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Charting Formosan Waters: British Surveys of Taiwan's Ports and Seas, 1817-1867

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Abstract

Between 1817 and 1867, officers and sailors of the British East India Company and the British Admiralty conducted numerous surveys of the ports and coastal waters of Taiwan and the Pescadores. Knowledge in the form of plans, charts, sketches, sailing directions, etc. produced via these surveys was transmitted to the Hydrographic Office in England, where staff of the British Admiralty catalogued, cross-referenced, and summarized that information. Subsequently, Admiralty cartographers retrieved the stored data to create a series of official maps that transformed the maritime space surrounding Taiwan and the off-shore islands into the flat surface of numbered Admiralty maps. With time, these cartographic representations became the standard authority used by foreign ship captains, merchants, explorers, and consular agents attempting to navigate "Formosan waters."

Using this surveying of Taiwan as a case study, I seek to test claims regarding the roles played by British field agents in the development of "comprehensive knowledge of the peoples and territories" of the Qing empire. In particular, I examine the investigative practices and the epistemological objects of British surveyors, artists, and cartographers who produced the basic knowledge of

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Taiwan's maritime spaces. Secondly, I probe the impact of local knowledge, gained from fishermen, pilots, sailors, interpreters, officials, etc., in determining the content of the cartographic representations penned by British field agents. Finally, I analyze both the modalities and the networks by which this field-level information was communicated to "centers of calculation" in England, where it was processed as part of the larger epistemological complex of the British Empire.

Sources for this article include cartographic charts, plans, surveys, landfall views, and textual supplements currently held in the British Hydrographic Office archives; Admiralty maps published by the Hydrographic Office; sailing directions in the *India directory* (1836) and *The China pilot* (1855, 1861, 1864); and various publications penned by captains and crew members of British surveying vessels.

Keywords: hydrographic, British Admiralty, cartography, Taiwan, Pescadores

I. Introduction[1]

Between 1817 and 1867, officers of the British East India Company, such as Captain Daniel Ross, the Company's marine surveyor, and personnel of the British Admiralty, including ship captains, naval surveyors, and their assistants, conducted numerous surveying missions in the ports and coastal waters of Taiwan,[2] the Pescadores, and neighboring islands. Hydrographic knowledge in the form

1 This research was made possible by the assistance of staff in the archives division of the Hydrographic Office in Taunton, UK (in particular Dr. Adrian Webb, Jens Pagotto, and Matthew Millard) and by funding provided by the Dean's Office, Reed College. Digital scans of original charts and plans were provided by the Hydrographic Office; details of several scans are included below. Comments provided by two anonymous reviewers, and by participants at the "International Conference on Comparative Colonialism and Culture" (Institute of Taiwan History, Academia Sinica, 7-8 September 2012) and Philip Brown were especially helpful in revising this paper for publication.

2 In order to reveal inconsistencies in the use of place names by ship captains, surveyors, crew members, and Hydrographic Office personnel, I have retained many of the spellings from original documents when referring to a specific survey, publication or cartographic document. When geographical references are more general in nature, I use the more common spellings of place names employed during the nineteenth century.

of harbor plans, coastal charts, landfall views, sailing directions, and the like that were produced via these surveys was transmitted to the Hydrographic Office in England, where staff of the British Admiralty catalogued, cross-referenced, summarized and stored this textual and visual information. Subsequently, Admiralty cartographers retrieved the stored data to create a series of official charts and plans that transformed the maritime space surrounding Taiwan and the off-shore islands into the flat surface of numbered Admiralty maps that were published and available for purchase by mercantile companies, diplomatic personnel, and others who sought to comprehend Formosa, its harbors, coasts and seas. Over time, these cartographic representations became the standard authority used by European and American ship captains, merchants who traded in East Asia, explorers who investigated the geography and natural history of Taiwan, and consular agents attempting to navigate "Formosan waters."

Using this British surveying activities specific to Taiwan and the Pescadores as a case study, I seek to test the tentative claims made by James Hevia regarding the roles played by British field agents (e.g., surveyors) and local centers of collection (e.g., the Hong Kong naval station) in the development of the "comprehensive knowledge of the peoples and territories" of the Qing empire. In his *English lessons*, Hevia argued that the British information empire, with its field agents and their investigative modalities situated in China, and the mundane paper shuffling procedures of bureaucrats residing in centers of calculation in England, enabled the production of an imperial archive with the capacity for creating an entirely new "China" by the end of the nineteenth century. [3]

> It is precisely this epistemological complex, with its immutable mobiles, networks for generating and transmitting information, its creation of a host of proper names to be used in cataloguing exotic others, and its capacities for transforming and, indeed, assimilating others, that is of critical importance for

3 James Hevia, "Constructing a New Order," *English Lessons* (Duke University Press, 2003), pp. 123-155.

understanding the nature of the new order imposed on China after 1860.[4]

In this article, I focus my attention on the specific investigative practices employed (and the epistemological objects created) by British hydrographic surveyors, sailors who served as ship artists, and cartographers who produced British knowledge of Taiwan's maritime spaces between 1817 and 1867. Secondly, I examine the impact of local knowledge gained from Taiwanese fishermen, harbor pilots, junk captains, Chinese interpreters, and Qing officials in determining the content of the cartographic representations penned by British field agents. In addition, I analyze both the surveying practices and the official networks by which this field-level information was communicated to the Hydrographic Office (the "center of calculation" in this maritime network) in England. Here it was processed as one part of the larger epistemological complex produced by officers and personnel of the British Empire, with the help of their collaborators. Ultimately, this research seeks to examine the impact of early British hydrographic knowledge production upon subsequent apprehensions of maritime Taiwan and the Pescadores.

II. Summary of British Surveying, 1817-1867

Although trading ships traversed the seas surrounding Taiwan or visited the Pescadores during the eighteenth century, hydrographic investigation and surveying activities conducted by British naval vessels began only in 1817, when Captain Daniel Ross, Marine Surveyor for the British East India Company, took soundings and bearings along the coast of south and southwest Taiwan aboard H.M.S *Discovery*.[5] Over the next fifty years, hydrographic surveying carried out by British Admiralty ships gradually mapped the entire Formosan coastline, all the major harbors used by European and American ships, as well as the waters

4 Ibid., p. 127.

5 James Horsburgh, *The India Directory, or Directions for Sailing to and from the East Indies, China, Australia, Cape of Good Hope, Brazil, and the Interjacent Ports*, Fourth Edition (London: W. H. Allen and Co., 1836), pp. 446-450.

surrounding the Pescadores Islands 澎湖群島. Editions of the British Admiralty charts of Formosa and the Pescadores issued late in the nineteenth century indicate that all the major hydrographic surveying carried out in this region of East Asia had been conducted by 1867. Corrections made subsequent to that date were infrequent and minor, and the new major hydrographic surveying of Taiwan seas was accomplished by the Japanese, after taking possession of the island in 1895. Thus, one might attempt to argue that British naval surveyors "mastered" the harbors and coastline of Taiwan within only fifty years after sending its first surveyor there in 1817. (See Table 1 for a summary of these surveying activities; a map of the ports and coastlines included in draft and published plans and charts, 1827-1868, is included in the Appendix.)

Table 1 British Surveying in Formosa, 1817-1867

Date of Survey Activities	Ship & Commander	Places Visited / Mapped	Survey Tracks, Harbor Plans, Coastline Charts, Landfall Views
June 1817	*Discovery*; Capt. Daniel Ross	*Southeast*: Botel Tobago 紅頭嶼; *South*: Gadd's Rock〔紅頭嶼附近的暗礁〕, Vele Rete Rocks 七星岩, Southwest Point 南西岬; *Southwest:* Lamay Island 小琉球島, Pong-li 枋寮; Pescadores Islands	
Sept. 1824	*Merope*; Lt. G. Parkyns	*Northeast*: Kelung harbour 雞籠港	cursory plan
7-8 Apr. 1827	*Blossom*; F. W. Beechey	*Southeast*: Botel Tobago; *South*: Vele Rete Rocks, Lamay Island; Formosa Channel 臺灣海峽	
8-9 May 1827	*Blossom*; F. W. Beechey	*Southeast*: Botel Tobago, Samasana 火燒島	rough plan; two views
27-29 Nov. 1843	*Samarang*; Capt. Edward Belcher	*Southeast*: Samasana; East Coast	
June to Aug. 1844	*Plover*; Richard Collinson	Pescadores Islands	chart, with three views
2-3 June 1845	*Samarang*; Capt. Edward Belcher	*South*: Gadd's Rock; *Southeast*: eastward of Botel Tobago, Samasana	
July to Aug. 1845	*Plover*; Richard Collinson	*South*: South Cape 南岬; *East Coast*: Black Rock Bay 烏岸灣, Chockeday Bay 擺其黎灣, Double Peak 都蘭山, Sau-o Bay 蘇澳灣; *Northeast*: Steep Island 龜山島, Northeast Point 三貂角, Dome Point 鼻頭角, Kelung Island 雞籠嶼, Kelung Bay 雞籠灣	track of surveying vessel, plans, a chart
30 Aug. to 6 Sept. 1845	*Samarang*; Capt. Edward Belcher	*Southeast*: Botel Tobago; *South*: Gadd's Rock, Vele Rete Rocks	

20 Sept. to after 16 Oct. 1846	*Royalist*; Lt. D. M. Gordon	*Northeast*: Northeast Point, Petow 鼻頭角 , Chin-mo〔鼻頭角附近的海灣〕, Pe-ta-oa Bay〔桶盤嶼附近的海灣〕, Kelung harbor, Reef Island 中山仔島 , Kelung Island, Dome Peak 鼻頭山 , Bush Island 桶盤嶼 , Ma-soo Bay 馬鍊灣 , Double Rock 燭臺嶼 , North Point 北方澳 ; perhaps Sau-o 蘇澳 ; *Northwest*: Tamsui harbour 淡水港 , Nam-cam-sui 南崁水 , Table Hill〔竹塹附近的丘陵〕, Houng-mo Keng 紅毛港 , Port Heong-san 香山港 , Teuck-cham 竹塹 , Cheung Cong Kai 中港溪 , Single Peak〔竹塹附近〕, Mow-lung-sui 後壟水	four charts, a plan, warning to mariners, coal field report, sailing directions
24 Feb. to 28 Mar. 1855	*Saracen*; John Richards	*Southwest*: West Point〔國聖港北邊的山丘〕, Kok-si-kon 國聖港, Joss Islet〔鹿耳門附近的小島〕, An-ping 安平, Fort Zelandia熱蘭遮城, Twa-si-mui-oa〔臺灣府城內海〕, Ar-con-tien 阿公店, Ung-lo 鳳梨山, So-co Hill〔國聖港附近〕, Whale's Back 半屏山, Ape's Hill 猴山, Takow 打狗	two plans, two draft charts, a chart, a view
8 June to 1 July 1858	*Inflexible*; Capt. Brooker	*South* Pescadores Islands; *Southwest*: Kok-si-kon, Lok-he-mung 鹿耳門, Joss Islet, Fort Zelandia, Taiwan-foo 臺灣府, Ape's Hill, Takow, Pong-li, Lamay Island, Liang-kiow 琅璚; *South:* Southwest Point, South Cape, Vele Rete Rocks; *Southeast*: Botel Tobago, Samasana; *East Coast*: Black Rock Bay, Chockeday, Dome Point, Sau-o Bay, Kaleewan River 加禮宛河, Ke-ta-kan 叭連港; *Northeast*: Steep Island, Kelung Island, Kelung harbour, Masoo Peninsula 馬鍊半島; *Northwest*: Tamsui harbor, Haw-be 滬尾; West Coast (but not close in); *Southwest*: Taiwan-foo, Takow, Kok-si-kon; Pescadores Islands	a tracing, views, plans, and a chart
Sept. 1864	*Swallow*; E. Wilds; *Dove*; G. Stanley	Formosa Channel; perhaps Pescadores Islands	a view
Apr. to May 1865	*Swallow*; E. Wilds; *Dove*; G. Stanley	*South*: South Cape, Kwa-leang Bay 鵝鑾灣, Southwest Point; *Southwest*: Gooswa Promontory 龜山角, Chim-hong-o Bay 蟳廣澳灣, Lung-keaou Bay 琅璚灣, Che-tong-ka 蔥桐腳, Lamay Island, Tang-kang River 東港溪, Hong-swa 鳳山, Saracen's Head 沙拉心頭, Takow, Ape's Hill, Kakaou〔位置在馬沙溝附近，無法辨識〕, Paw-teh-chui 布袋嘴, Ang-hay-kang 紅蝦港; *West*: Wanckan Reef 魍港暗礁, Formosa Banks 福爾摩沙淺灘	numerous views, several charts, plans
6 May to 20 June 1866	*Serpent*; Cmdr. Charles T. Bullock	*Southwest*: Takow; Formosa Channel, Makung 馬公; *West Coast*: Wanckan Reef, Gilim Bay 二林灣, Mow-lung-sui; *Northwest*: Tamsui 淡水; *Northeast*: Kelung 雞籠; *East Coast*: Sau-o Bay	a track survey, corrections to earlier plans
June to July 1867	*Sylvia*; E. W. Brooker	*East Coast*: Sau-o Bay, Black Rock Bay; *Southeast*: Samasana, Botel Tobago; *South*: Gadd's Rock, South Cape, Vele Rete Rocks	track of ship's work, numerous views, plan

[Aug. 1867]	*Sylvia*; E. W. Brooker	*West Coast*: Wanckan 魍港, Monkiang 蚊港, Baliau 麥寮, Sei-kiang 西港, Quang-wa 番挖, Lo-kiang 鹿港, Goche 梧棲, Kobien 高美, Tyan Kiang 大安港, Toti Kiang〔無法辨識，位置在房里溪出海口，應為房裡港〕, Wani 苑裡, Tyka 大甲, Single Peak, Tongsiau 吞霄	charts
Sept. 1867	*Sylvia*; E. W. Brooker	*Northeast*: Kelung harbour; *Northwest*: Tamsui harbour, Foki Point 富貴角	a view, a plan

Sources: Hydrographic Office archives, British Admiralty charts, *The India Directory*, *The China Pilot*, and the published reports of each survey vessel by captains and crew who were responsible for the surveying activities.

A closer look at this history provides an alternate narrative, however. During the first three decades (1817 to 1845) only three areas of Taiwan seas were given much attention. For these early surveyors, rocks off the southern end of the island, and the reefs and channels in the Pescadores Archipelago posed the most danger to European sailing vessels, and several surveys were made of these two regions. Granted, Lt. G. Parkyns, commander of H.M.S. *Merope*, did conduct a cursory survey of Killon (Kelung 雞籠) harbor when his ship visited that port in September 1824. However, little attention was given to this or any other Taiwan harbor until Richard Collinson and his crew of H.M.S. *Plover* began to investigate the anchorages at Sau-o 蘇澳 and Kelung in the mid-1840s. Therefore, the rapid growth in British hydrographic knowledge of waters surrounding Taiwan and the Pescadores occurred only between 1845 and 1867, the last twenty-some years of the period under investigation.

The speed of that investigative process and the cartographic production of those last two decades of surveying Formosan waters is remarkable. When Collinson surveyed Sau-o and Kelung harbors in 1845, he also charted the coastline along the eastern periphery of Taiwan. During the early fall of the next year, the crew of H.M.S. *Royalist*, commanded by Lt. D. M. Gordon, investigated the northeast and northwest coastlines and conducted a survey of Tamsui 淡水 harbor. The *Saracen* mapped two harbors on the southwest coast, Kok-si-kon 國聖港 and Takow 打狗, in 1855. Three years later, H.M.S. *Inflexible* visited the south Pescadores and circumnavigated the island of Taiwan, looking for Europeans

who were rumored to be held captive on the island. Brooker, the captain of the vessel, had borrowed a surveyor from the *Actaeon*, William Blackney, who carried out surveys of Sau-o Bay and Kelung harbor, while collecting soundings and bearings on the southwest and east coasts that enabled corrections of earlier charts published by the Admiralty. The southwest coastline was thoroughly surveyed by the *Swallow* and the *Dove* in 1865, [6] and two years later, H.M.S. *Sylvia* finished the last leg of the coastal survey (the segment between Kok-si-kon in the southwest and Tongsiau 吞霄 in the northwest), while conducting new surveys of Sau-o Bay and Tamsui and correcting the east coast chart with new soundings and bearings. In short, during the brief period between 1845 and 1867, Admiralty ships had completed a comprehensive survey of the entire coastline, and large-scale surveys of five of Taiwan's major harbors. The coastal charts and harbor plans, with accompanying views of ports and coastlines, produced from these surveys, soon became the new hydrographic standard for this region of East Asia—at least for Anglo-American naval and consular personal, and those who privileged British hydrographic investigative expertise. The degree to which these surveys produced a new view of maritime Taiwan for Qing officials, merchants and ship captains who traveled the surrounding seas, and others for whom this knowledge was essential will be discussed in a later section of the article. However, to get a quick visual sense of the difference in knowledge produced by these hydrographic activities off the coasts and in the harbors of Taiwan, one only needs to compare different versions of Admiralty Chart No. 1968 (Fig. 1).

III. Surveying Practices

Reviewing the record of investigative activities carried out by British naval vessels in Formosan waters in the first few decades of the nineteenth century, one sees that soundings of water depths and the calculation of latitude and longitude measurements occupied most surveyors' time, that coastal surveys

6 Some sources give 1864 as the year of these surveys.

Fig. 1 Admiralty Chart No. 1968, comparing editions from 1850 (left) and 1886 (right)

were considered too dangerous to undertake, and that harbor surveys were rather exceptional activities.[7] This can be explained, in part, by the delay in the institutional and financial development of the Hydrographic Office (relative to its later years), and the immediate needs of British vessels sailing in these waters. In general, British ships avoided Taiwan ports prior to the 1840s, even though they skirted the southern tip of the island, sailed up the eastern coast of Formosa and occasionally visited the Pescadores.[8] These habitual sailing routes necessitated a greater understanding of dangerous reefs and rocks off the southern tip of Taiwan, as well as the locations of suitable anchorages for ships in distress or those

7 My knowledge of the details of *general* surveying practices promoted by the British Admiralty comes primarily from two sources: G. S. Ritchie, *The Admiralty Chart: British Naval Hydrography in the Nineteenth Century* (New York: American Elsevier Publishing Co., 1967); and A. H. W. Robinson, *Marine Cartography in Britain: A History of the Sea Chart to 1855* (Oxford: Oxford University Press, 1962).

8 My record of British navigation in this period is limited to official and published sources.

seeking shelter in a violent ocean storm. Thus, during this earlier period, British naval surveyors focused their attention specifically on these immediate needs.

Taking water depth measurements, i.e., soundings, was a regular task throughout the period covered by this research. Survey reports, remark books, draft surveys, sailing directions, and published charts and plans all testify to the importance of this work as a foundational practice. Taking a sounding required little equipment, though different lengths of lines were used, and a variety of weights were employed, some of which helped gather samples from the ocean bed (especially for anchorages near the shoreline). To be useful to other mariners, however, soundings also required geographical locations of the spots where each water depth was measured, which meant plotting latitudes and longitudes, or obtaining triangular sitings from fixed points whose latitudes and longitudes were known. Fathom measurements and compass bearings were reported by surveyors and later published in sailing directions, such as this example from Captain Daniel Ross's work in June, 1817:

> In steering from the S.W. point of Formosa, along the west coast, the *Discovery* had no soundings off the S.W. point until within about ½ mile of the shore, then had 120 fathoms; and with Lamay Island 小琉球島 bearing about W.N.W., got 30 and 40 fathoms on the mud bank when about 1½ mile off Formosa, and passed between the island and the coast. At anchor in 15 fathoms, very soft holding ground, about 3 miles off the town of Pong-lieu 枋寮 bearing N. 59° E., Lamay Island bore from S. 86½° W., the N.W. extreme of the coast, a small black hummock N. 41° W., southern extreme of the coast S. 22½° E. [9]

Off the southern tip of the island and elsewhere along portions of the eastern and northern coastline, taking soundings and plotting bearings could be delicate, even dangerous activity. Accurate geographical placement of significant (i.e., dangerous) locations were nearly impossible to ascertain. In April, 1827, crew

9 *The India Directory*, vol. 2 (1836), p. 520.

of H.M.S. *Blossom* compensated for this lack by describing what they had seen, heard, and smelled, while also attempting to measure the speed of the current flowing off the waters of South Cape 南岬.

> [The Vele Rete rocks 七星岩] lie off the south end of Formosa, [10] and are surrounded by breakers, which in thick weather could not be approached with safety. We observed strong ripples in the water near them, but the wind did not permit us to enter any for the purpose of sounding; late in the evening, however, when we were several leagues from them, the weather being nearly calm, we were drawn into one of these ripples and continued in it several hours, during which time we tried for soundings with a hundred fathoms of line without success. Upon trial a current was found to set S.E. seven furlongs per hour; this experiment, however, was made from the ship by mooring a buoy, and probably incorrect, as the water was much agitated; and had a vessel seen it, or even heard it in the night-time (for it made a considerable noise), she would have taken it for breakers and put about. [11]

When Richard Collinson and the crew of H.M.S. *Plover* surveyed the Pescadores islands in the summer of 1844, their sitings of rocks, coral reefs, shoals and safe anchorages were both more detailed and more precise than those taken by Ross or Beechey. Comparing Collinson's draft survey of the archipelago (Fig. 2) with his published sailing directions, [12] one notices the density of water depth measurements, the increased complexity in pinpointing coral reefs and rocks (large and small), and the detail in which island topography and archipelago configuration are represented. At the end of his published sailing directions,

10 [Original footnote:] "The large rock bears S. 29° 09' 15" E. from the west end of Lamay Island."

11 Frederick William Beechey, *Narrative of a Voyage to the Pacific and Bearing's Strait, to Co-operate with the Polar Expeditions: Performed in His Majesty's Ship* Blossom, *under the Command of Captain F. W. Beechey ... in the years 1825, 26, 27, 28*; published by the authority of the Lords Commissioners of the Admiralty (London: Henry Colburn and Richard Bentley, 1831), pp. 129-130.

12 Richard Collinson, "Sailing Directions for the Panghu, or Pescadore Archipelago, with Notices of the Islands," *Chinese Repository* 14 (1845): 249-257.

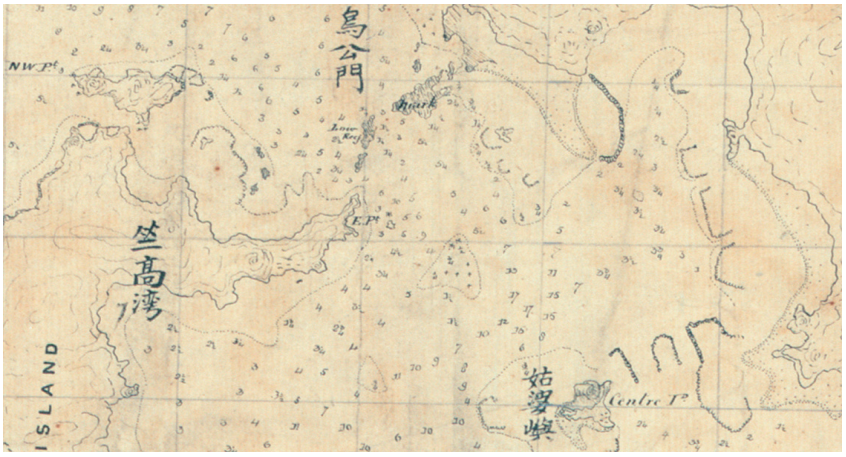

Fig. 2 Detail from "澎湖 Panghu or Pescadore Islands."[13]

Collinson provided a table of "Astronomical positions," which included latitude and longitude measurements for specific spots on thirteen islands, reefs and rocks.[14] This data suggests that surveying assistants in the *Plover*'s crew approached these positions in small boats in order to take the proper latitude and longitude measurements. In contrast, the locations of most landmarks (especially rocks, reefs, coral patches, etc.) in the archipelago's configuration were more frequently given in compass bearings relative to a neighboring island or major landmark (e.g., the lighthouse on Fisher's Island; the old Dutch fort on Penghu Island).

These lines of sight from a fixed position, and the compass bearings associated with such viewing, are infrequently represented in the textual and

13 Draft survey, Richard Collinson, H.M.S. *Plover* and *Young Hebe*, 1844; Hydrographic Office archives, L4368 Shelf 13G.

14 Reports from the *Inflexible*'s surveying in 1858 confirm the use of chronometers for calculating longitude and using meridian altitudes of stars for determining latitude. See G. A. C. Brooker, "Observations on Taï-wan or Formoza," *The Nautical Magazine and Naval Chronicle* 28.1 (November 1858): 562; and page 66 of "Remarks on the south & eastern coasts of Taiwan or Formosa, made during the visit of H.M.S. *Inflexible*, Commander Brooker, in search of missing Europeans"; Hydrographic Office archives, M 13 / 15. However, Vele Rete Rocks had already been located with the use of a chronometer by Captain Daniel Ross in the *Discovery* in 1817. See *The India Directory*, vol. 2, p. 447.

visual data I have examined. Beechey's simple sketch of Botel Tobago 紅頭嶼, completed in May, 1827, provides the first example of this phenomenon.[15] Likewise, draft charts produced by surveyors aboard the *Inflexible* indicate that this practice was used to ascertain more accurate locations for Pong-li 枋寮 and Lamay Island in 1858.[16] The "Diagram of Ta-kau-kon 打狗港 Formosa,"[17] sketched by surveyors in the *Swallow* in 1865, focused entirely on this aspect of coastal surveying.

Obtaining soundings and coordinates was often a very tedious, repetitive and time-consuming practice. A detail taken from the draft "Plan of Port Cock-si-con 國聖港" (Fig. 3) indicates that when this activity was conducted in and around harbors, smaller boats, such as gigs and cutters, were used for the purpose.

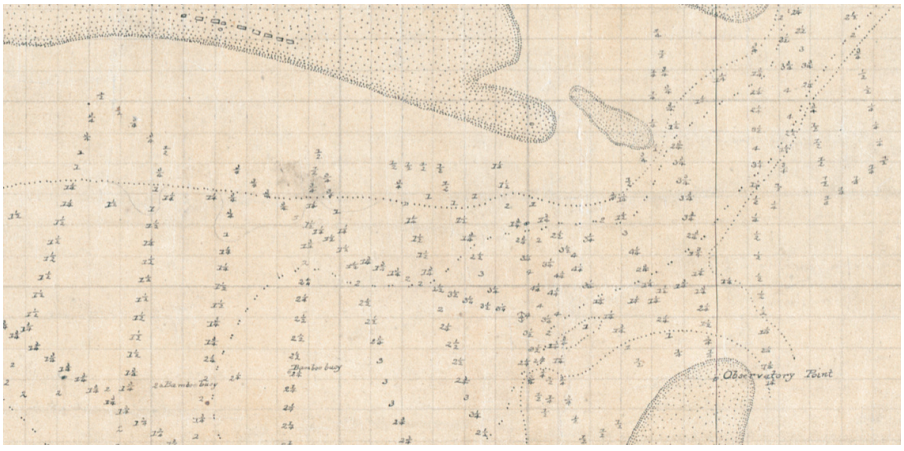

Fig. 3 Detail, "Plan of Port Cock-Si-Con."[18]

15 "Rough Plan of Botel Tobago Xima," Capt. F. W. Beechey; Hydrographic Archives, E777 Shelf Pacific folio 1.

16 "Tracing Shewing [sic] the Additions and Alterations Made to the Chart of Formosa during the Cruise of H.M.S. *Inflexible* (Commander Brooker) in Search of Missing Europeans," William Blackney, June 1858; Hydrographic Office archives, D3850 Shelf El.

17 Hydrographic Office archives, DS8807 Folio 17.

18 Mr. John W. Reed, 2nd Master R.N., 1855; Hydrographic Office archives, D1463 Shelf 35A.

Following standard procedures, surveyors and their assistants traversed back and forth across the region under investigation. Along broader expanses of coastal seas, or in areas where micro-surveying was deemed inappropriate or dangerous, this same criss-crossing survey was accomplished from the mother ship, as is seen in this quotation from Edward Belcher, captain of H.M.S. *Samarang*:

> The breeze deserted us on rounding the western dangers, and between these islands and the southern limit of Formosa, we were harassed by contrary currents and light baffling airs, reaching Botel Tobago on the 30th [of August 1845]. In this neighbourhood we continued to make many traverses, taking advantage of every change in order to cross the position assigned to Gadd's Rock, or Cumbrian Reef〔紅頭嶼附近的暗礁〕; but without noticing the slightest indication of ripple or breaker, sufficiently distinct to warrant the idea of a shoal. [19]

Cartographic documentation of this practice can also be seen in the draft charts of the *Saracen*, and British ships that surveyed Formosan waters some years later.

For more accurate surveying of coastlines and harbors, landing on shore was unavoidable. One of Collinson's assistant surveyors went on shore in Black Rock Bay 烏岸灣 on the east coast of Taiwan in 1845 to "take up a position to make a survey of the place." [20] Lt. David Gordon's surveys of northern Taiwan, especially that of Kelung harbor, were accomplished only by sending surveyors ashore. Gordon's inspection of coal pits in the region, perhaps the first European investigation of this resource, was accomplished on such a visit. [21] Because the ostensible purpose behind the expedition carried out by the *Inflexible* was locating and freeing any European captives on Taiwan, their presence on shore in the

19 Captain Edward Belcher, *Narrative of the Voyage of H.M.S. Samarang, during the Years 1843-46* (London: Reeve, Benham, and Reeve, 1848), vol. 2, p. 72.

20 Admiral Collinson's responses to Swinhoe's "Notes on the Island of Formosa," *Proceedings of the Royal Geographical Society* VIII (February 1864): 25. A very simple sketch of the coastline surrounding Black Rock Bay from that surveying work is included in the Hydrographic Office archives.

21 Lieut. [David MacDougal] Gordon, "Observations on Coal in the N. E. Part of the Island of Formosa," *Journal of the Royal Geographic Society of London* 19 (1849): 22-25.

summer of 1858 was inevitable. However, the multiple reports of this expedition, authored by Blackney, Brooker, and Swinhoe, show that surveys produced by the *Inflexible*'s crew also depended upon such visits. [22]

Sometimes this work on or near shore could be dangerous. Crew in a surveying boat dispatched from the *Dove* in 1865 were attacked near shore not far from South Cape.

> During the survey of Kwa-leang Bay 鵝鑾灣, the *Dove*'s gig was briskly attacked, and in less than ten minutes hit in twelve places, one man being wounded—the surveying party just escaped being cut off, and murdered. [23]

A similar attack was repeated in 1867, when a surveying party from H.M.S. *Sylvia* attempted to gather bearings and soundings off the southern tip of the island. [24] The threat of such a response was also experienced by crew from the *Inflexible* on the east coast near a spot (Lat 24° 6' 18") later given the name of Chock-e-day 擢其黎. [25] Violence was avoided, however, when a heavy surf prevented the gig from landing. These three incidents appear to be the only such violent attacks upon British naval crew members documented by British reports, despite the numerous landings at a variety of locations along Taiwan's long coast. The more common encounter was peaceful, as noted by Richards in 1855:

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22 Their reports of visiting Sau-o and Kelung are perhaps the most detailed. See Blackney, "Taï-wan, or Formoza [sic] Island," *The Mercantile Marine Magazine and Nautical Record* 6 (1859): 44-45, 85-86; Brooker, "Observations on Taï-wan or Formoza," pp. 565-566, 567-568; Brooker, "Journal of H.M.S. 'Inflexible' on a Visit to Formosa, in Search of Shipwrecked Seamen," *The Nautical Magazine and Naval Chronicle* 28.1 (January 1859): 7-8, and Swinhoe, "Narrative of a Visit to the Island of Formosa," *Journal of the North-China Branch of the Royal Asiatic Society* 1.2 (1859): 153-155, 157-159.

23 Master George Stanley, R.N., "Remarks on the Coast of Formosa between the South Cape and Takau-kon," p. 17; Hydrographic Office archives, M 17 / 13, included in OD 156, OD. CD.3 / 5.

24 Edward W. Brooker, H.M. surveying vessel *Sylvia*, 1867, "Remarks on the Coast of Formosa, and Islands and Dangers East of It," *Nautical Magazine and Naval Chronicle* 37. 4 (September 1868): 505.

25 For details, see the accounts of: Blackney, "Taï-wan, or Formoza [sic] Island," p. 44; and Swinhoe, "Narrative of a Visit to the Island of Formosa," pp. 151-152.

> Whenever we landed we were treated with the greatest civility and deference, and our surveying marks, although sometimes made of an article most tempting to them (white calico), were never in one case interfered with. [26]

Rowing close to the coast or landing on shore enabled surveyors and their assistants to post more detailed cartographic arguments onto their charts and plans. [27] A detail (Fig. 4) taken from the draft chart of Captain John Richards' survey of the southwest coast in 1855 provides one example. When captain and crew members visited Anping 安平 harbor and the surrounding region, they collected data on the configuration of mud flats, inner seas and channels between them, as well as coastal sand dunes and cultivated fields nearby.

Fig. 4 Detail from "Formosa Island. West coast. From West Point〔國聖港北邊的山丘〕to Apes Hill 猴山" [28]

Where those details did matter, however, surveys done on land did produce

26 John Richards, "Harbours of Kok-si-kon and Taku-kon at the South-West End of Taïwan or Formosa," *The Nautical Magazine and Naval Chronicle* (1855): 373. The locals referenced here were fishermen residing on the sandbanks off Kok-si-kon and Anping.

27 For an in-depth discussion of postings and cartographic propositions, see Denis Wood, *Rethinking the Power of Maps* (New York: Guilford Press, 2010).

28 Draft survey, John Richards, H.M.S. *Saracen*; Hydrographic Office archives, D1464 Shelf 35a.

exceptional knowledge of some places. Blackney's draft chart of the coastal region of Kilung (Kelung) harbor (a detail of which can be seen in Fig. 5), completed in 1858, demonstrates that fact. In addition to the foundational water depth measurements provided on all charts and harbor plans, Blackney gave topographical contour data, altitudes for the major peaks, locations for local settlements, and a detailed sketch of coral reefs and rocks along the shoreline of each island in Kelung harbor.

Although this chart does not depict the settlement at Anping (nor the city of Taiwanfu 臺灣府) with any accuracy, this can be explained by the crew's limited access to Anping, and no time spent in Taiwanfu. Because these hydrographic surveys prioritized knowledge of coastlines, harbors, navigational dangers and anchorages, much less attention was given to geographical or topographical detail for inland areas.

Fig. 5 Detail from "China Sea. East Coast of Taïwan or Formoza. Kilung Harbour 雞籠港." [29]

A surveying activity that has received little attention in the historical literature, but which was essential to nineteenth-century maritime travel, is the

29 Draft harbor plan, drawn by Wm. Blackney, H.M.S. *Inflexible*; Hydrographic Office archives, D3841 Shelf Zu.

composition of landfall silhouettes, commonly known as "views."[30] Most charts and harbor plans for regions of East Asia produced by the British Admiralty include engravings of such views. The original versions were drawn by crew members designated for that work, though few if any had previously received any artistic training.[31] Sketched from the sea (normally from a distance), these views were intended to provide sea captains and their crews a unique and accurate view of landfall as seen from a safe distance. The example given here (Fig. 6), of Ape's Hill in Takau 打狗 harbor, is perhaps an exception both in terms of its close-up perspective and the artist's use of watercolors to create the image. When mechanically reproduced on published Admiralty charts, these landfall views were reduced in size, bleached of their color, and often relegated to the peripheries of these cartographic aids.

Fig. 6 Detail from "Ape Hill 猴山 N. 10 E. 1.7 mls."[32]

30 For a more detailed analysis of this type of visual representation of Taiwan, see my "Spotting Heights: Topographical Sketches and Panoramas in Nineteenth-Century Euroamerican Cartography of Taiwan," paper for "New Perspectives on Geographic Space: International Symposium on Historical Cartography," National Palace Museum, Taipei, Taiwan, 6-7 November 2008.

31 Though see *Eyes of the Admiralty: T. S. Serres, An Artist in the Channel Fleet, 1799-1800*, by M. K. Barritt (Greenwich: National Maritime Museum, 2008) for an exception to this general tendency.

32 View, Grandell, 1864 aboard H.M.S. *Swallow*; Hydrographic Office archives, "East Coast

IV. Local Knowledge

The preceding section may give one the impression that British surveying activities were conducted independent of local assistance or knowledge, but that would be a mistaken inference to make. Although there are fewer references to encounters between British crew members and local residents or Chinese officials stationed on the island in the sources I have analyzed,[33] one can construct a general picture of the nature of British reliance upon local knowledge when conducting hydrographic investigations.

In 1845, when Richard Collinson reported the results of his survey of the Pescadores archipelago, he noted that vessels seeking to navigate the northern passage between Fisher's Island and Panghu 澎湖 Island should hire a local pilot to guide them around the dangers in that channel. Charles Bullock, commander of H.M.S. *Serpent*, repeated a similar warning two decades later, when he advised ship captains to hire a local pilot to navigate foreign vessels across the bar at Tamsui harbor. Though the records left by these two captains of British surveying vessels do not document their own use of such local seamen as pilots, reports from other surveying expeditions do testify to such assistance. The incidence of employing local pilots is greatest for the *Inflexible*, perhaps because that British naval vessel circumnavigated the island of Taiwan (in 1858), while other Admiralty vessels were given the task of surveying only portions of the Formosan coast. Published reports and documents in the Hydrographic Office archives show that Commander Brooker or his crew used local fishermen as pilots to enter the ports at Anping (actually Lok-he-mung 鹿耳門) and to cross the surf and enter the Kaleewan River 加禮宛河 on the northeast coast. Furthermore, the *Inflexible*

of Asia," vol. II, 5A, p. 25.

33 Although I have used the relevant remarks books from the Hydrographic Office archives for this, I have not yet examined the ship logs for British Admiralty vessels, as those records were housed at a separate depository. Based on my knowledge of American naval ship logs, it is possible that additional information may be found in this source.

relied on local fishermen for knowledge of the sandbanks off the west coast near Kok-si-kon and for safe passage into Sau-o Bay. When the *Saracen* surveyed Kok-si-kon in 1855, a local pilot was employed to guide entry into the inner harbor area. H.M.S. *Dove*'s captain, G. Stanley, also hired a Taiwanese fisherman to gain access to the inner harbor at Takow in 1865. I suspect this is hardly a complete record of British reliance on local nautical knowledge during the period under study.

When orders from the Admiralty included the investigation of inland regions, local guides often were deemed necessary. In his report on the coal fields in northern Taiwan, Lt. D. M. Gordon remarked on the use of "Chinamen" as guides. Village headmen near Lung-keaou Bay 琅璚灣 pointed out "Kwei-tsei-luh 龜仔角" settlements for crew of the *Salamander* who were surveying hill country at the southern tip of Formosa in 1851.[34] Before Captain Brooker left Amoy 廈門 in 1858, he hired a "Chinese messenger" who had previously traveled through towns and the countryside in southwest Taiwan to assist the *Inflexible* in locating possible news of Europeans held captive on the island.[35] However, when Brooker and crew members, including Robert Swinhoe (his translator), explored the sulphur mines in northern Taiwan, the captain hired a local guide to lead the way.

Documents also indicate that local informants were sources for other knowledge that found its way onto surveyors' charts or into their reports and sailing directions. Nearly all captains and commanders of these British surveying ships mention Chinese junks and their use (or disuse) of specific coastal ports. Many surveying reports mention the residences and activities of local fishermen

34 "Salamander's Visit to Formosa," *The Nautical Magazine and Naval Chronicle* 20 (October 1851): 525.

35 It is possible that this "messenger" was the Xiamen 廈門 resident called "Urian" or "Oo-sian" who assisted with the recovery of the survivors of the *Larpent* shipwreck. For information on his journey to the Pescadores and Taiwan, see Urian, "Translation of a Report by Urian, Who Was Sent to Formosa by the United States Consul at Amoy, to Search for Missing Europeans," *The Nautical Magazine and Naval Chronicle* 28.1 (January 1859): 9-11. A record of that itinerary is also given in the Timeline section of my digital library, "Formosa: Nineteenth Century Images" (http://cdm.reed.edu/cdm4/formosa/).

(and in one case fisherwomen), and, as I noted above, some of these instances cite local fishermen as informants and/or as pilots. Chw. T. Brooker and some of his crew from the *Inflexible* visited a village near Pongli to interview a local strongman, "Bancheong," believed to have knowledge of European shipwrecks off the southwestern coast.[36] E. W. Brooker, captain of the *Sylvia*, spoke with residents of Samasana 火燒島 Island in 1867 to expand his knowledge of that region, as well as previous encounters of the island's residents with European vessels. The draft charts and plans in the Hydrographic Office archives are filled with local place names, and many of these charts and plans contain Chinese characters in addition to romanized versions of those names. However, we don't know who provided this linguistic expertise nor at what stage in the drafting process these additions were made.[37] The most likely sources for this local geographical knowledge are local residents, village headmen, or guides hired by ship captains. Officers of British naval vessels did communicate with British consular officials whenever they stopped in Hong Kong or docked at designated treaty ports in Taiwan and south China. In some instances, they also conferred with Qing officials on Taiwan. It is possible that some of this linguistic expertise was provided by these officials or by translators on their staffs.

European traders in the region were another source for some knowledge of Formosan geographical data and hydrographic information, even prior to 1860, when designated ports on Taiwan were opened for international trade. Chw. T. Brooker's reports of the *Inflexible*'s expedition mention discussions with a Mr. Rooney,[38] who had placed a receiving ship inside Takow harbor to store

36 This local strongman was Lin Wanzhang. See Brooker's report, "Journal of H.M.S. 'Inflexible' on a Visit to Formosa, in Search of Shipwrecked Seamen," *The Nautical Magazine and Naval Chronicle* 28.1 (January 1859): 4-5. In 1851 Lin had assisted Captain Ellman of the *Salamander* by sending Lin Tsieh with the ship to explain its purposes to village headman in Lung-keaou Bay. See "Salamander's visit to Formosa," p. 524.

37 Some place names do evoke an earlier era of European cartography and show the influence of Dutch names for Taiwan places.

38 In Alexander Christie's memoir of his travels in East Asia, he calls Rooney an Irish-

goods he was importing and exporting from that harbor. From these reports, it is clear that Brooker relied on Rooney for knowledge of the course of the Tamsui River, and Chinese towns along that river in northern Taiwan, as well as for the location of a safe harbor near South Cape, which the *Inflexible* later used.[39] If one systematically analyzed the letters of ship captains and surveyors, as well as all of the official and private communications of consular officials and commanders of the British naval station at Hong Kong, additional information on non-Chinese sources for hydrographic or geographic knowledge of Taiwan would, no doubt, appear.

V. Reporting Results

Based on the materials that I have examined,[40] the standard practice of reporting survey results to the British Admiralty consisted of filing three types of materials:

a. the original official report of the survey expedition (OD series in the Hydrographic Office archives), separated into discrete geographical segments.
b. the draft charts, plans and views produced by the surveyor and his assistants, which were sometimes supplemented by a chart of the track made by the surveying ship.
c. the ship commander's remark book.[41]

American. See *A Cruise in an Opium Clipper* (London: Chapman and Hall, 1891), p. 52.

39 Brooker, "Journal of H.M.S. 'Inflexible' on a Visit to Formosa," p. 4; "Remarks on the South & Eastern Coasts of Taiwan or Formosa, Made during the Visit of H.M.S. *Inflexible*, Commander Brooker, in Search of Missing Europeans," p. 54; Hydrographic Office archives, M 13 / 15; "Tracing Shewing [sic] the Additions and Alterations."

40 My analysis is incomplete for the first two decades of these activities, as early surveys were conducted by surveyors of the British East India Company and most of those records are located in the British Library.

41 Alexander Dalrymple was instrumental in establishing remark books as a record kept by all H.M. ships as early as 1804. See G. S. Ritchie, *The Admiralty Chart*, p. 93.

In addition, commanders of surveying expeditions often wrote letters to their superior officers in the Admiralty. This latter type of document dealt primarily with miscellaneous and/or mundane matters. None of the letters I examined contained any substantive information regarding the content of the hydrographic survey activities conducted in Taiwan. [42]

It often took three to seven months for these original survey materials to be sent from survey ships to the Hydrographic Office in England. [43] It is uncertain when these original charts and plans were drafted by official surveyors, though it is likely that they were completed not long after the detailed data (soundings, bearings, coastline terrain, etc.) had been collected. In the case of William Blackney of the *Inflexible* survey expedition, because he was loaned from another surveying vessel, it is possible that some of the final drafting of his charts and plans were carried out after he had returned to his mother ship. This interim delay may have occurred also in the production of landfall views, in particular views painted with watercolors.

Once these original documents had been received by the Hydrographic Office, they were indexed and filed for use in preparing sailing directions and official Admiralty charts. The indexing of remark books and the preparing of sailing directions was initiated by W. E. Parry, who succeeded Thomas Hurd as Admiralty Hydrographer in 1823 and remained in that position till 1829. Already in 1809, Hurd, Parry's predecessor, had established the dissemination of chart boxes to vessels of the British Admiralty, as well as the system by which those boxes would be returned, inspected and replenished with new or additional charts

42 I examined letters written by Beechey, Collinson, Belcher, Gordon, Richards, Brooker and Wilds, each for the years of their respective surveys of Taiwan. None of these letters contained substantive information regarding the surveys or encounters with Euroamericans or Chinese along the way. I suspect that more useful information will be found in ship logs and other official communication contained in the British National Archives, which I have not yet examined.

43 This dating is based on a comparison of the dates of surveying activities and the date of receipt by the Hydrographic Office, stamped on draft charts, plans and views in the Hydrographic Office archives.

whenever ships changed their official naval stations.[44] However, a considerable amount of time might lapse between the receipt of original survey reports and hydrographic documents and the subsequent dissemination of a new or revised Admiralty chart or harbor plan to the Admiralty's fleet of ships.[45] In the meantime, when nautical dangers along prominent shipping lanes were significant, warnings to mariners were often issued in the relevant regional journals, such as the *Hongkong Register*.

It would appear that the networks involved in the reporting of survey results were rather circumscribed. Commanders and crew of British surveying vessels may have reported some of their results to the commander of the naval station to which they were attached. Subsequently their draft charts, plans, views, and remark books would have been transferred to the Hydrographic Office of the British Admiralty within a few months. Perhaps this transfer process involved an additional British naval vessel, in particular when surveying ships were dispatched to a new maritime region. However, in most instances, it is unlikely that the substance of their surveying results would have been shared with anyone outside of official channels.

However, ship captains did share some of their draft charts or surveying knowledge with private ships owned by British merchants or vessels owned and commanded by other European or American nationals. An oblique reference in one British naval captain's travel report suggests such sharing may have been practiced, if only infrequently:

> At daylight proceeded up the river under steam, and with the help of a tracing of Capt. Bate's survey, which he was good enough to give me before we left Hong-Kong, found no difficulty, although it is evident that the shoal south

44 See Ritchie, *The Admiralty Chart*, p. 159 and p. 98, respectively for these two innovations and their dates.

45 For example, while the surveys of Collinson and Gordon had been conducted in 1844-45 and 1846, respectively, the first official Admiralty chart of the island of Formosa and the Pescadores was not published until April 1850. See Admiralty Chart No. 1968, "Formosa Island, the North and East Coasts."

> of the entrance of the river has extended considerably since the survey was made. [46]

Testimony from Robert Swinhoe, when he was serving as British consul stationed in southern Taiwan at Takow, confirms that tracings of original charts and harbor plans were shared by commanders of surveying vessels with British diplomatic personnel.

> Mr. Stanley, commanding the *Dove*, has kindly given me a tracing of the Takow chart for my office, and Mr. Wilds has promised me similar tracings of the south and north coast, and Formosa Channel 臺灣海峽. The chart of Takow is an excellent piece of work, and shows that no labour has been spared to ensure its correctness. It comprises, besides the harbour, the approach from the sea. [47]

VI. Publishing Official Charts and Plans

The work of integrating new hydrographic data received from surveying vessels in order to compile official sailing directions and Admiralty charts was conducted by staff in the Hydrographic Office in England. Their compilations might appear in a variety of formats:

1. official Admiralty charts and harbor plans.
2. sailing directions and related nautical information, published in the *India Directory*, the *China Pilot* (and later, the *China Directory*).
3. warnings to mariners, and sailing directions published in journals subsidized by the Admiralty, such as the *Hongkong Register* and *The Nautical Magazine and Naval Chronicle.* [48]

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46 Commander P. Cracroft, "Notes on a Voyage to China in Her Majesty's Late Screw Steamer *Reynard*," *Nautical Magazine and Naval Chronicle* 21.10 (Oct. 1852): 520.

47 Robert Swinhoe, "Additional Notes on Formosa," *Proceedings of the Royal Geographical Society of London* 10 (1866): 128.

48 The *Nautical Magazine*, subsidized by the Admiralty and the Mercantile Marine Fund, was first published in 1832 under the direction of the Admiralty's hydrographer. It initially served to disseminate "notices to mariners," but later this work was taken over by the

In addition to these official publications, ship captains, official surveyors and sometimes other members of a vessel's crew did publish travel reports in journals or magazines, some of which were published in Hong Kong or in the treaty ports in China. Much later in time, some individuals responsible for these surveying activities also published memoirs of their naval career, in which revised versions of their travel reports and hydrographic charts or harbor plans might be included.

In order to see how this process worked in the case of the early surveys of Formosan waters, let me use the expedition carried out in 1858 by H.M.S. *Inflexible*, commanded by Captain Chw. T. Brooker, as an example. Taiwan and the southern Pescadores Islands were only a small part of the *Inflexible*'s larger surveying expedition, but the *Inflexible* was also the only Admiralty vessel to circumnavigate and survey the entire coastline of Taiwan prior to 1867. On the other hand, less than one month was allotted for this complex survey work: from 8 June to 1 July 1858. Although the ostensible purpose behind the *Inflexible*'s visit to Taiwan was to search for European captives rumored to be working in the island's sulphur mines, Captain Brooker specifically borrowed an official surveyor, William Blackney, from H.M.S. *Actaeon* before he left Amoy. Thus, surveying activities were intended as part of the *Inflexible*'s mission from the very beginning.

Several original documents were compiled by the captain and crew of the *Inflexible* on this expedition:

1. Brooker's remark book: "Remarks on the South & Eastern Coasts of Taiwan or Formosa, Made during the Visit of H.M.S. *Inflexible*, Commander Brooker, in Search of Missing Europeans."
2. a "Tracing Shewing [sic] the Additions and Alterations Made to the Chart of Formosa during the Cruise of H.M.S. *Inflexible*."
3. draft harbor plans of Kelung harbour and Sau-o Bay, both in two, slightly different versions.
4. landfall views, sketched by William Blackney.

official publications of the Hydrographic Office. See Ritchie, *The Admiralty Chart*, p. 193.

All of these items were received by the Hydrographic Office by 22 November 1858, though some materials had arrived nearly two months earlier.

Within a year, reports of the visit were published by Captain Brooker, William Blackney (the surveyor) and Robert Swinhoe (the ship's interpreter). Brooker's "Observations on Taï-wan or Formoza" and "Journal of H.M.S. 'Inflexible' on a Visit to Formosa, in Search of Shipwrecked Seamen" appeared in the *Nautical Magazine and Naval Chronicle*, while Blackney's less detailed report was published in *The Mercantile Marine Magazine and Nautical Record*. Both of these publications were closely affiliated with the Hydrographic Office. Swinhoe's "Narrative of a Visit to the Island of Formosa" was the exception, for it was published in China by the treaty-port magazine, *Journal of the North-China Branch of the Royal Asiatic Society*. Considered together, this publishing record indicates that early results of the survey of Taiwan's coastline and selected harbors reached an audience beyond the narrow maritime network of British naval officers and captains of British merchant vessels to include their non-British counterparts in the American, French and (perhaps) German naval and merchant communities. Furthermore, Swinhoe's article made details of the surveying mission available to a broader public, after Swinhoe had reported in person to that branch of the *Royal Asiatic Society* in Shanghai. Consular staff from the European and American nations with consulates in China also read at least some of these published reports from the *Inflexible*'s Formosan survey.

Official Hydrographic Office publications that incorporated the survey data from the *Inflexible*'s 1858 visit to Taiwan were disseminated somewhat later. Surprisingly, none of the Admiralty Charts or harbor plans specifically cite the *Inflexible* or Capt. Chw. T. Brooker as its source for hydrographic data, whether it be information regarding the harbors of Kelung, the bay of Sau-o or the coastline surrounding the island. Perhaps this can be explained by the relative compression in the interval between the *Inflexible*'s mission and subsequent British surveys, or by the dates on which charts and harbor plans for this region in East Asia were

disseminated relative to these various surveys.[49] The one official source that does specifically cite hydrographic information from the *Inflexible*'s survey is the third edition of *The China Pilot* of 1861, yet Blackney is the only person from the crew cited by name in this work.[50]

If each hydrographic survey impacted the production of Admiralty charts and publications in different ways, the importance of these individual surveys upon the work of subsequent hydrographic investigations cannot be denied. Early in the history of British surveying in Formosan waters, Belcher, commander of the *Samarang*, which visited Botel Tobago in 1843 and 1845, cited the data collected by Daniel Ross in 1817. Thereafter, nearly every captain cited the surveys of their immediate predecessor. Collinson referred to Horsburgh's chart and directory; Chw. T. Brooker cited Richards' longitude readings, plans, charts and surveys; Stanley, captain of the *Dove*, referenced previous charts of the west coast of Taiwan in his reports; Charles Bullock compared his surveys with extant charts of the Formosa Channel and Sau-o harbor; and E. W. Brooker, captain of the *Sylvia*, cited D. M. Gordon's surveys of the northern coastline and of Tamsui harbor. It is impossible to tell whether *each* of these ship captains was using tracings from original charts and plans drafted by their predecessors or whether their chart boxes had been replenished with newly published versions of Admiralty Charts. However, such reference to specific surveyor, combined with the existence in Hydrographic Office archives of published charts with penned in corrections, associated with individual survey missions, suggests that published charts and

49 In addition, I have not yet found an original copy of the first edition of Admiralty Chart No. 2376, "China Sea: Harbours in Formosa," which is cited in *The China Pilot*, 3rd edition. This chart contained a plan of Sau-o Bay, and hydrographic information for that plan had to come either from Collinson and the *Plover* (1845) or from the visit of the *Inflexible* (1858).

50 *The China Pilot: The Coasts of China, Korea, and Tartary; the Sea of Japan, Gulfs of Tartary and Amur, and Sea of Okhotsk; Babyan, Bashi, Formosa, Meiaco-sima, Lu-chu, Ladrones, Bonin, Japan, Saghalin, and Kuril Islands*, compiled from various sources by John W. King, Master, R.N., Third edition (London: Hydrographic Office, Admiralty, 1861). Blackney's surveying activities in Formosan waters is cited on pages 279, 280, 282, and 292.

tracings of original drafts were available during official survey missions. Because compilers of *published* charts often reduced the detail of information originally collected by surveyors and their assistants, survey vessel commanders and their crews needed the more complex hydrographic data found in those original materials. Thus, the intercommunication between various survey missions tended to be intensive and never limited to the data collected by a survey ship's most recent predecessor.

VII. The Reach of This New Knowledge

According to data collected from various primary documents, at least forty-six foreign vessels were recorded to have wrecked in the seas surrounding Taiwan or the Pescadores between 1842 and 1869;[51] though the actual number of foreign shipwrecks surely exceeded this amount. In 1868, a total of 111 foreign vessels (the majority of which were British ships) arrived and departed Tamsui and Kelung harbors, and during the same year, 131 foreign vessels (primarily North-German ships) entered the ports of Takow and Anping, while only 125 departed in that same period.[52] Surely this volume of trade and such high incidence of maritime disaster in Formosan waters was sufficient reason in diplomatic and commercial circles for conducting rapid and extensive hydrographic surveys in this maritime region of East Asia. However, that begs the question of how useful these British surveys of Formosan waters were to mariners sailing (or steaming) in the region.

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51 Most of the shipwreck data I have compiled can be accessed via a keyword search (using "wreck" in the Event field) on the Timeline function of my digital library, "Formosa: Nineteenth Century Images." I am aware that Tang Xiyong 湯熙勇 and his collaborators have compiled a more extensive database of shipwrecks in this region of East Asia, both for the nineteenth century and for earlier periods in Taiwan's maritime history. However, I did not have access to that database when writing this article.

52 This data comes from the relevant trade reports for this year, *Reports on Trade at the Treaty Ports in China for the Year 1868* (Shanghai: Customs' Press, 1869).

Admiralty charts went on sale to merchant fleets in 1823,[53] so availability of these published results to ship captains and other consumers in East Asia was only limited by factors related to the publishing enterprise: cost of the charts, the printing run and in-stock supply of any chart, as well as the ease of access to Admiralty publications so far from its headquarters in England.[54] Unfortunately, few merchant ship captains published journals of their maritime travels, and of those who did, few mentioned cartographic aids related to Taiwan or the Pescadores. It is from other, more official sources that I have obtained some references to these hydrographic materials related to Formosa.

When Ferdinand von Richthofen visited Tamsui briefly in 1860 as part of the Prussian expedition to East Asia, he cited "the English marine charts of the island and the separate chart of Tamsui harbor" when describing the northwest coast of Taiwan.[55] If this confirms my general assumption that European navies were careful to acquire current hydrographic survey data from rival nations, it doesn't tell us whether captains of "North-German" vessels sailing into Taiwan's ports used the same English marine charts. Though Robert Swinhoe had access to the more recent Admiralty chart of Sawo (Sau-o) Bay when he visited that harbor in May of 1865, his testimony merely demonstrates the sharing of information between diplomatic and naval divisions of the British government.[56]

A more detailed, yet also institutionally close, set of anecdotes comes from P. Cracroft, the commander of H.M.S. *Reynard*, which sailed from Great Britain to China in 1850, visiting only Killon (Kelung) in Formosan waters in early May of

53 Ritchie, *The Admiralty Chart*, p. 189.

54 At present, I lack specific information on each of these three factors for the time period and specific region covered by this.

55 Ferdinand von Richthofen, "Ueber den Gebirgsbau an der Nordküste von Formosa" [On the geological composition of Formosa's north coast], *Zeitschrift der Deutschen geologischen Gesellschaft* 2 (1860): 533; English translation by Tina Schneider available at "Formosa: Nineteenth Century Images," http://cdm.reed.edu/cdm4/document.php?CISOROOT=/formosa&CISOPTR=733&REC=2, accessed 1 May 2014.

56 Robert Swinhoe, "Additional Notes on Formosa," *Proceedings of the Royal Geographical Society of London* 10 (1866): 123.

that year. Interested in purchasing coal from the port, Cracroft had prepared for the visit by reading three different sources of information on Kelung's coal resources:

1. A memo from Chin-Siensang, a Chinese trader; this item was furnished by the British consul at Amoy.
2. Martin Montgomery's book on China: *China; Political, Commercial, and Social; in an Official Report to Her Majesty's Government* (London: J. Madden, 1847), vol. 1, p. 27.
3. Lieut. [David MacDougal] Gordon's report on the coal field: "Observations on Coal in the N.E. Part of the Island of Formosa," *Journal of the Royal Geographic Society of London* 19 (1849): 22-25.

Only the last item on this list was the product of official British hydrographic surveys. Gordon had examined the coal mines near Kelung in late September or early October 1846, when the Royalist remained in the harbor for twenty days.

In other sections of "Notes of a Voyage to China," Cracroft provides additional information on his sources for cartographic information necessary for sailing in Chinese waters. If these notes do not relate directly to Formosan coasts, harbors or coastal seas, they do hint at the importance of Admiralty charts, plans and sailing directions relative to other sources. When navigating the Min River 閩江 in Fujian 福建 in his steamship, prior to visiting Kelung, Cracroft revealed two of his most important sources:

1. "The Chinaman I have on board as a spy or informer, was once taken prisoner and detained here several weeks."[57]
2. "At daylight proceeded up the river under steam, and with the help of a tracing of Capt. Bate's survey, which he was good enough to give me before we left Hong-Kong, found no difficulty, although it is evident that the shoal south of the entrance of the river has extended considerably since the survey was made."[58]

Like any experienced ship captain, Cracroft was aware of the need to compare

57 P. Cracroft, "Notes on a Voyage to China," p. 520.

58 Ibid.

received information (whether it be the personal experience of a Chinese informant or the most recent chart completed by a British surveying ship) with actual conditions on site. On the other hand, Cracroft concluded that these received sources were essential when navigating in Chinese waters. However, in the very same passage where he praised this official British work, Cracroft also revealed additional, private sources for his hydrographic knowledge:

> How thankful every navigator of these seas ought to feel to Captain Collinson for his invaluable charts; the two dollars I invested in my copy of these rocks and dangers were amply repaid me last night. I shall take this opportunity of noting that all the charts of this coast by which the ship has been navigated since December, were either purchased by myself or were tracings of manuscript copies kindly lent us by the captains of opium ships.[59]

It is impossible to tell whether opium ship captains were drafting their own charts or merely sharing tracings from Admiralty charts that had come into their possession. Cracroft's record does suggest that the production of cartographic knowledge was a collaborative enterprise, not monopolized by the British Admiralty.

VIII. Conclusions

In the mid-1880s and later in the century, obtaining a set of British Admiralty charts of the coastlines, harbors, and seas in China and Formosa would not have been difficult. Among those charts and harbor plans, one would have found five maps devoted specifically to Formosan waters: a chart of the Pescadores Islands; a large-format chart of Formosa Island and the Formosa Strait; a set of harbor plans that included maps of Tamsui, Sau-o Bay, Port Kok-si-kon, and Port Ta-kau-kon; a chart specifically devoted to the west coast of Formosa and the Pescadores Channel, and a harbor plan of Kelung.[60] With the exception of one harbor plan in

59 P. Cracroft, "Notes on a Voyage to China," pp. 574-575.

60 These are, respectively, Admiralty Charts 1961, 1968, 2376, 2409 and 2618. The set that I have used contains many more maps of China's coasts, rivers, harbors, and seas. Today

this set (i.e., the map of Tamsui), all of the charts and plans and their inset landfall views were based primarily on the Admiralty surveys conducted prior to 1868. Thus, nineteenth-century British hydrographic knowledge concerning Formosa and the Pescadores was a product of the surveying activities analyzed in this article.

As the thumbnail of the 1886 edition of the map of Formosa Island and the Pescadores (Admiralty Chart No. 1968)[61] shown in Fig. 1 above indicates, this hydrographic knowledge consisted of a general outline of the coast of Formosa and the neighboring islands, the names (romanized) and locations of a substantive number of coastal towns and ports, altitudes and locations for the major mountains visible from the sea and altitudes and locations for prominent coastal hills, brief and scattered information on currents, and an intensity of sounding measurements for the northern and western coast of Formosa and the Pescadores. Regional charts of the Pescadores Islands and the west coast amplify the cartographic scale while adding more detail on coastal terrain and inland shoaling, and greater intensity of water depth measurements along the shores and among the islands of the Pescadores Archipelago. Harbor plans in this set are even larger in scale, and the detail on port facilities, sandbars, beacons and buoys, potential anchorages, and water depths is much greater. Landfall views, small in scale and often relegated to the peripheries of maps, are included on both charts and harbor plans. This comprises the content of the hydrographic knowledge of Formosa and the

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it is part of the collection at Cornell University, and it appears to have been produced as an atlas of hydrographic maps when it was published in the late 1880s.

61 Complete bibliographical data for this map includes the following: Admiralty Chart No. 1968, "Formosa Id. and Strait," compiled from the surveys of Captains Henry Kellett & R. Collinson, R.N., Lieut. M. Gordon, R.N., J. Richards, E. Wilds and G. Stanley, Masters, R.N., 1867; additions by Commd. Brooker, R.N. 1868; magnetic variation in 1883; additions to the topography of Formosa from a map compiled by Gen. Chs. W. Le Gendre, U.S. Consul, Amoy & Formosa, 1870. Annotations at the bottom of the map include: "London. Published at the Admiralty Augt. 15th 1867 under the superintendence of Captain G. H. Richards, R.N. F.R.S. Hydrographer. Large corrections Feby. 1873, July '81, June 1886." Given these dates, it had to be published in 1886 or after that date.

Pescadores represented in the Admiralty's published charts by 1868.

However, this data was not the extent of the hydrographic knowledge of this region produced by British naval surveys prior to 1868. There were many draft charts, harbor plans, and landfall views in the Hydrographic Office files that were not reproduced in all of their complexity when this data was incorporated into published Admiralty charts. For example, while the published chart of the west coast of Formosa was one rectangular map, draft charts from on-site surveys divided that coast into three separate segments, and the detail of each was greater than the whole of the published chart, "West Coast of Formosa and Pescadores Channel," of 1869.[62] Harbor plans drafted by the surveyors and crew of the *Serpent* in 1866 and the *Sylvia* in 1867 were far more detailed in their water depth soundings and coastline terrain than the published plans of Tamsui harbor, Kelung harbor, and Sau-o Bay. Landfall views drawn by crew members of the *Swallow* and the *Sylvia* were far greater in number than those found on the published charts and plans, and the aesthetic beauty of watercolor views was never reproduced in the printed Admiralty charts. Sailing directions included in the various new editions of *The China Pilot* were often updated, but anyone who has compared different editions of that maritime manual is reminded of the repetition found in respective editions of Chinese gazetteers for the same district or prefecture. The new details on coasts, harbors, islands, rocks and reefs, and channels included in captains' remark books were never fully incorporated in revised editions of *The China Pilot*.

When considered as a whole body of knowledge (i.e., both draft data and published charts, plans and views), British Admiralty hydrographic mappings of Formosa and the Pescadores were limited in both scope and content. Only a small number of Taiwan's ports were included in the harbor plans—primarily the ports

62 The British Library contains this edition, published in 1869, based on data collected by Collinson (1844), Richards (1855), Wilds (1865) and E. W. Brooker (1867) and others not cited. The geographical parameters of Admiralty Chart 2409 did change over time between its first printing in 1855 and the final chart of the mid-1880s; the earliest chart contained only the coastline from "Port Kok-si-kon to Ta-kau-kon."

opened by the Treaty of Tianjin 天津 and those ports deemed more suitable for European and American sailing vessels and steamships. On the other hand, Sau-o never became a prominent port of call for Euroamerican ships in the nineteenth century. Furthermore, Kok-si-kon had silted in as early as 1858, when the crew of the *Inflexible* noticed that Chinese junks had shifted from that port to Lok-he-mung, further south towards Anping. And of the four ports formally opened to foreign trade after 1860, Anping (often called the "roadstead off Taiwanfu") was never privileged with its own harbor plan in published Admiralty charts. Furthermore, given the constant attention to the locations of Chinese trading junks in captains' remark books and original documents, as well as the attention given to sea-going junks entering and leaving the harbors cited in the annual trade reports of the Chinese Maritime Customs Service, there is a surprising lack of hydrographic knowledge relevant to the junk trade across the Formosa Strait and along the coast of Taiwan.

There are more limits to this British hydrographic knowledge. Landfall views on Admiralty charts were seldom updated. If a ship captain encountered the coastline in a path that exactly replicated the course of the ship whose crew member drew the landfall view, it is possible that this visual data would help the captain find a "hidden" harbor. However, landfall silhouettes of the same coast or harbor entrance are multiple when viewed from different angles. This fact explains the various views of the southern tip of Taiwan, taken from different perspectives, that one can find in the Hydrographic Office archives. Other significant variations involve the silting in of island harbors, the shifting locations of sandbars across harbor entrances, and the changes in shoaling along coastlines, especially on the western coast of Taiwan. If corrections and alterations were made by successive British naval surveys, not all of this detail was incorporated into the published Admiralty charts.

What role did British seamen, cartographers and bureaucrats play in generating and sustaining a new imperial imaginary of China, as posited by James Hevia? Did this British hydrographic knowledge production create a new

understanding of Formosa, the Pescadores and the neighboring channels and seas? In one sense it did. For an armchair audience outside the region, and a readership who knew little about Formosa's existence, a careful reading of relevant sections of the 1874 edition of *The China Pilot* together with thoughtful analysis of all the published Admiralty charts would enable a new, though limited apprehension of Formosa. For the ship captain with ample maritime experience in the waters surrounding Formosa and the Pescadores, this hydrographic knowledge was only one part of a greater understanding of seas, harbors, currents, junks, pirates, winds, typhoons, etc. in the region. For foreign diplomatic personnel in the region or their superiors in Great Britain, these charts and plans contributed to the on-going production of a larger picture of the island, its geography (physical and human), its resources and trade potential, and (on occasion) its strategic importance to British interests in East Asia. However, when any local crisis erupted (such as the *Rover* shipwreck of 1867 or the bombardment of Anping in 1868 [63]), this body of knowledge was suddenly insufficient. Furthermore, a comparison of the romanized place names employed on the draft and published cartographic materials reveals the limitations of order and standardization attributed to this data.

Finally, the degree to which this hydrographic knowledge was produced independent of non-British sources is a matter more difficult to determine. Non-British maps contained in the Hydrographic Office archives and place names contained in the earlier charts show that British hydrographic charts were composed on a foundation created by earlier European cartographers, in particular the Dutch. American and French maps were also acknowledged in the textual and cartographic materials produced by British mapmakers. The very brief references to specific surveying practices that I have culled from the textual and visual sources *infers* that ship surveyors and their assistants did all of their work

63 For information on both events, see Charles Le Gendre, *Notes of Travel in Formosa*, Douglas Fix and John Shufelt, eds. (Tainan: National Museum of Taiwan History, 2012), pp. 149-155, and chapter 15.

independent of local assistance. On the other hand, my research has shown that local guides were employed to investigate coal mines, pilots were hired to enter harbors, and fishermen and junk captains provided valuable information about safe anchorages and nautical dangers. Some ships, such as the *Inflexible*, carried Chinese interpreters who had previously visited the island. Chinese officials and non-British mariners also provided information essential to some surveying missions. What is yet impossible for me to determine is just how often a local villager or fisherman assisted the surveyor and his assistants as they marked out distances along the coast or plumbed reefs, rocks and shoals in coastal waters or harbors. We can document instances of local input, but the nature of the sources —British documents that did not respect the contributions of local informants enough to consistently note their input, and the lack of relevant Chinese-language records—limits my ability to specify precisely the degree of local input. Anecdotal data found in mariners' published reports suggests that British hydrographic knowledge was not entirely British in its construction.[64]

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64 I wish to thank Philip Brown for suggesting a more accurate description of this limitation of source materials.

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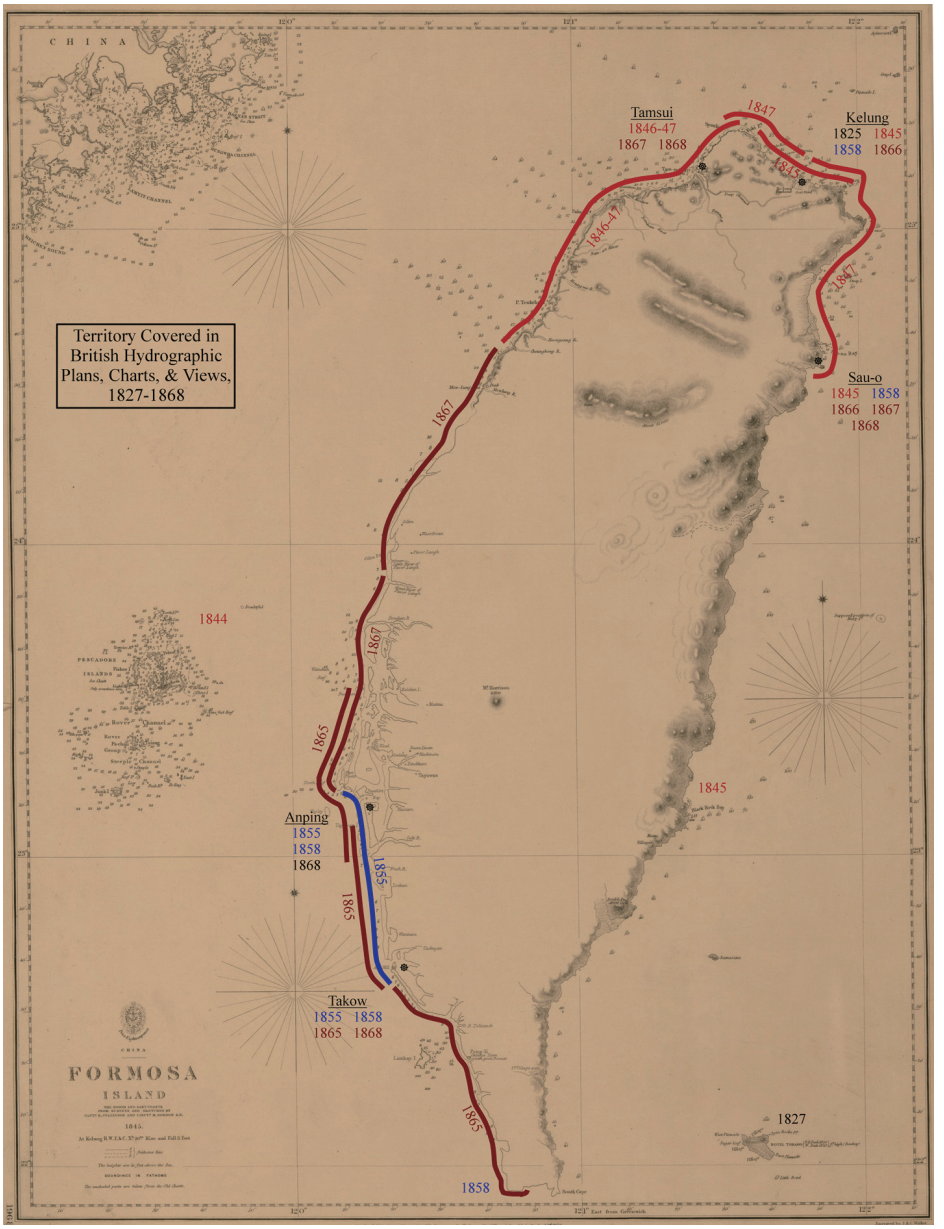
Appendix: Territory Covered in British Hydrographic Plans, Charts, & Views, 1827-1868



繪製福爾摩沙海域──英國海軍對臺灣港口、海域之測量，1817-1867

費 德 廉*

摘 要

1817-1867年間，英國東印度公司和英國海軍的軍官和水手，在臺灣沿海及澎湖海域進行了數次測量工作。由這些調查所產生的知識（例如海圖、港口詳圖、航行指南等）都被傳送至英國海軍部的海洋局，進行編目並作成交叉引用表、摘要、索引等。隨後，海洋局製圖人員再據以繪製一系列的官方地圖。隨著時間的推移，這些圖表資料即成為試圖航行臺灣水域的外國船長、商人、探險家和領事人員等所使用的標準權威了。

我以此測量活動作為個案研究，試圖檢驗英國外勤職員在製作清帝國人民和領土的綜合知識上所扮演的角色；亦欲探討建構臺灣海洋空間基本知識的英國測量師、藝術家和製圖家的調查對象與方法。同時探測由當地漁民、領港員、水手、通事及官員等所提供的知識，對英國外勤人員在製造圖表資料內容上有何影響。最後試圖分析地方層面的信息傳達給在英國「運算中心」的模式和網絡，而在該處又如何被容於大英帝國更大的綜合認識體內。

本文所使用的資料包括：英國海洋局檔案館所藏之海圖、港口詳圖、測量圖、登陸平面圖及補充文字資料，海洋局所出版有關臺灣、澎湖海域的海圖，在《印度指南》（1836）及《中國航海指南》（1855、1861、1864）所公布的航海訊息，以及由英國測量船的船長與水手所著的各種出版物。

關鍵詞：海域測量、英國海軍部、地圖、臺灣、澎湖

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