British Logbooks in UK Archives, 20th Century - a survey of the range, selection and suitability of British logbooks and related documents for climatic research

C. Wilkinson

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British logbooks in UK archives, 20th century – a survey of the range, selection and suitability of British logbooks and related documents for climatic research.
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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National Oceanic and Atmospheric Administration (NOAA)
Climate Database Modernization Program (CDMP)

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

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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
The 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.

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

**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.

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of Logbooks</th>
<th>Year</th>
<th>No. of Logbooks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1939</td>
<td>4,045</td>
<td>1945</td>
<td>1,760</td>
</tr>
<tr>
<td>1940</td>
<td>2,207</td>
<td>1946</td>
<td>1,122</td>
</tr>
<tr>
<td>1941</td>
<td>1,723</td>
<td>1947</td>
<td>787</td>
</tr>
<tr>
<td>1942</td>
<td>1,564</td>
<td>1948</td>
<td>897</td>
</tr>
<tr>
<td>1943</td>
<td>1,941</td>
<td>1949</td>
<td>2,070</td>
</tr>
<tr>
<td>1944</td>
<td>2,025</td>
<td>1950</td>
<td>2,027</td>
</tr>
</tbody>
</table>

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.

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

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.

---

**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](image)

**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 \textit{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.

\textbf{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 \textit{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:

\begin{quote}
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.
\end{quote}

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 \textit{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 88° 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 20\textsuperscript{th} 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.
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.
Table 4. ADM 173 Submarine Logbooks c. 1915-1938

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of Logbooks</th>
<th>Year</th>
<th>No. of Logbooks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1939</td>
<td>621</td>
<td>1945</td>
<td>906</td>
</tr>
<tr>
<td>1940</td>
<td>445</td>
<td>1946</td>
<td>509</td>
</tr>
<tr>
<td>1941</td>
<td>477</td>
<td>1947</td>
<td>434</td>
</tr>
<tr>
<td>1942</td>
<td>558</td>
<td>1948</td>
<td>410</td>
</tr>
<tr>
<td>1943</td>
<td>721</td>
<td>1949</td>
<td>397</td>
</tr>
<tr>
<td>1944</td>
<td>1,004</td>
<td>1950</td>
<td>376</td>
</tr>
</tbody>
</table>

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.

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](image)

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 3/1-4, 20-34 - Decrypts U-boats 1941

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 49° to 53° North, and 20° to 25° West. (ADM 1/16313) The Military Class trawlers *Fusilier, Homeguard* and *Royal Marine* also served as weather ships.

<table>
<thead>
<tr>
<th>Ship</th>
<th>Dates</th>
<th>Area covered by Logbook</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arakaka</td>
<td>Sept-Nov 1940</td>
<td>North Atlantic</td>
</tr>
<tr>
<td></td>
<td>Jan-Feb 1941</td>
<td>Liverpool – St. John’s Newfoundland</td>
</tr>
<tr>
<td>Grindall</td>
<td>Apr-Jun 1944</td>
<td>Londonderry</td>
</tr>
<tr>
<td>Homeguard</td>
<td>May-Nov 1945</td>
<td>North Atlantic</td>
</tr>
<tr>
<td>Port Arthur</td>
<td>Jun-Nov 1944</td>
<td>Liverpool and area</td>
</tr>
</tbody>
</table>

**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](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.
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.’
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 (14th) and 0900 hours (15th). 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/reclainv/).

8.3. Merchant Shipping Logbooks

Merchant shipping deck logbooks from the 20th 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 20\textsuperscript{th} 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 20\textsuperscript{th} 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
9.1 Operational areas
The names of fleets and their operational areas at the commencement of the 20\textsuperscript{th}
century were largely the same as those established in 1878 (Table 7)

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

Table 7. Fleet Names and Bases 1878

The following revisions in operational areas and names took place in the early years
of the 20\textsuperscript{th} 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-instituted 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:

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

*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

ADM 1
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 or 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.
10.2 Instrumentation

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

<table>
<thead>
<tr>
<th>Ship Type</th>
<th>Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>All ships sloops and above</td>
<td>Kew pattern marine barometer, aneroid barometer, barograph, hydrometer, wet and dry bulb thermometer, thermometer for sea temperature</td>
</tr>
<tr>
<td>Survey ships</td>
<td>As above plus electrical cap anemometer</td>
</tr>
<tr>
<td>Aircraft Carriers</td>
<td>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.</td>
</tr>
</tbody>
</table>

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.

![Fig. 15 Instruments Available in Ships 1939](image)

**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.
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.

<table>
<thead>
<tr>
<th>Day</th>
<th>Time Zone Kept</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>-2</td>
<td>5.44E</td>
</tr>
<tr>
<td>25</td>
<td>-1</td>
<td>1.53E</td>
</tr>
<tr>
<td>26</td>
<td>-1</td>
<td>2.07W</td>
</tr>
<tr>
<td>27</td>
<td>-1</td>
<td>6.12W</td>
</tr>
<tr>
<td>28</td>
<td>GMT</td>
<td>10.41W</td>
</tr>
<tr>
<td>29</td>
<td>GMT</td>
<td>13.43W</td>
</tr>
<tr>
<td>30</td>
<td>GMT</td>
<td>Freetown</td>
</tr>
</tbody>
</table>

Table 10. HMS Alcantara Dec 1942 – Time Zones
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 they 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 perpendiculares 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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