temperature and sea temperature are recorded at four hourly intervals at 4, 8 and 12, both am and pm. During stormy weather, pressure and air temperature are to be recorded hourly.
- Wind force is recorded according to the Beaufort Scale
- A scheme of letters, the Beaufort weather scale, is used to describe the weather conditions
- Sea state is described according to a scale 0-9, with 0 as calm and 9 as tremendous.

3.3 Inside Cover - Instruments

Following the directions, a page gives details of the type and the placement of the instruments carried. Again the example is from the *Pyramus* in 1909.



BAROMETER.

Mercurial or Aneroid — Mercurial
Name of Maker and number — Adie . 423
Height of cistern above sea — 15 ft.

Thermometers for Air Temperature.

Position in Ship — After side of Chart House
Whether in screen — Yes

	Maker and No.	From (Date.)	To
Maker and No.	Negretti & Zambra	From	To
,,	Wet. 8092	1st Sept.'09	
,,	Dry 8090		
,,			

N.B.—The thermometer attached to barometer should never be used for air temperatures.

Thermometers for Sea Temperature.

	Maker and No.	From (Date.)	To
Maker and No.	Negretti & Zambra	From	To
,,	6885	1st Sept.'09	4th Feb.'10
,,	6157	5th Feb.'10	
,,			

N.B.—When new instruments are brought into use, the date of change is to be given.

Fig. 3 Detail of page listing instruments HMS Pyramus 1909, ADM 53/25053

In an example from the year 1921, (HMS *Constance*) the error of the mercurial barometer was also given.

3.4 The Logbook Page
3.4.1 Format and Content 1900-c.1920s

Each page of the logbook represents a single day and is divided into twenty-four hours. In the middle of the page is a section dividing the morning and afternoon parts of the day and giving the noon position, course and distance run in the past 24 hours with bearings to landmarks. There are only minor differences between this and late 19th century logbooks. In the example below, the main observations recorded were:

1. Latitude and longitude by observation and dead reckoning
2. The hour of the day
3. Distance run in knots and tenths
4. Standard compass course (magnetic and recorded as a quadrant such as S64E)
5. Compass deviation
6. Patent log (running total of distance covered)
7. Wind direction and force
8. Weather
9. Sea state (scale 0-9)
10. Barometric pressure with attached thermometer reading
11. Temperature of air, wet bulb and sea
12. Observation of the current in the last 24 hours.

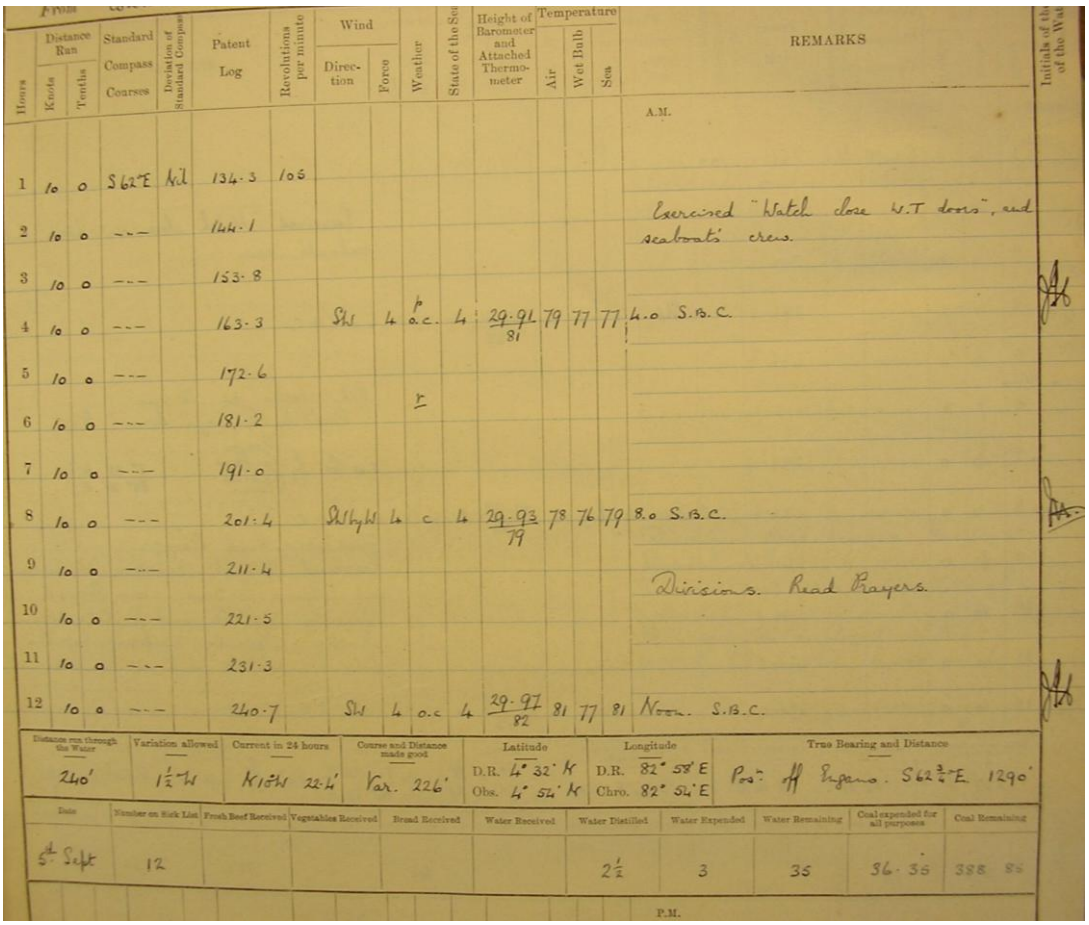


Fig. 4 Top Half of Logbook Page HMS Pyramus 1909, ADM 53/25053

Note. If viewing an electronic copy, the logbook can be read clearly by enlarging the page.

By the time of the First World War (1914-18), the logbook included a space to record the ships position at 8am and 8pm. A box was located in the top right corner of the page but not always filled in. The column for the patent log (running total of distance) was moved next to the column containing the hour of the day. (see HMS *Alcantara* ADM 53/33261 May 1915). These changes were probably part of the revisions to logbook form S-321b in September 1913, as discussed above

3.4.2 Format and Content 1920s and 1930s

Several changes are to be seen in logbook format in the period after WWI. The following examples are from the logbook of HMS *Constance* (ADM 53/74049, April 1921). An important addition was made to the directions for recording wind speed in the logbook. In a remarks section it stated:

> Special consideration is necessary when logging the wind. When steaming 15 knots, if the wind felt on the bridge be from ahead, velocity 15 nautical miles per hour or force 4, the actual velocity of the wind would be nil and must be logged 0. If the wind on the bridge be from astern, velocity 15 nautical miles per hour or force 4, the actual velocity of the wind would be 30 nautical miles per hour and must be logged as force 7. ..... The direction of the sea must be the principal guide in determining the direction of the wind but a table is issued with each chart set to assist in computing the true force and direction of the wind as compared with the apparent force and direction as observed on board moving vessels.

The directions also give a scale of fog intensity on a scale of 1-5 and a 'sea disturbance' scale as opposed to a 'sea state' scale although the logbook page is printed as 'sea state'. The sea disturbance/state scale was now 0-10.

There were other significant changes in the way navigational data was recorded. The examples are again from the logbook of the *Constance*. Although the layout of the page was essentially unchanged, the hour of the day was printed in a 24-hour format rather than am and pm. This format also applied to the intermediate positions of the vessel at 0800 and 2000 hours as recorded at the top right of the page. The pre-printed page stated that the courses steered were true rather than magnetic and the notation for recording the course made good was in degrees but no longer treated as a quadrant, for example 88º and no longer N88E. The gyroscopic compass was introduced about this time, and in a Royal Navy ship was checked and corrected daily.

The error is rarely more than one degree. As a consequence, it is likely that the wind directions recorded were also true rather than magnetic. However it was not until the late 1920s and certainly by 1930 that the pre-printed logbook pages explicitly stated that the wind directions recorded were true. (See below 10.3) Another addition to the information recorded in the logbook was the 'time zone kept at noon' found at the centre left hand edge of the page. The subject of time zones is treated separately below (section 10.4).

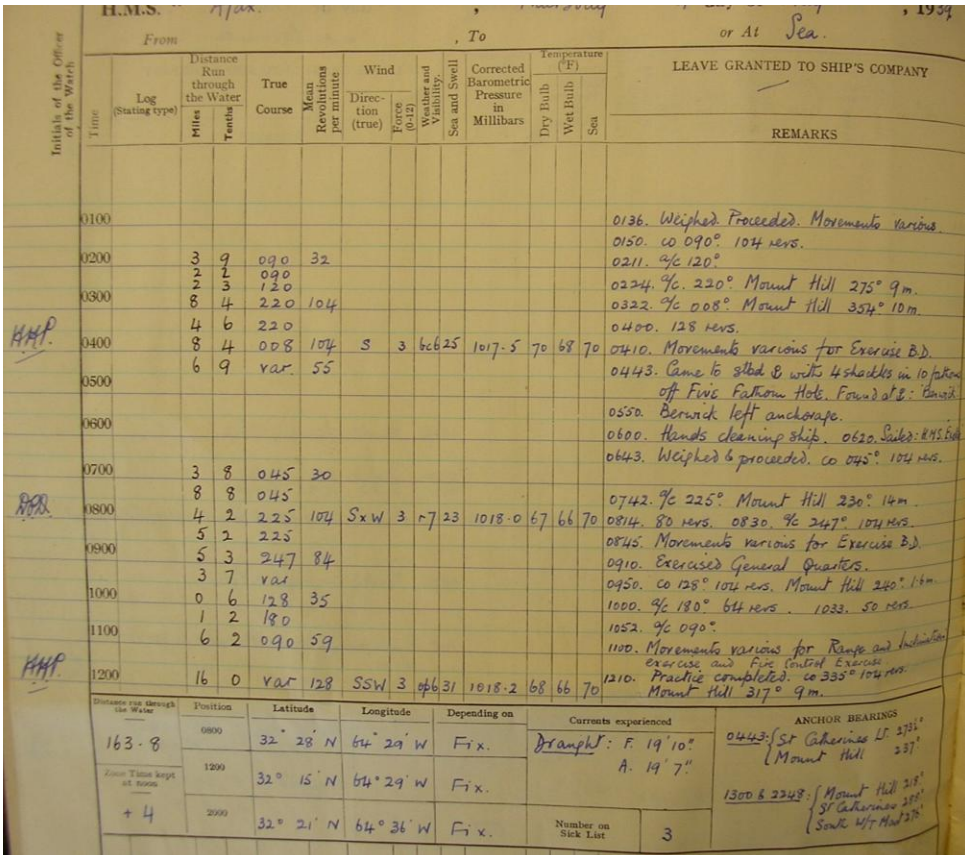
By 1930 there were additional changes in the way meteorological observations were recorded. The precise date that these changes were ordered is still under investigation. The logbook of HMS *Carlisle* (ADM 53/72695 June 1930) indicates that the chief difference in meteorological recording by 1930 was the replacement of inches by millibars in observing barometric pressure. The sea state was no longer a scale of 0-10 but a system of double digits (Douglas Scale).

Summary of Format and Content of 20th century logbooks prior to WWII

- Air, wet bulb and sea temperatures were consistently recorded from 1900s
- All courses and bearings were given as true rather than magnetic from 1920s
- The ship's position was recorded at 0800, noon and 2000 hours from the WWI period
- Scale of fog intensity (0-5) used from 1920s
- Time zone recorded from 1920s
- Pressure readings made in millibars rather than inches between 1920 and 1930
- Sea state scale changed between 1920 and 1930 – (0-9 to 0-10)

3.4.3 Format and Content WWII Period

By the time of the Second World War (1939-45), there were further minor changes to the format of the pre-printed logbook page. The example examined here is the logbook of HMS *Ajax* (ADM 53/107353, May 1939). The revised format was established in October 1938.


H.M.S. Ajax , 1939
From , To or At Sea.

LEAVE GRANTED TO SHIP'S COMPANY

REMARKS

0136. Weighed. Proceeded. Movements various
0150. co 090°. 104 revs.
0211. a/c 120°.
0224. a/c. 220° Mount Hill 275° 9m.
0322. a/c 008° Mount Hill 354° 10m.
0400. 128 revs.
0410. Movements various for Exercise B.D.
0443. Came to stbd & with 4 shackles in 10 fathoms off Five Fathom Hole.
0550. Berwick left anchorage.
0600. Hands cleaning ship. 0620. Sailed: HMS
0643. Weighed & proceeded. co 045°. 104 revs.
0742. a/c 225°. Mount Hill 230°. 14m.
0814. 80 revs. 0830. a/c 247°. 104 revs.
0845. Movements various for Exercise B.D.
0910. Exercised General Quarters.
0950. co 128° 104 revs. Mount Hill 240°.
1000. a/c 180° 64 revs. 1033. 50 revs.
1052. a/c 090°.
1100. Movements various for Range and Inclination exercise and Fire Control Exercise
1210. Practice completed. co 335° 104 revs. Mount Hill 317° 9m.

Distance run through the Water	Position	Latitude	Longitude	Depending on
163·8	0800	32° 28' N	64° 29' W	Fix.
	1200	32° 15' N	64° 29' W	Fix.
Zone Time kept at noon: + 4	2000	32° 21' N	64° 36' W	Fix.

Currents experienced: Draught: F. 19' 10". A. 19' 7".
Number on Sick List: 3

ANCHOR BEARINGS: 0443: St Catherines Lt. 273½°, Mount Hill 237°

Fig. 5 Top Half of Logbook Page HMS *Ajax* 4 May 1939, ADM 53/107353

Note. If viewing an electronic copy, the logbook can be read clearly by enlarging the page.

The October 1938 version of form S-321 was used throughout the war period. The recorded positions at 0800 and 2000 hours had been moved from the upper right of the page to the middle section of the page above and below the noon position. The wind direction was stated as true and the barometric pressure was recorded in millibars and corrected. The column labelled weather now, contained an additional number indicating a scale of visibility.

4. National Archives, ADM 173 Submarine Logbooks - Organization

A notable innovation in 20th century naval warfare was the development of the modern submarine. Such vessels had been used with various degrees of success since the late 18th century and most notably during the American Civil War. It was not until the 20th century that the Royal Navy maintained a substantial number of these vessels. The logbooks of submarines are kept in the National Archives and catalogued under ADM 173. Submarines kept regular meteorological observations and spent most of their time on the surface, submerging only to avoid detection. Their number and availability both prior to and during WWII is outlined in Tables 4 and 5.

Date Range	No. of Logbooks
c. 1915-1934	13,341
1935-1938	2,294

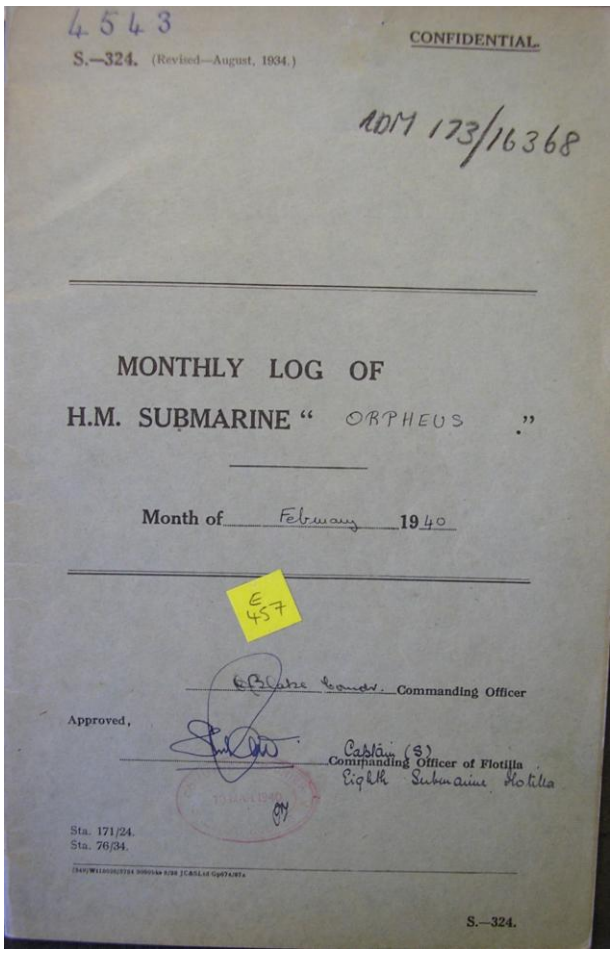
Table 4. ADM 173 Submarine Logbooks c. 1915-1938

Year	No. of Logbooks	Year	No. of Logbooks
1939	621	**1945**	906
1940	445	**1946**	509
1941	477	**1947**	434
1942	558	**1948**	410
1943	721	**1949**	397
1944	1,004	**1950**	376

Table 5. ADM 173 Logbooks of submarines 1939-1950

5. ADM 173 Submarine - Logbook Cover, Format and Content

Submarine logbooks are found in ADM 173 and their number and organization is discussed in section 3 above. The format of the submarine logbook was very different to surface vessels although many of the same elements were present.


4543

S.—324. (Revised—August, 1934.)

CONFIDENTIAL.

ADM 173/16368

MONTHLY LOG OF

H.M. SUBMARINE "ORPHEUS."

Month of February 1940

E 457

Commanding Officer

Approved,

Captain (S)
Commanding Officer of Flotilla
Eighth Submarine Flotilla

Sta. 171/24.
Sta. 76/34.

S.—324.

Fig. 6 Logbook Cover HMS *Orpheus* February 1940, ADM 173/16368

The logbook layout was established in June 1903 with form S-324. This designation continued with a number of revisions, for example the logbook used by submarine E44 in 1916 was form S-324 (revised February 1916). The example image is the logbook cover of HMS *Orpheus*. This is based on Form S-324 (revised October 1934) as noted in the top left corner.

The logbook itself was smaller in size, and like surface ships of the time, contained a period of one month. The cover of the logbook had the name of the vessel, the month and the year. It was signed by the commanding officer and by the commanding officer of the flotilla. The number of the flotilla to which the submarine was attached was also stated. Like surface vessels of this period, the logbook cover usually bore the stamp of the office of the commander in chief.

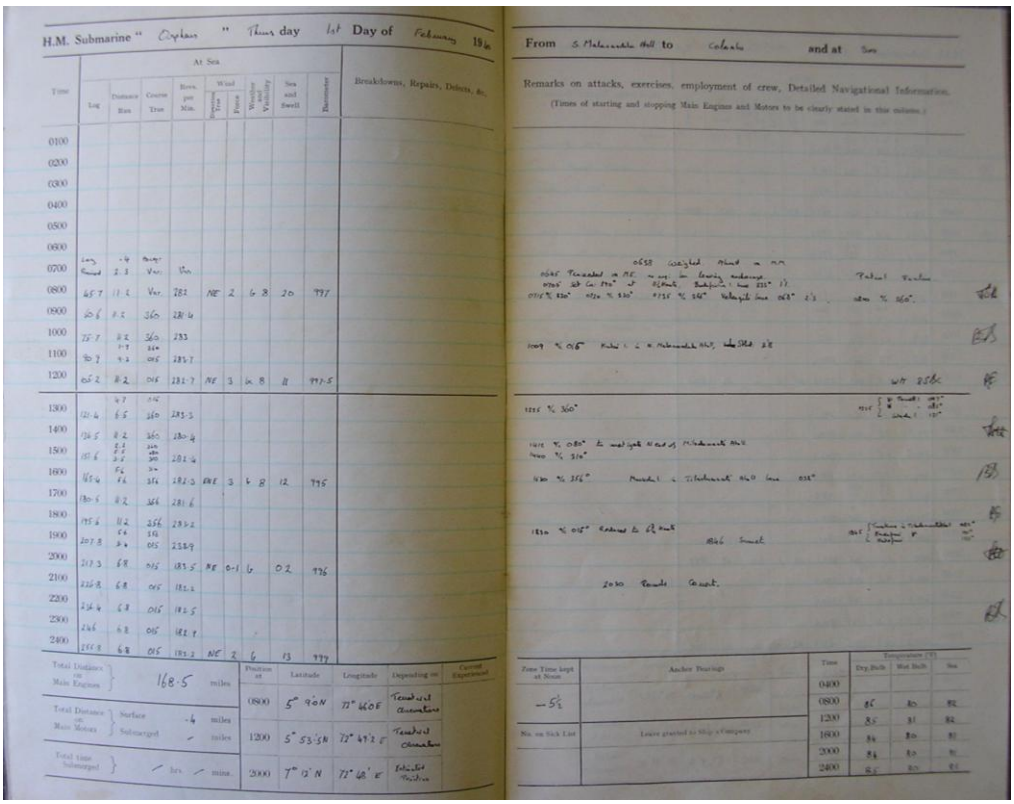


Fig. 7 Logbook Page HMS *Orpheus* 1 February 1940, ADM 173/16368
Note. If viewing an electronic copy, the logbook can be read clearly by enlarging the page.

The submarine logbook was a two facing-page format, unlike surface vessels. The right hand page was for remarks while the left contained the following observations.

- Hour of the day by a 24-hour format
- Log (patent log) of distance run
- Distance run (hourly)

- True course
- Wind direction (true)
- Wind force (Beaufort Scale)
- Weather and visibility (series of letters with a scale of visibility)
- Sea and swell (a scale of double digits)
- Barometer (in millibars) *the example examined did not mention an attached thermometer.*

The meteorological observations were recorded every four hours. Unlike surface vessels the navigational detail was provided at the bottom of the page rather than in the centre. The first part of the navigational section indicated the amount of time and miles covered either on the surface or submerged. The submarine's position was then reported at 0800, noon and 2000 hours. Next to this was a space for remarks upon any current experienced. On the bottom of facing page was the time zone kept at noon, and anchor bearings. At the far bottom right was a section for recording four hourly observations of dry bulb, wet bulb and sea temperature.

The position of the instruments was not stated. Whether recordings were taken from instruments fixed in the conning tower (and presumable protected from submersion), taken on deck for observations or obtained by remote sensors is not yet clear.

It must be noted that many of the early submarine logs did not record meteorological data. Of the very small number sampled to date (2008), submarines *E44* and *G6*, both operating in the White Sea in 1916, did not record data in the logbooks. Submarine *G2* (also in the White Sea) however did record four-hourly pressure data. Early submarine logbooks (probably up to circa 1920) should be pre-examined to determine if meteorological data is present. This is not an issue for the WWII period.

6. German U-Boat Radio Intercepts (ADM DEFE/3)

Radio transmissions from German U-boats during the Second World War contained weather reports. These radio transmissions were intercepted, decoded and translated by the Government Code and Cypher School at Bletchley Park, North London prior to submission to the submarine tracking room at the Admiralty. The weather reports within the transmissions were not submitted to the submarine tracking room. Similarly, the US Navy decrypted U-boat transmissions from the North Atlantic through the Office of Naval Operations, Communications Division, Communications Intelligence, Atlantic Theatre. Over 49,000 individual radio intercepts are archived in the United States, and many can also be found in the National Archives in the UK.

The Germans used three different encryptions for naval and U-boat radio traffic called by the British, *porpoise*, *dolphin* and *shark*. *Shark* was used for transmissions from the Atlantic from February 1942 at which time the use of *dolphin* was confined to the Arctic, Baltic and European waters. In the UK National Archives, the decrypted transmissions are to be found in:

DEFE 3/705-744 - Shark decrypts U-boats Atlantic Dec 1942 – war end.
DEFE 3/1-4, 20-34 - Decrypts U-boats 1941
DEFE 3/180-219, 245-299, 340-499, 521-560 – Decrypts U-boats Baltic and Arctic.

The US decrypts are held at the National Archives and Records Administration (http://www.archives.gov/) facility in College Park, Maryland. These are: Record Group 457 with numbers SRGN 0001/49668. A useful article by David Syrett, 'German Meteorological Intelligence from the Arctic and North Atlantic 1940-1945' was published by the *Mariners Mirror*, 1985.

7. Meteorological Vessels (National Archives & National Meteorological Archive)

The Royal Navy and the Royal Canadian Navy maintained dedicated meteorological ships in the Atlantic from time to time throughout the period of WWII. Information on these can be found in the National Archives, ADM 1/16022 and 16313. The type of vessel required was usually a Flower Class corvette but merchant ships and small trawlers were used as well. In the early years of the war the met ships *Toronto City* and *Arakaka* were stationed in the North Atlantic and both were lost in June/July 1941. Their deck logs are not kept by the National Archives but may prove to be in a Canadian archive. Likewise the met ships HMS *Grindall* and HMS *Hoste* do not have logbooks in the National Archives, as the logbooks of smaller vessels were not retained after February 1940. The *Grindall* was withdrawn in June 1944 and *Hoste* was relieved during the same month by HMCS *Port Arthur* and HMCS *Mayflower*. They reported from the area approximately 49º to 53º North, and 20º to 25º West. (ADM 1/16313) The Military Class trawlers *Fusilier*, *Homeguard* and *Royal Marine* also served as weather ships.

Ship	Dates	Area covered by Logbook
Arakaka	Sept-Nov 1940 Jan-Feb 1941	North Atlantic Liverpool – St. John's Newfoundland
Grindall	Apr-Jun 1944	Londonderry
Homeguard	May-Nov 1945	North Atlantic
Port Arthur	Jun-Nov 1944	Liverpool and area

Table 6. NMA Weather Ship Meteorological Logs WWII

A few meteorological logbooks from these ships are archived at the National Meteorological Archive, as indicated in Table 6.

In addition to the above, the National Meteorological Archive also holds met logs for the Flower class corvettes *Celadine*, *Primrose*, *Lavender*, *Pennywort*, *Camellia* and *Sweet Briar*. These appear to be weather-reporting ships but this has not been verified at the time of writing. Furthermore the trawlers *Northern Gift*, *Northern Foam*, *Northern Sky* and *Northern Reward* are stated to have operated in the Liverpool met area in 1945 which would indicate that these were weather-reporting ships. The meteorological logbooks for all these vessels do not have corresponding logbooks in the National Archives at Kew. Although there are logbooks at Kew for the trawlers *Northern Gift* (Jan-Jun 1940) and *Northern Sky* (May-June 1942) these vessels were not operating as weather ships at the time. For the post WWII period, the National Meteorological Archive holds met logs for the ocean weather stations (OWS) *Alpha*, *India*, *Juliet* and *Kilo* 1947-1975. Some data from these and other international OWS are already available in the International Comprehensive Ocean-Atmosphere Data Set (http://icoads.noaa.gov) and also available for example in digital form from the British Oceanographic Data Centre (BODC) [http://www.bodc.ac.uk/] (see e.g. Diaz et al. 1987). The National Meteorological Archive is discussed in more detail in section 8.

8. National Meteorological Archive
Royal Navy Meteorological Logs
8.1 Extent of Logbook Collection

The National Meteorological Archive is located at the Devon Record Office in Exeter and holds the Royal Navy meteorological logs. Those covering the 20th century are a continuation of the extensive collection beginning in 1854 (see Wilkinson 2009, section 9.3). There are just thirty-two Royal Navy meteorological logs for the WWI period, from twelve ships covering the period 1911-1918 (Rhodes 1994a). For the period 1936 to 1948, there are 812 meteorological logs. (Rhodes, 1994b) At this time, meteorological logs were kept by vessels with dedicated met offices fitted, such as aircraft carriers and flagships (see section 10 below) as well as by weather ships. The meteorological logs are only available for these vessels. There is a hand-written list of meteorological logs mainly for the WWII period (1930s to early 1950s), available as a PDF on the RECLAIM website at http://icoads.noaa.gov/reclaim

After the WWII period, the NMA holds meteorological logs for a variety of vessels from aircraft carriers to destroyers, frigates royal fleet auxiliaries, and ocean weather ships. There are 397 logs and they run from 1948 to 2000, with the most numerous in the 1980s and 1990s. Enquiries are in hand (2009) to determine whether the data from these logs has been reported and assimilated for climate studies or whether these logs are an untapped resource.

8.2 The Meteorological Log - Cover, Format and Content

Figure 8 shows a typical example of a cover of a meteorological log of the Second World War period. The form designation as printed in the top left corner is H 243, established November 1928 and revised August 1936, June 1939 and March 1942. The logbook cover gave the name of the ship and its station or area of deployment (apparently the "station was not always inserted), beginning and end dates of the log, with the signatures of the meteorological officer and the captain. The first two pages provided detailed instructions on times of observations and the manner in which those observations were to be recorded. (Figs. 9-10) This was followed by a page of detailed instrument metadata with additional comments (Fig. 11). Also printed on this page were a combined sea and swell scale (Douglas Scale) and letters to indicate the state of the weather.

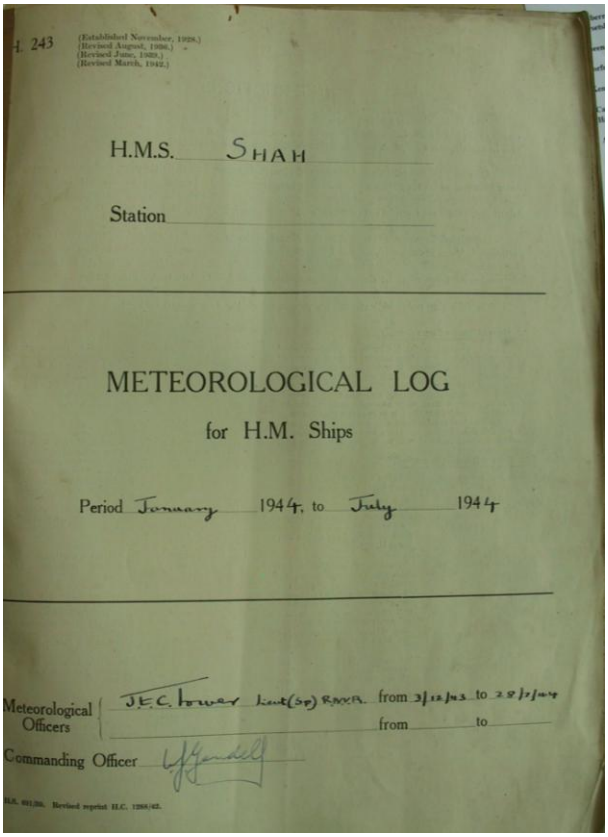
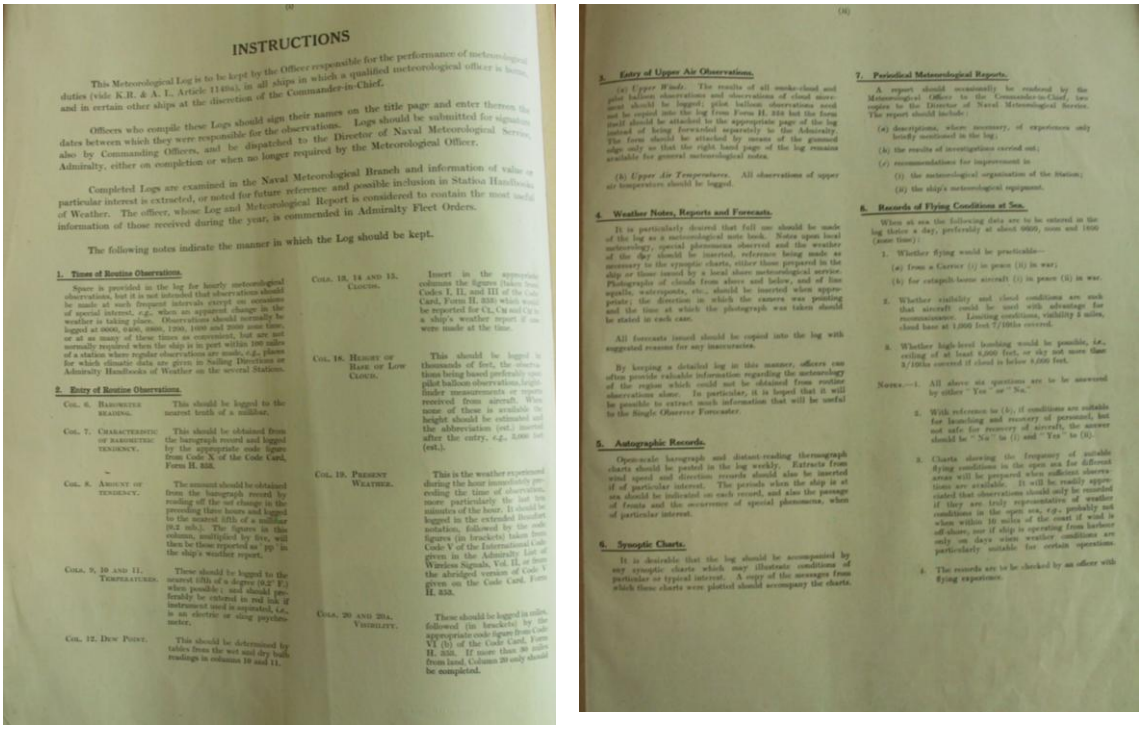


Fig. 8 Met Log HMS *Shah*, Jan-Jul 1944 National Meteorological Archive



INSTRUCTIONS

This Meteorological Log is to be kept by the Officer responsible for the performance of meteorological duties (vide K.R. & A. I., Article 1148a), in all ships in which a qualified meteorological officer is borne, and in certain other ships at the discretion of the Commander-in-Chief.

Officers who compile these Logs should sign their names on the title page and enter thereon the dates between which they were responsible for the observations. Logs should be submitted for signature also by Commanding Officers, and be dispatched to the Director of Naval Meteorological Service, Admiralty, either on completion or when no longer required by the Meteorological Officer.

Completed Logs are examined in the Naval Meteorological Branch and information of value or particular interest is extracted, or noted for future reference and possible inclusion in Statica Handbook of Weather. The officer, whose Log and Meteorological Report is considered to contain the most useful information of those received during the year, is commended in Admiralty Fleet Orders.

The following notes indicate the manner in which the Log should be kept.

1. Times of Routine Observations.

Space is provided in the log for hourly meteorological observations, but it is not intended that observations should be made at such frequent intervals except on occasions of special interest, *e.g.*, when an apparent change in the weather is taking place. Observations should normally be logged at 0000, 0400, 0800, 1200, 1600 and 2000 zone time, or at as many of these times as convenient, but are not normally required when the ship is in port within 100 miles of a station where regular observations are made, *e.g.*, places for which climatic data are given in Sailing Directions or Admiralty Handbooks of Weather on the several Stations.

2. Entry of Routine Observations.

Col. 6. Barometer Reading. This should be logged to the nearest tenth of a millibar.

Col. 7. Characteristic of Barometric Tendency. This should be obtained from the barograph record and logged by the appropriate code figure from Code X of the Code Card, Form H. 858.

Col. 8. Amount of Tendency. The amount should be obtained from the barograph record by reading off the net change in the preceding three hours and logged to the nearest fifth of a millibar (0.2 mb.). The figures in this column, multiplied by five, will then be those reported as "pp" in the ship's weather report.

Cols. 9, 10 and 11. Temperatures. These should be logged to the nearest fifth of a degree (0.2° F.) when possible; and should preferably be entered in red ink if instrument used is aspirated, *i.e.*, is an electric or sling psychrometer.

Col. 12. Dew Point. This should be determined by tables from the wet and dry bulb readings in columns 10 and 11.

Cols. 13, 14 and 15. Clouds. Insert in the appropriate columns the figures (taken from Codes I, II, and III of the Code Card, Form H. 858) which would be reported for Ct, Cu and Cy in a ship's weather report if one were made at the time.

Col. 18. Height or Base of Low Clouds. This should be logged in thousands of feet, the observations being based preferably on pilot balloon observations, height finder measurements or reports received from aircraft. When none of these is available the height should be estimated and the abbreviation (est.) inserted after the entry, *e.g.*, 3,000 feet (est.).

Col. 19. Present Weather. This is the weather experienced during the hour immediately preceding the time of observation, more particularly the last two minutes of the hour. It should be logged in the extended Beaufort notation, followed by the code figures (in brackets) taken from Code V of the International Code given in the Admiralty List of Wireless Signals, Vol. II, or from the abridged version of Code V given on the Code Card, Form H. 858.

Cols. 20 and 20a. Visibility. These should be logged in miles, followed (in brackets) by the appropriate code figure from Code VI (b) of the Code Card, Form H. 858. If more than 20 miles from land, Column 20 only should be completed.

3. Entry of Upper Air Observations.

(a) *Upper Winds.* The results of all smoke-cloud and pilot balloon observations and observations of cloud movement should be logged; pilot balloon observations need not be copied into the log from Form H. 224 but the form itself should be attached to the appropriate page of the log instead of being forwarded separately to the Admiralty. The form should be attached by means of the gummed edge only so that the right hand page of the log remains available for general meteorological notes.

(b) *Upper Air Temperatures.* All observations of upper air temperature should be logged.

4. Weather Notes, Reports and Forecasts.

It is particularly desired that full use should be made of the log as a meteorological note book. Notes upon local meteorology, special phenomena observed and the weather of the day should be inserted, reference being made as necessary to the synoptic charts, either those prepared in the ship or those issued by a local shore meteorological service. Photographs of clouds from above and below, and of line squalls, waterspouts, etc., should be inserted when appropriate; the direction in which the camera was pointing and the time at which the photograph was taken should be stated in each case.

All forecasts issued should be copied into the log with suggested reasons for any inaccuracies.

By keeping a detailed log in this manner, officers can often provide valuable information regarding the meteorology of the region which could not be obtained from routine observations alone. In particular, it is hoped that it will be possible to extract much information that will be useful to the Single Observer Forecaster.

5. Autographic Records.

Open-scale barograph and distant-reading thermograph charts should be pasted in the log weekly. Extracts from wind speed and direction records should also be inserted if of particular interest. The periods when the ship is at sea should be indicated on each record, and also the passage of fronts and the occurrence of special phenomena, when of particular interest.

6. Synoptic Charts.

It is desirable that the log should be accompanied by any synoptic charts which may illustrate conditions of particular or typical interest. A copy of the messages from which these charts were plotted should accompany the charts.

7. Periodical Meteorological Reports.

A report should occasionally be rendered by the Meteorological Officer to the Commander-in-Chief, two copies to the Director of Naval Meteorological Service. The report should include:

(a) descriptions, where necessary, of experiences only briefly mentioned in the log;

(b) the results of investigations carried out;

(c) recommendations for improvement in

(i) the meteorological organisation of the Station;

(ii) the ship's meteorological equipment.

8. Records of Flying Conditions at Sea.

When at sea the following data are to be entered in the log three a day, preferably at about 0900, noon and 1600 (zone time):

1. Whether flying would be practicable—

(a) from a Carrier (i) in peace (ii) in war;

(b) for catapult-borne aircraft (i) in peace (ii) in war.

2. Whether visibility and cloud conditions are such that aircraft could be used with advantage for reconnaissance. Limiting conditions, visibility 5 miles, cloud base at 1,000 feet 7/10ths covered.

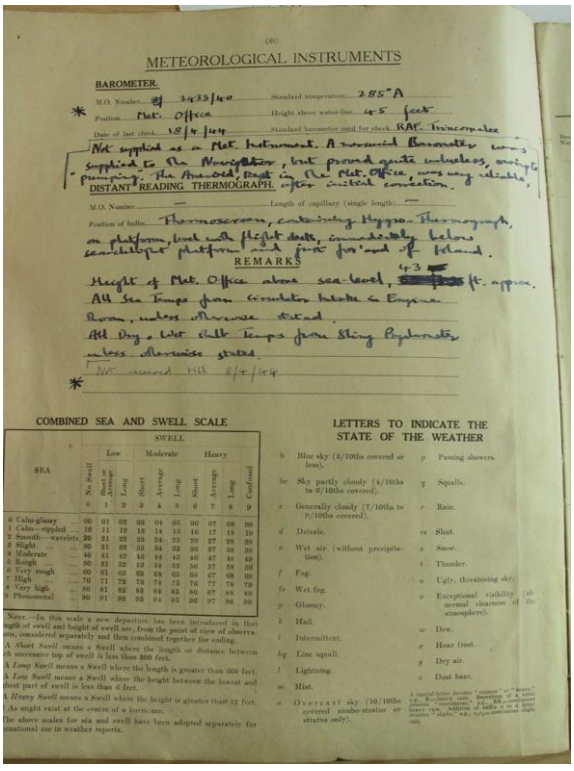
3. Whether high-level bombing would be possible, *i.e.*, ceiling of at least 4,000 feet, or sky not more than 3/10ths covered if cloud is below 4,000 feet.

Notes.—1. All above six questions are to be answered by either "Yes" or "No."

2. With reference to (b), if conditions are suitable for launching and recovery of personnel, but not safe for recovery of aircraft, the answer should be "No" to (i) and "Yes" to (ii).

3. Charts showing the frequency of suitable flying conditions in the open sea for different areas will be prepared when sufficient observations are available. It will be readily appreciated that observations should only be recorded if they are truly representative of weather conditions in the open sea, *e.g.*, probably not when within 10 miles of the coast if wind is off-shore, nor if ship is operating from harbour or anchorage. Such observations are only on days when weather conditions are particularly suitable for certain operations.

4. The records are to be checked by an officer with flying experience.



METEOROLOGICAL INSTRUMENTS

BAROMETER.

M.O. Number 2433/40 Standard temperature 28.5° A

Position Met. Office Height above water-line 45 feet

Date of last check 18/4/44 Standard barometer used for check R.A.F. Trincomalee

Not supplied as a Met. Instrument. A reserved Barometer was supplied to the Navigator, but proved quite valueless, owing to pumping. The Aneroid Bark in the Met. Office, was very reliable, after initial correction.

DISTANT READING THERMOGRAPH.

M.O. Number — Length of capillary (single length) —

Position of bulbs Thermoscreen, containing Hygro-Thermograph, on platform, level with flight deck, immediately below searchlight platform, and just forward of Island.

REMARKS

Height of Met. Office above sea-level, 43 ft. approx.

All Sea Temps from circulator intake in Engine Room, unless otherwise stated.

All Dry & Wet Bulb Temps from Sling Psychrometer unless otherwise stated.

W.C. received 18/4/44

COMBINED SEA AND SWELL SCALE

SEA	SWELL: No Swell	Low: Short or Average	Low: Long	Moderate: Short	Moderate: Average	Moderate: Long	Heavy: Short	Heavy: Average	Heavy: Long	Confused
	0	1	2	3	4	5	6	7	8	9
0 Calm-glassy	00	01	02	03	04	05	06	07	08	09
1 Calm—rippled	10	11	12	13	14	15	16	17	18	19
2 Smooth—wavelets	20	21	22	23	24	25	26	27	28	29
3 Slight	30	31	32	33	34	35	36	37	38	39
4 Moderate	40	41	42	43	44	45	46	47	48	49
5 Rough	50	51	52	53	54	55	56	57	58	59
6 Very rough	60	61	62	63	64	65	66	67	68	69
7 High	70	71	72	73	74	75	76	77	78	79
8 Very high	80	81	82	83	84	85	86	87	88	89
9 Phenomenal	90	91	92	93	94	95	96	97	98	99

Note.—In this scale a new departure has been introduced in that length of swell and height of swell are, from the point of view of observation, considered separately and then combined together for coding.

A *Short Swell* means a Swell where the length or distance between each successive top of swell is less than 800 feet.

A *Long Swell* means a Swell where the length is greater than 800 feet.

A *Low Swell* means a Swell where the height between the lowest and highest part of swell is less than 6 feet.

A *Heavy Swell* means a Swell where the height is greater than 12 feet.

As might exist at the centre of a hurricane.

The above scales for sea and swell have been adopted separately for international use in weather reports.

LETTERS TO INDICATE THE STATE OF THE WEATHER

b	Blue sky (3/10ths covered or less).	p	Passing showers.
be	Sky partly cloudy (4/10ths to 6/10ths covered).	q	Squalls.
c	Generally cloudy (7/10ths to 9/10ths covered).	r	Rain.
d	Drizzle.	rs	Sleet.
e	Wet air (without precipitation).	s	Snow.
f	Fog.	t	Thunder.
fe	Wet fog.	u	Ugly, threatening sky.
g	Gloomy.	v	Exceptional visibility (abnormal clearness of the atmosphere).
h	Hail.	w	Dew.
i	Intermittent.	x	Hoar frost.
lg	Line squall.	y	Dry air.
l	Lightning.	z	Dust haze.
m	Mist.		
o	Overcast sky (10/10ths covered nimbo-stratus or stratus only).		

A mixed letter denotes "passing" or "heavy" showers, *e.g.*, "hr" = "heavy rain showers." "Ir" = "intermittent rain." "Ig" = "intermittent light rain." Addition of suffix *e* to a letter denotes "slight," *e.g.*, "re" = "slight rain."

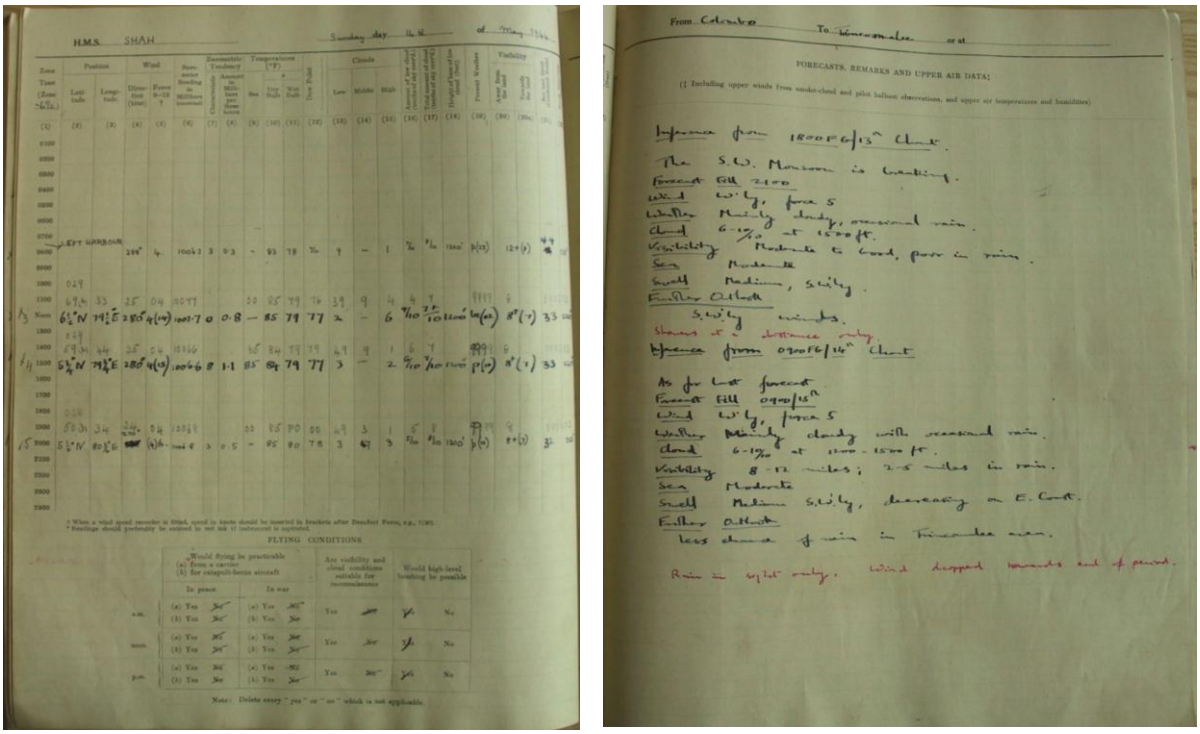
The meteorological instruments page stated the Met Office number of the barometer and its position, in this instance in the ship's met office. Also noted was the date it was last checked, standard temperature, the height above the waterline, and the standard barometer against which it was last checked, in this instance RAF Trincomalee. Also noted on this example was the location of the thermoscreen, the hygometer, and thermograph located; '...on platform level with the flight deck, immediately below the searchlight platform, and just forward of the island' - HMS *Shah* was an escort carrier. Also of interest on this page is the section for remarks, which states that the ship's met office was 43 feet above the waterline, and significantly that '...all sea temperatures from circulator intake in Engine Room unless otherwise stated.' It

Figs. 9, 10 & 11 Instructions Met Log HMS *Shah* 1944, National Meteorological Archive
Note. If viewing an electronic copy, the logbook can be read clearly by enlarging the page.

was during the 1930s-1940s period that SST observations were changing from temperatures measured by bucket and thermometer, to readings from engine room intakes and this level of detail provides important ship-specific metadata. It is also significant in the particular case of HMS *Shah*, because she was originally built as the USS *Jamaica* and presented, like many other RN escort carriers, to Britain under lend-lease arrangements. The method of engine intake SST recording is not peculiar to the meteorological logbook, but is dependant on the origin of the vessel.

The page following the 'Instruments' (not illustrated) printed the Beaufort Scale with a correlative sea disturbance scale.

The main daily entry pages were a double facing-page format, the left side being for tabulated data and the right side for remarks (figs. 12-13)



Figs. 12 & 13 - Met Log of HMS *Shah*, 14 May 1944. National Meteorological Archive
Note. If viewing an electronic copy, the logbook can be read clearly by enlarging the page

Note that at the bottom of the left-facing page there is a box to describe flying conditions at different times of the day. This was only pertinent to those vessels with flight decks or an aircraft-launching catapult. The main section of the page was divided into 24 hours beginning with 0100 hours and ending at midnight. Observations were to be made at four-hourly intervals from midnight (zone time) or as many of those times as convenient, and more frequently during an apparent change

in the weather. Observations were not normally required if the vessel was with 100 miles of a station where regular observations were made (see Fig. 9).

The top of the left-facing page had the name of the ship, day of the week and date. The top left-hand corner of the page contained a box to indicate which time zone was kept. Following this was a series of columns describing the data to be entered.

- Latitude and Longitude
- Wind Direction (True) and Wind Force (Beaufort Scale)
- Barometric Pressure in millibars (corrected)
- Barometric Tendency (Characteristics and Amount per three hours)
- Temperatures (Sea, Dry and Wet Bulb)
- Dew Point
- Clouds (Low, Middle and High)
- Amount of Low Cloud (10ths of sky covered)
- Total Cloud (10ths of sky covered)
- Height of Base Cloud
- Present Weather
- Visibility (towards land and away from land)
- Sea and Swell (combined scale)
- Direction of Swell

The right-hand facing page was reserved for 'Forecasts, Remarks and Upper Air Data.' The page itself was headed by the port of departure and the destination, or if not at sea, the present port position of the vessel. In the example above, this section stated that the ship was bound to Trincomalee from Colombo and remarked that the SW Monsoon was breaking and then described the forecast and outlook for 2100 hours (14^{th}) and 0900 hours (15^{th}). Example pages from a slightly different meteorological logbook, the cruiser HMS *Ajax* in 1935, can be seen in Rhodes, 1994b (Annex C, http://icoads.noaa.gov/reclaim/).

8.3. Merchant Shipping Logbooks

Merchant shipping deck logbooks from the 20^{th} century have not been collected into one archive. Companies such as P&O and Cunard hold a very small number of logbooks. It is possible that other collections of logbooks associated with various shipping companies still exist but these companies have either stopped trading or were absorbed by other shipping lines. It is possible that their logbooks have been disposed of but it is also possible that they may be stored somewhere unrecorded and

unnoticed. At the time of writing (2008), no information has been discovered. If any have survived, confirmation of this must await further enquiries.

Meteorological data from 20th century merchant ships has not entirely disappeared (and as noted in the Introduction, merchant meteorological data have been widely exchanged internationally under the WMO/VOS Programme since about 1963). The National Meteorological Archive holds large numbers of meteorological logs for merchant vessels. The quantity of these for the first half of the 20th century has not yet been determined. However for the period 1910-1920 there are 2,191 logs of which only a handful are naval vessels and the remaining are merchant ships. Of those remaining, 337 logbooks from the period 1911-16 are missing. For the period 1936-1948 there are 3,795 merchant ship meteorological logs and an additional 10,887 met forms. These figures are based on the UK Met Office entry registers as reported in Rhodes (1994b). For a discussion of the observations that have been keyed into the Marine Database (MDB) from these meteorological logs, see the relevant Rhodes report, and for more information about the status of blending MDB into ICOADS see Worley et al. (2005). Examples of a meteorological logbook from a merchant ship can be seen in Rhodes, 1994b (Annex D, http://icoads.noaa.gov/reclaim/)

9. Naval Movements 1900-1946

9.1Operational areas

The names of fleets and their operational areas at the commencement of the 20th century were largely the same as those established in 1878 (Table 7)

Name of Fleet or Squadron in 1878	Main Base(s)
Channel Fleet	Portsmouth, Plymouth
Mediterranean	Malta, Gibraltar
North America and West Indies	Bermuda, Kingston, Halifax
Pacific	Valparaiso, Esquimalt
China	Hong Kong, Singapore
East Indies	Colombo, Trincomalee
Australia	Sydney
Cape of Good Hope and West Africa	Simonstown, Sierra Leone
Reserve Fleet	

Table 7. Fleet Names and Bases 1878

The following revisions in operational areas and names took place in the early years of the 20th century. In October 1903, the West Coast of Africa and the Cape of Good

Hope commands were separated. West Africa was joined with the Southeast Coast of America to form the South Atlantic Squadron. This was then abolished in January 1905 but was re-instated by the time of the Second World War. In 1905, the China, Australia and East Indies fleets became squadrons of the Eastern Fleet under the overall direction of the commander-in-chief China. The Home Fleet was re-named the Channel Fleet and the existing Channel Fleet was re-named the Atlantic fleet. The cruisers attached to the fleets were organised into numbered squadrons (1.Channel, 2.Atlantic, 3.Mediterranean, 4.North America and West Indies, 5.Nore). These squadrons were re-numbered in March 1909 with the introduction of additional numbered light cruiser squadrons. The year 1912 saw the substitution of fleets named after their operational areas with numbered battle squadrons. (*Royal Navy List* 1917) By the time of the First World War 1914-1918, foreign naval operations and administration were organized according to the following table:

Region/Squadron Number	Main Bases or Ports	Operational Area
9th Cruiser Squadron	Cape Verde Islands (to coal), Freetown	Mid-Atlantic, Madeira, Canary Islands, Cape Verde Islands, West Africa
10th Cruiser Squadron	Shetland Islands, Liverpool	Norway, Shetland-Faroes Passage, Denmark Strait
4th Cruiser Squadron	Halifax, Bermuda, Jamaica	Western Atlantic and West Indies
Mediterranean	Gibraltar, Malta	Mediterranean
South America	Rio de Janeiro, Abrolhos Rocks (coaling), Falkland Islands	South Atlantic, River Plate
Cape of Good Hope	Simonstown, Durban	Cape area and East Africa
East Indies	Suez, Aden, Bombay, Trincomalee, Colombo	Red Sea, Arabian Sea, Persian Gulf
China	Hong Kong, Singapore	Western Pacific, Indonesia, Bay of Bengal
Australia (Royal Australian Navy)	Sydney	Australia, New Zealand
Pacific	Valparaiso, Esquimalt	Eastern Pacific

Table 8 Main Operational Areas 1914-1918 (based on 'Reports of Proceedings')

9.2 Sources for Warship Movements 1900-1946

Unlike earlier centuries, there is no long, single series of fleet and station manuscript lists such as ADM8 for the 20th century. There are however a large range of different sources both in manuscript and printed form for researching naval shipping movements. Several of these can be found in the National Archives.

9.2.1 Manuscript Sources – National Archives Kew

ADM1

ADM 1 contains among other series, many sets of 'reports of proceedings'. These reports apply to both stations generally and some ships specifically. The list is extensive and not sequentially numbered.

ADM 8

The two volumes covering the early 20th century are unlike those for the 19th century. The last entry for the latter is December 1893 in ADM 8/172. ADM 8 173 (1903) and ADM 8/174 give alphabetical listings of the fleet with dates of commissioning, re-commissioning and locations. There are no dates of sailing from British ports.

ADM 127

ADM 127/24 and ADM 127/30 are registers of proceedings (shipping movements) for the East Indies Dec 1923-Dec 1930.

ADM 137

ADM 137 is a large collection of manuscript materials gathered together to write the official history of the First World War (see Corbett and Newbolt below). Amongst these materials are 'Reports of Proceedings' issued by various station commanders often supplemented by reports from individual captains. In addition to this there are detailed convoy reports as well as précis of convoy reports providing the names of ocean escorts and dates of sailing. These and the Reports of Proceedings are not numbered sequentially. It should be noted that at present (2008), the details of individual items for the entire collection of ADM 137 documents is not available through the National Archives on-line catalogue. A hard copy catalogue is available at Kew that provides some assistance.

ADM 187

ADM 187 comprise a set of documents called the 'Pink Lists' These once 'top secret' documents were produced every few days throughout WWII for issue to ships and shore establishments. The list included Royal Navy and Commonwealth vessels, giving the operating area or location of each vessel with occasional notes on dates of sailing. It was also noted if a vessel was refitting or repairing with the location of the refit. It is apparent however that some shipping movements, including many submarines (which are certainly not all listed) were either not available or deemed too secret to be printed in the Pink Lists and ships may suddenly turn up in a particular area. Despite this, these lists are immensely detailed and useful.

ADM 199

ADM 199 contains sets of 'Reports of Proceedings' for the Second World War period. These are not numbered sequentially. See also Admiralty Movement Books (9.2.2 below).

9.2.2 Admiralty Ship Movement Books

Probably the best, resource for locating ships and plotting their movements during the WWII period can be found at the National Maritime Museum at Greenwich and the Admiralty Library, Portsmouth. These are the 'Ship Movement Books'. They are presently (2008) not catalogued at the National Maritime Museum and do not appear on-line or in any of the printed finding aids. They are large and bulky volumes, housed in a basement, and need to be requested in advance. They appear to be a compilation of the 'Pink Lists' but on a ship-by-ship basis. Both surface ships and submarines are represented and each vessel has a separate page or pages listing various places and locations with the dates of arrival and departure, and the authority for movement. A remarks column provides details of operations and refits, repairs etc. Most vessels appear to be present and usefully many vessels of the Indian, Canadian, Australian and New Zealand navies are also listed. The documents appear to be an official government issue. Those held by the Museum are photocopies. The originals are held at the Admiralty Library in Portsmouth. The originals also cover the pre-war period back to 1923.

9.2.3 Official Warship Histories

The National Maritime Museum holds copies of 20th century warship service histories. These are photocopies of short papers produced by the Ministry of Defence, Naval Historical Branch and include service records of both surface ships and submarines. The collection is however incomplete and the histories for many vessels have either not been written of have not been passed to the Museum. The original collection held by the Naval Historical Branch may have additional histories.

9.2.4 Printed Sources

The Navy List

Produced quarterly or monthly since the end of the 18th century, the *Navy List* prints a complete list of Royal Navy officers and vessels. The 20th century lists give a

monthly summary of which ships are on particular stations but no dates of sailing or subsequent movements. Even this somewhat sketchy information is absent in the volumes issued during the two world wars as the information was sensitive.

The Royal Navy List Special War Supplement (1917)

A copy of this publication can be consulted at the National Maritime Museum Greenwich (call no. 940.459(42) Roy P4460). Pages 245-270 detail the 'Commissions and Services of first and second class ships now in the active list compiled to the declaration of war August 14, 1914'.

Naval Staff Monographs (Historical)

These publications were issued by the Naval Staff, Training and Staff Duties Division. They provide detailed histories of operational areas or particular events. For instance the complex set of events and naval movements in Far Eastern, Australian and Indian waters, and in particular the search for German surface raiders at the outbreak of WWI, can be traced in considerable detail. This is found in *Naval Staff Monographs (Historical) Fleet Issue volume 5, the Eastern Squadron 1914* (April 1922). Copies are held by the National Maritime Museum Greenwich.

Operational Histories

A detailed source of naval operations during the First World War is the five-volume *Naval Operations: History of the Great War based on Official Documents*. The first three volumes were authored by Sir Julian Corbett, the fourth and fifth volumes are by Henry Newbolt. John Grainger's, *The Maritime Blockade of Germany in the Great War: the Northern Patrol 1914-1918*, provides details of the 10th Cruiser squadron patrolling the seas north of Britain, the Iceland-Faroes Passage and the Denmark Strait. This is based on previously unpublished documents including the 'Reports of Proceedings, 10th Cruiser Squadron' from ADM 137 at the National Archives.

During the first decade of the 20th century a popular 'Log Series' was published. Accounts of the commissions of various vessels, from all over the globe, were written, by a member of the crew. Many volumes contain useful summaries of the vessel's movements with dates of arrival in different ports and often accounts of severe weather such as typhoons. The National Maritime Museum holds a large collection of these books. A list of the most useful is included in the 'sources' section of the 20th

century Ship Movement and Logbook Directory soon to be available on the RECLAIM website.

10. Naval Meteorological Organization: Observation and Recording

10.1 General Organization

A Naval Meteorological Service was established towards the end of the First World War as part of the Hydrographic Department of the Admiralty. By 1930, meteorology was handled by the Navy Services Division (NSD) of the Meteorological Office, Air Ministry. The NSD was responsible for the provision of meteorological information to the Navy, for equipment, and for the training of selected naval officers. The NSD also issued memoranda concerning developments in meteorological practice and organization.

Overall, many observing and reporting practices for the Royal Navy ships appear to have been carefully prescribed by the Admiralty Weather Manual (1938) or its predecessors. However, it is not yet clear how these instructions were specifically applied to the recording of Ship's Logs and Met Logs. The ship's logs from ADM 53 do not print observing instructions, whereas the met logs do. Direction and instruction was provided by the *Marine Observer's Handbook*, first issued in 1915 and running to seven editions to 1937. The *Admiralty Weather Manual* was published in 1938 with a further edition in 1941. The first part of the *Admiralty Weather Manual* was based on the *Marine Observers Handbook*, according to a review of the publication in 1939, (QJRMS). This would indicate that it probably superseded the earlier publication, but this was temporary as the *Marine Observers Handbook* was re-issued in 1950.

In the Royal Navy, the ship's navigating officer was responsible for meteorology. The exception was the aircraft carrier, which carried a specialist meteorological officer. Aircraft carriers were also fitted with a dedicated meteorological office. In 1930 it was decided that all flagships would be fitted with a met office and carry a specialist. The general arrangements of an on-board met office, in this instance the cruiser HMS *Suffolk* about 1939, are illustrated below.

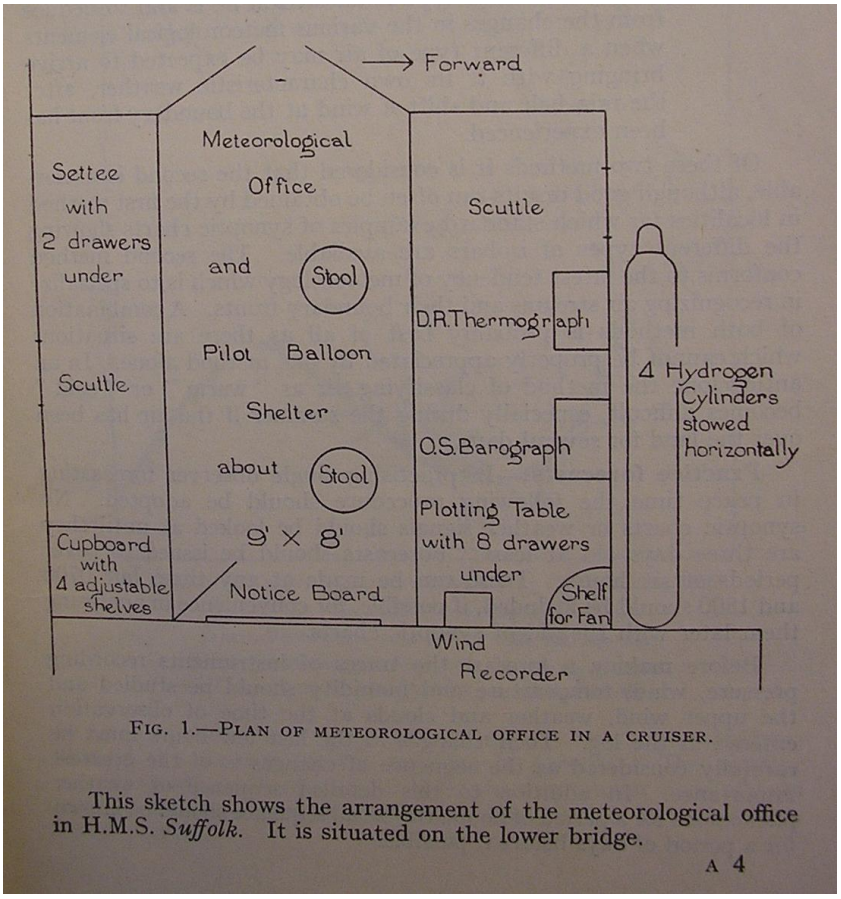


Fig. 14 Meteorological Office HMS *Suffolk*, ADM 239/191

10.2 Instrumentation

The typical instruments carried by Royal Navy vessels by 1930 are listed below.

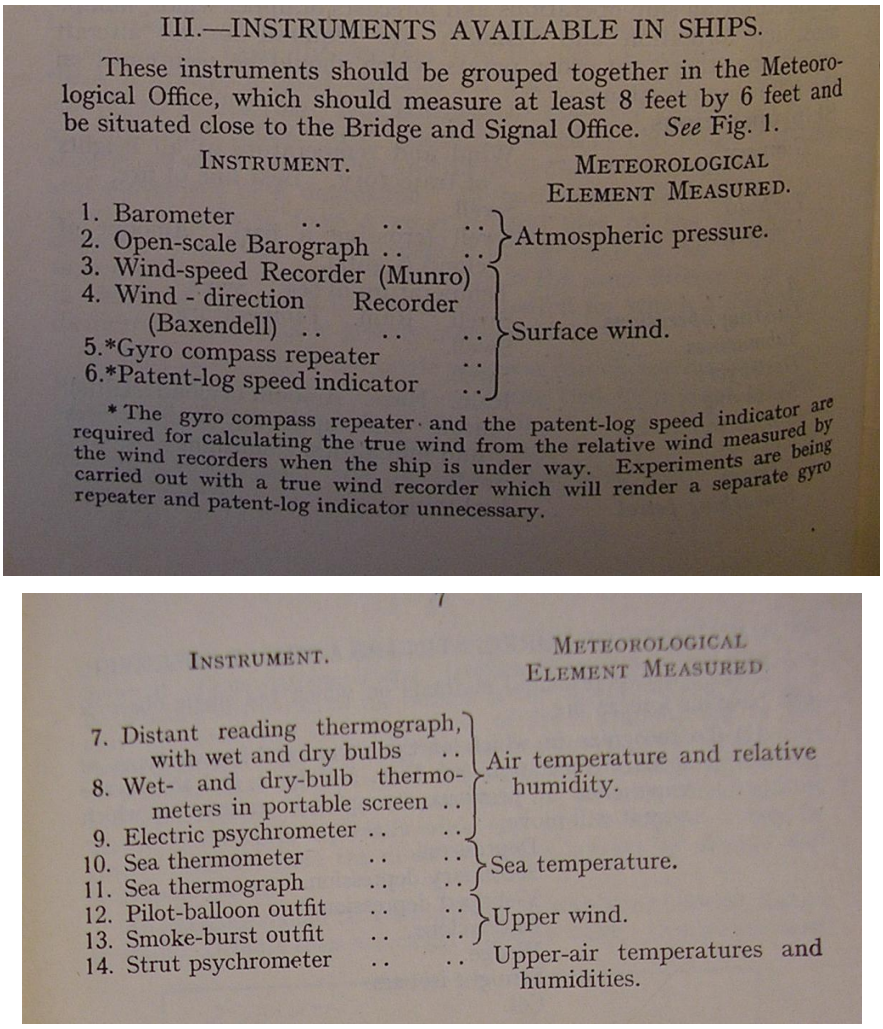
Ship Type	Instruments
All ships sloops and above	Kew pattern marine barometer, aneroid barometer, barograph, hydrometer, wet and dry bulb thermometer, thermometer for sea temperature
Survey ships	As above plus electrical cap anemometer
Aircraft Carriers	As sloops etc. plus distant reading thermograph, hair hydrograph, whirling psychrometer, Finemann nephoscope, strut psychrometer (for aircraft), aircraft barometer. Carriers with masts also carried a diaphragm wind speed recorder, and a Baxter wind direction recorder.

Table 9. Royal Navy Meteorological Instruments circa 1930 (ADM 116/2773)

Naval Met Service memo 8/28 instructed ships to regularly check their barometers against those held by shore establishments. (See the example of HMS *Shah*, 8.2 above) As well as the instruments listed in Table 9, by 1930 about forty Royal Navy ships, including all aircraft carriers, recorded upper wind observations from pilot

balloons. For instance, regular upper wind observations were made in the Mediterranean by the aircraft carriers HMS *Courageous* and HMS *Eagle.*

Typical instrumentation for the Second World War period is listed in the *Appendix to the Admiralty Weather Manual* (1939) and the relevant pages are reproduced below.



III.—INSTRUMENTS AVAILABLE IN SHIPS.

These instruments should be grouped together in the Meteorological Office, which should measure at least 8 feet by 6 feet and be situated close to the Bridge and Signal Office. *See* Fig. 1.

Instrument.	Meteorological Element Measured.
1. Barometer	Atmospheric pressure.
2. Open-scale Barograph	
3. Wind-speed Recorder (Munro)	Surface wind.
4. Wind - direction Recorder (Baxendell)	
5.*Gyro compass repeater ..	
6.*Patent-log speed indicator ..	

* The gyro compass repeater and the patent-log speed indicator are required for calculating the true wind from the relative wind measured by the wind recorders when the ship is under way. Experiments are being carried out with a true wind recorder which will render a separate gyro repeater and patent-log indicator unnecessary.

Instrument.	Meteorological Element Measured.
7. Distant reading thermograph, with wet and dry bulbs ..	Air temperature and relative humidity.
8. Wet- and dry-bulb thermometers in portable screen ..	
9. Electric psychrometer	
10. Sea thermometer	Sea temperature.
11. Sea thermograph	
12. Pilot-balloon outfit	Upper wind.
13. Smoke-burst outfit	
14. Strut psychrometer	Upper-air temperatures and humidities.

Fig. 15 Instruments Available in Ships 1939

10.3 Magnetic and True Bearings

ADM 53 ship's log formats suggest that sometime in the 1920s or 1930s the wind directions recorded in Royal Navy logbooks were with reference to the geographic pole, or true north, rather than the magnetic pole. The corresponding met logs have yet (2009) to be examined. The relevant column, in the ADM 53 logs of the late 1930s, is printed 'wind direction (true)'. However, printed logbook pages of the early 1920s indicate that only the ship's course was recorded as true. This was a development from the use of the new gyro-compass. It might follow therefore that along with true courses being recorded from about 1920, true wind directions were

also being recorded. Yet without sight of the specific instructions issued to HM ships, this assumption is presently unsafe and will be resolved in a future revision of this report. There is however a certainty that magnetic bearings were recorded for both course and wind direction up to the end of the First World War (1918). The logbook of HMS *Alcantara* in 1915 shows courses as 'standard compass course' that is magnetic, and wind direction as in previous logbook formats. Furthermore the front cover of the 'Convoy Orders for the Mediterranean 1918', ADM 137/2648, clearly states in a large bold type that all courses and bearings are magnetic. Further confirmation that WWI period logbooks recorded magnetic wind directions can be found in the *Marine Observers Handbook*, 1915 edition, that states:

> The direction of the wind is given by the quarter from which the wind blows. For meteorological purposes, the geographical or true direction is required. It is the practice on the ships of the Navy for all directions to be logged according to the magnetic compass, but on merchant ships the true direction has come to be regarded as the most convenient, and the column in the meteorological log should accordingly be carefully headed.

It is clear from this handbook that recording practice differed between the Royal Navy and the merchant service. (see 10.1 above)

10.4 Time Zones

The time zone kept was recorded in the ADM 53 ship's logs from about 1920 onwards. The corresponding met logs have yet (2009) to be examined. 'Local Time' differs from Greenwich Mean Time (GMT) by one hour for every 15 degrees of longitude. Logbooks recorded a figure plus or minus GMT, either as a whole figure or a fractional part. Time zones to the west of the Greenwich meridian are plus and those to the east are minus. GMT or '0' time zone therefore extends 7.5 degrees on either side of the prime meridian. However when the 'zone kept' is recorded in the logbook, it frequently does not adhere to strict boundaries, and many vessels recorded a minus figure when west of the Greenwich meridian, for example HMS *Alcantara* in December 1942.

Day	Time Zone Kept	Longitude
24	-2	5.44E
25	-1	1.53E
26	-1	2.07W
27	-1	6.12W
28	GMT	10.41W
29	GMT	13.43W
30	GMT	Freetown

Table 10. HMS *Alcantara* Dec 1942 – Time Zones

There are practical explanations for this. Each ship effectively carried around its own time and if sailing due east or west would need to adjust its internal time as it crossed into different time zones. However it was inconvenient for a ship to constantly adjust its clocks to local time. If a ship's port of departure and destination were both in time zone –1 and the route carried the vessel from zone –1 to –2 and then back to –1, it made no sense to alter the ship's clocks and consequently the vessel's domestic routine. Therefore the ship's time does not coincide with local time, the only exception being of course that precise local noon was required to determine the ship's longitude. It is also possible that two ships, having commenced their voyage in different time zones might meet or record the same event in their logbooks but at slightly different times. This need not be an error and merely reflects the nature of their movements across the ocean. It should be assumed therefore that when the noon position is recorded in the logbook this is with reference to local noon. The question then arises as to whether the other hourly logbook entries and four-hourly met observations are made according to time reckoned from the noon observation or the time zone kept (ie +/- GMT or a fractional part). A memo, no. 1085, superceding China Station Order Book article 227, (circa 1930) gives directions for meteorological observations to be transmitted by wireless telegraphy (W/T). Observations were to be made at 0200, 0600, 1400 and 2000 hours and giving the ship's name, position and time of the observation by 'time zone –8'. This would indicate that observations were by a pre-determined time zone or the ship's time rather than by precise local time. Further investigation is presently (2009) in hand to confirm that this is the case.

11. Metadata
11.1 Sources of Metadata
11.1.1 Logbooks
The sources of metadata and other ancillary information needed to process historical marine data are many and varied. For climate research, probably the most critical metadata are platform and instrumental metadata. Since 1955, WMO has published many such metadata for the VOS (but possibly therefore not for any/many RN ships??) in their Publication No. 47 (see Kent et al. 2007). Depending on the period under study, both the ships' log or a corresponding met log will provide some of the required information. The logbook cover will usually state the name of the ship, and depending on the period, the range of dates covered by the logbook and the name of the commanding officer. Most early 20th century Royal Navy ship and met logs will also provide details of meteorological instruments. This information includes the type (mercurial or aneroid) and maker of the barometer, the height above sea level and the error. Information on thermometers includes the maker, position and whether screened. The ADM 53 ships' logs of the WWII period do not provide this information in each of the monthly logbooks, although corresponding met logs where the exist, invariably do. Instrument metadata for this period is presently (2009) a matter of further enquiry.

11.1.2 Reference works
Ship or platform metadata can be found in a number of standard reference books. For the late 19th century and the 20th century up to and including the Second World War, there is *Conway's all the World's Fighting Ships*. There are three volumes covering the periods 1860-1905, 1906-1921, and 1922-1946. These three volumes not only cover all major navies such as Britain, the United States, Germany, Japan, France and Italy, but also the smaller navies such as those of the British Commonwealth, and the South American republics. A further standard text is Colledge, *Ships of the Royal Navy: an historical index* (1969).

11.2 Types of Metadata
11.2a Ship Name
It is usual to find the name of a vessel on all logbooks. One should also be aware of the use of special characters such as 'æ' (Megæra) or ç (Curaçoa) in some on-line catalogues, which if not used can bring up a negative search result. This is more likely to be encountered with some 19th century vessels but may arise with a few early 20th

century ship names as well. Where one suspects the use of such special characters, some imaginative search options using '*' instead of the special character will usually produce a positive result. Over a period of time, there will be a duplication of names and it should not be assumed that ships with the same name are the same vessel. If dealing with an extended time period, it is usual to append the date of launch to the vessel's name, for example, *Resolution* (1915) as this method is unambiguous. Duplication of names of vessels co-existing will not usually occur with the Royal Navy in the 20th century.

11.2b Tonnage

Tonnage will give the relative size of the vessel. There were two main types of tonnage assigned to vessels, either displacement tonnage or gross tonnage. Gross tonnage was used by merchant vessels and was only applied to naval vessels such as armed merchant cruisers and other vessels that had been converted from merchantmen. The calculations for the two types of tonnage yield very different values and are not directly comparable or easily converted. Displacement tonnage is a calculation of the water displaced by the hull of the vessel, the weight of the water displaced being equal to the actual weight of the vessel. Gross tonnage, as it appears in *Lloyd's Register of Shipping* from 1875 onwards, is a calculation of capacity below the upper deck level of a vessel, dividing the number of cubic feet by 100. This calculation includes engine compartments and crew quarters as well as cargo spaces. Net tonnage, on which port dues are levied, is the same calculation but based on the cargo space only. (Kemp, 1976)

11.2c Dimensions

The dimensions, available for most vessels are extreme length and breadth, length between perpendiculars and depth (below waterline).

11.2d Builder/Launch

The available building details of vessels are the name of the builder and the location of the dock or slipway, the date the ship was begun and the date of launch. The year of launch is often useful to distinguish between ships of the same name. For 20th century vessels, the date of completion (following the launch) is also available.

11.2e Conversions

The standard reference books on naval vessels will include any conversions and the date. Conversions refer to a vessel being assigned and fitted for other duties such as a minelayer or a more radical and permanent change to a depot ship or base ship.

11.2f Machinery/Speed

The standard reference books will give information on the name/type of machinery, boilers etc. Also provided is the horsepower and maximum speed. In some instances the range of the vessel is provided. This is based on a full fuel capacity and steaming at a stated economical speed.

11.2g Fate/Disposal

The details concerning the fate of a vessel can often explain the absence of a logbook and prevent an unnecessary search

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