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"Mr George Thomas RN and the Ordnance, 1809-1850"

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Mr George Thomas RN and the Ordnance, 1809-1850

David L Walker

As a Master in the Royal Navy, George Thomas was lowly but not humble, and warranted but not commissioned. His relationship with the Ordnance was notable for its length, its mutual respect and its benefit to both parties. It started not with the Survey, but the destruction of fortifications in the Scheldt in 1809. Thomas used Ordnance positions as the basis for his surveys of the Thames Approaches, the Mersey and the East Coast, and conveyed Ordnance expeditions to Balta Island and Dunkirk. For the Shetland Islands, the Ordnance shared its trigonometrical observations only with Thomas. As his chart provided the only accurate map of the coastline, it was put to good use by the Ordnance from 1840 onwards, and used within its exhibit at the Great Exhibition of 1851.

The remarkable survival of Thomas's logbooks, calculations and correspondence has underpinned the writer's articles in *Sheetlines* and elsewhere. He wishes here to fill some gaps, to add some colourful details, and to include Thomas's talented son, FWL Thomas.

From the River Plate to the Scheldt

The son of an indigent tailor, George Thomas graduated from Christ's Hospital mathematical school in 1796. After ten years in the South Seas, he was captured off Montevideo in 1806 by a British frigate, commanded by Captain the Hon Duncombe Playdell Bouverie. Happily, Thomas's ability as a surveyor impressed Bouverie to the extent that he was warranted as Master in the frigate *Fisgard* only two years later.[1]

Under William Bolton and then Francis Mason, both captains known for their surveying experience, *Fisgard* in 1809 was one of the first vessels to arrive and in 1810 the last to leave in the ill-fated Scheldt expedition. Comprising no fewer than 27 ships of the line and 600 supporting vessels, and conveying 30,000 soldiers (outwards), it was within a few months defeated by poor leadership and the considerable loss of life from Walcheren fever.

Figure 1: Fortifications of Flushing Harbour as shown on Thomas's chart [2] in 1809.

[1] David Walker & Adrian Webb, *The Making of Mr George Thomas RN*, Mariners Mirror, May 2018.

[2] Thomas, George, *A New and correct chart of the Duerloo Channel*, UKHO, c53 press15b, 1809.

However, a recent study in the Netherlands is said to regard 'the prolonged, thorough demolition of the docks at Vlissingen' as more significant than the costly defeat, as it 'ended the emperor's use of an invasion threat to keep the British on the defensive.' [3] This demolition of the basin, arsenal and sea defences was carried out by an Ordnance party under Lt Col Robert Pilkington.[4] His officers included Edward Fanshaw, who as First Assistant Inspector of Fortifications from 1830 until 1850 was associated with Thomas Colby on various Ordnance committees. After the evacuation of the main force, these engineers were supported in the closing weeks of 1809 by Captain Mason's company in *Fisgard*, where the Ordnance could use Thomas's trigonometrical survey of Walcheren. This may have contributed to his later confidence in dealing with the Ordnance.[5]

His survey was the basis for the chart of the Duerloo Channel that he boldly submitted to the Secretary of the Admiralty Board in February 1810. Asked to advise 'whether Mr Thomas is competent to the making of such a chart', the Hydrographer advised that 'it is by far the best nautical survey that has made its appearance since his [Hurd's] appointment' and in April Thomas found himself appointed as Admiralty Surveyor in Home Waters.

Surveys of the Thames approaches

The shifting sands of the Thames approaches demanded the attention of the leading Admiralty hydrographers for many years. In 1804, Graeme Spence, the civilian hydrographer provided with an Admiralty vessel, completed a magnificent chart of the coastal waters from Clacton to Orford that was not immediately published. A law unto himself, Spence had observed his own triangles from Beachy Head to Orford Ness while the Ordnance was working over much of the same territory.

Oddly enough, the version of his chart held at the National Archives is a copy stamped by the Board of the Ordnance, copied by J Anderson and RE Scott, and rolled (all too tightly) with the one inch Ordnance map of Essex completed in the same year.[6] Its borders are lined by tiny pictures of inshore marks to guide navigators over hidden shoals (as exemplified in *figure 2*), pictures that are a tribute to the penmanship of the copyists, as well as to Spence working offshore.

Unlike Spence, Thomas chose to base his observations on the Ordnance triangulation, and his observations of the Naze Tower and Orford High Lighthouse from 'Mr Spence's station' on the troublesome Kentish Knock made him a joint author when his predecessors' surveys were at last published in 1812, albeit in diminished form.[7]

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[3] Review by Andrew Lambert of '*Military Power and the Dutch Republic, 1648-1813'* Leiden University Press, 2021, in The Mariners Mirror, Volume 109:3, August 2023, 370-372.

[4] Colonel Commandant of the Royal Engineers 1830 and Inspector-General of Fortifications (to whom both Lt Col Colby and Lt Col Fanshaw reported) 1832-34.

[5] *A Collection of Papers Relating to the Expedition to the Scheldt,* February 1810, [Google.play.books].

[6] TNA/MR 1/716/2 Map of the coast between Orford Ness and Jaywick, near Clacton, and of areas inland … Scale 2 inches to 1mile … surveyed by Graeme Spence, this copy by J Anderson and RE Scott 1804; TNA/MR 1/716/3 Four trimmed and joined sheets of [Ordnance Survey] map … between Bassingbourne, Orford Ness and Dulwich … Scale [1 inch to 1 mile} Engraved at the Tower. [1805]

[7] Malcolm Mackenzie jnr, Graeme Spence and George Thomas, *Survey of the Entrances or Channels into the River Thames*, UKHO, SVY/A/791a Shelf DI, 1812.

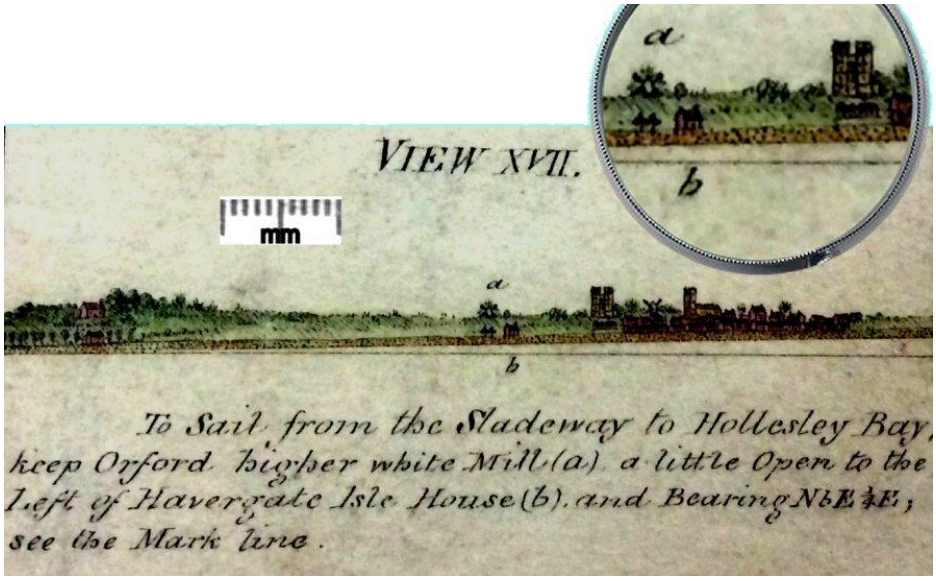

Figure 2 : Picture of leading marks near Orford (in the margin of Graeme Spence's chart).

In the footsteps of George Thomas

In the following year Thomas commissioned the purpose-built survey brig *Investigator* and was despatched to Great Yarmouth 'to report on the propriety of St Nicholas Gatt & Howle Passage for ships of the line'. He responded within a couple of months by completing a chart that shows soundings augmented by submarine contours, and detailed sailing directions relative to inland landmarks. The chart shows his trigonometrical points and there is a marginal scale of latitude (in nautical miles) but not of longitude. [8]

At this time the Ordnance triangulation had not progressed north of Orford into East Anglia, and it was not until 1824 that Thomas extended it northwards to intersect with the landmarks he had established in Lowestoft and Yarmouth. Many years later the writer walked between his home in Lowestoft, not far north of the High Lighthouse, and his junior school, near St Margaret's Church, and he likes to believe that his daily journeys retraced some of Thomas's footsteps.

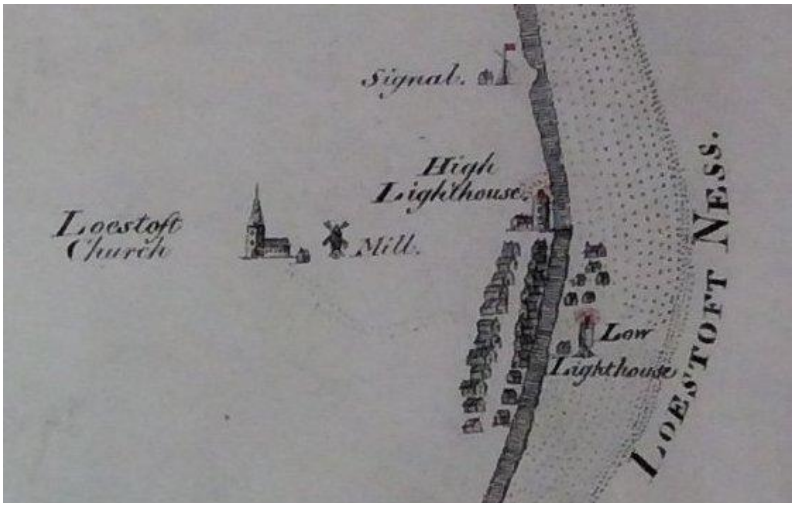

Figure 3 : North Lowestoft, showing George Thomas's trigonometrical points.

[8] TNA, ADM 12/146, Cut 68-1, 29 July and 18 Sept 1811; UKHO, chart A697 Of (ADM352/3616*), 'A Survey of the New Gateway into Yarmouth Roads*', by George Thomas, Royal Navy, November 1811.

The Mersey Estuary and the Firth of Forth

By 1813, when Thomas was sent to check the hydrographic survey of the Mersey Estuary, the Hydrographer had issued a firm directive to his surveyors that they should not spend time on establishing their own control where they could use the stations of the Trigonometrical Survey. Unlike his predecessor, Lt Evans, Thomas was again ready to adopt the Ordnance positions, well documented by Faden in 1811.[9]

As the Admiralty wanted a reliable chart to support improvements to the East Coast defences, Thomas was despatched in 1814-15 to chart the Firth of Forth. He used Ordnance positions intersected from Sayrs Law and Lumsdane thirty miles to the south and his chart now provides the frontispiece to the coastal section of the NLS maps website.

The expedition to Balta Sound

Colonel Mudge, who had acquired a high regard for George Thomas, [10] was expected to lead an Anglo-French expedition to be conveyed by Thomas to the Shetland Islands in 1817. When Colby had to take his place, antagonism developed that unfortunately thwarted its objectives. As this is reported in *Sheetlines*,[11] it suffices to add some details found since.

As the cramped accommodation provided for the gentlemen probably exacerbated the antagonism, its description is of interest. When commissioning, the Navy Board had accepted Thomas's request that 'in addition to the fire stove allowed for the after cabin of the Vessel, a second one be placed in the drawing room, as being in the centre of the vessel, and distant from all other communication.' [12] While the drawings of *Investigator* do not show the extent of this drawing room, they do show its skylight, 'as specified by Captain Hurd', extending over one sixth of the 75 ft length of the vessel'. This confirms that the five gentlemen enjoyed accommodation about 16 ft square in Thomas's 'drawing room' amidships across the main deck.

Subsequently the Navy Board, meticulous as always, added a note to the original plans of the *Investigator* to record that in 1815 the Plymouth dockyard, at the Master's request, had moved the water closet from the after cabin to the main deck.[13] Probably Thomas had foreseen that this would avoid giving up his own cabin to his passengers.

As an appreciative user of AHW Robinson's work, this writer regrets having to dissent from his remark that Thomas 'obviously learned much' from his association with Ordnance Survey officers.[14] As Thomas had already demonstrated his trigonometrical skills in 1809 (and made a good start on his survey of Balta Sound while Colby secured only a few primary stations), this judgement seems an exception to Robinson's usual grasp.

The excursion to Dunkirk

In autumn 1818 Thomas was again called upon to support comparisons between British and French observations of latitude, now planned to take place at the Dunkirk Arsenal, the northern extremity of the French arc of the meridian. William Mogg, appointed ln 1817 as

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[9] Michael Barritt, *Lieutenant Thomas Evans, Mr George Thomas and the survey of Liverpool,* Mariner's Mirror, 108:2, 116-233.

[10] UKHO, LB1, p 84, 22 Feb 1817

[11] David L Walker, 'Balta Sound and the figure of the earth', *Sheetlines* 99, April 2014, 5-17.

[12] TNA, ADM 106/1706, Masters letters 1808-1818, 28 March 1811.

[13] Royal Museums Greenwich, Caird Library, ships plans ZAZ 6604 and 6605.

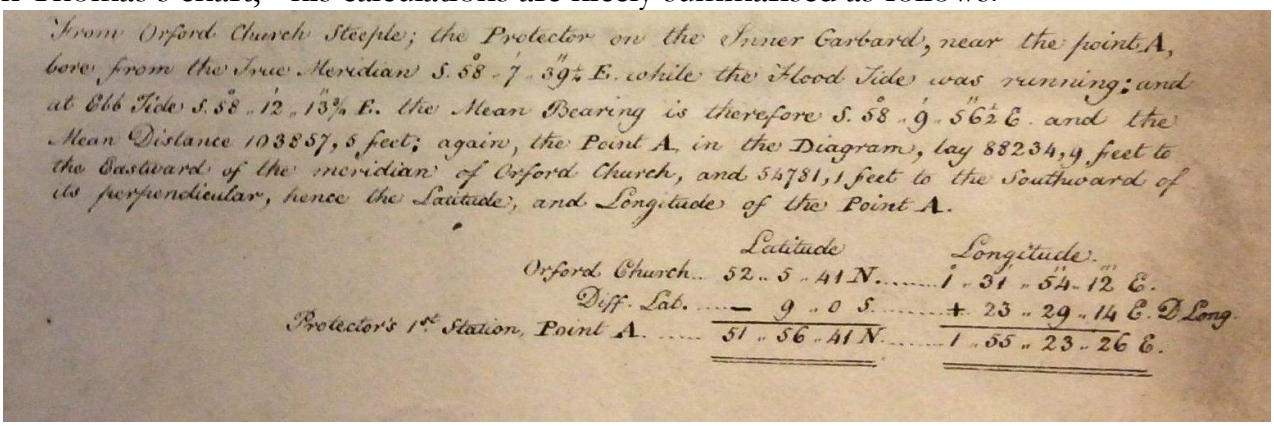
[14] AHW Robinson, *Marine Cartography in Britain*, Leicester UP, 1962.131.

Thomas's clerk, recalled that fires and lights had to be banned when *Investigator* conveyed Ramsden's precious zenith sector from Margate to Dunkirk.

Unusually honoured, Thomas and Mogg were conveyed by carriage to the Hotel du Nord where they were accommodated for a month. In independent mood, Thomas advised the Secretary to the Admiralty Board that, in accordance with his orders, he was 'now awaiting Colonel Mudge's instructions' and 'informing their Lordships at the same time of his proceedings.' According to Seymour's History, Colby and Biot again reacted like oil and water and its description of the expedition as 'partly abortive' seems overly optimistic compared with Portlock's lengthy apologia.[15]

The Inner Gabbard

In 1824 Thomas was ordered to survey the Inner Gabbard shoal, twenty miles offshore from Orford Ness. From the Ordnance points at Orford, Bawdsey, Aldeburgh and Hollesley Steeples, and using intermediate marks placed on *Investigator* and their two tenders, his triangles defined the position of Lt Hewett's vessel *Protector*, moored close to the shoal. On Thomas's chart,[16] his calculations are nicely summarised as follows:



From Orford Church Steeple; the Protector on the Inner Garbard, near the point A, bore from the True Meridian S. 88° 7′ 39″ E. while the Flood Tide was running: and at Ebb Tide S. 88° 12′ 13″ E. the Mean Bearing is therefore S. 88° 9′ 56″ E. and the Mean Distance 103857,5 feet; again, the Point A, in the Diagram, lay 88234,9 feet to the Eastward of the meridian of Orford Church, and 54781,1 feet to the Southward of its perpendicular, hence the Latitude, and Longitude of the Point A.

	Latitude	Longitude
Orford Church	52 ° 5 ′ 41 N.	1 ° 31 ′ 54 ″ 12 E.
Diff. Lat.	— 9 ′ 0 S.	+ 23 ′ 29 ″ 14 E. Diff Long.
Protector's 1st Station, Point A.	51 ° 56 ′ 41 N.	1 ° 55 ′ 23 ″ 26 E.

Figure 4 : Conclusion to Thomas's calculations of the position of Inner Gabbard shoal.

George Thomas's survey of the Shetland Islands

In 1825, and for many seasons thereafter, Thomas was despatched to survey first the Shetland Islands and then from 1835 the Orkney Islands. His trigonometrical framework is well documented and has been described in earlier papers in *Sheetlines*.[17] His baselines must have been secured from the Ordnance, first between the islands of Fair Isle and Foula, and then between Ben Clibrig and Ben Cheilt on the mainland. From these Thomas reworked the Ordnance principal triangulation and observed secondary triangles from Duncansby Head on the mainland to Out Stack, the northernmost rock of the Shetlands.[18]

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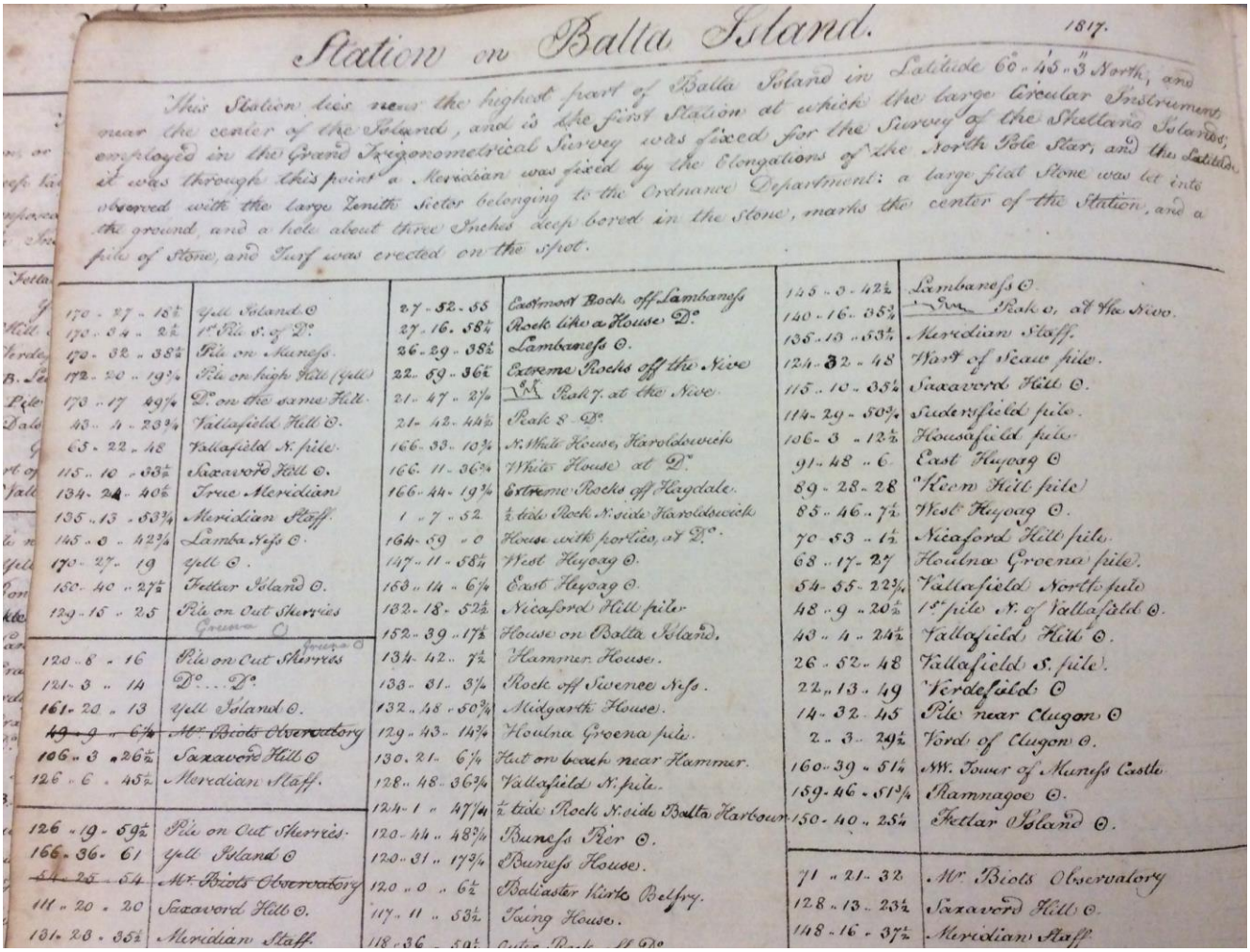
[15] William Mogg, *The Private Journal of William Mogg,* Southampton Univ MSS, MS 45 AO 183/1, chapter 4, 71; TNA, ADM 1/5055, 24 October 1818; Seymour ed, History of the Ordnance Survey, 30; JE Portlock*, Memoir of the Life of Maj-Gen Colby*, 1869, 97-105.

[16] G Thomas, *Relative positions of the Gabbard shoals…*, UKHO chart D809 Dg, 1824.

[17] David L Walker, 'An 1840 diagram of the Secondary Triangulation of N Scotland', *Sheetlines* 124, August 2022, 34-46.

[18] G Thomas, *Projection of triangles for the survey,* UKHO plan 530a Dr, 1827.

Thomas's survey book compiled in the Shetland Islands, recently re-discovered by Dr Adrian Webb, brings us much closer to George Thomas's coastal surveys.[19] It is interesting that two different approaches are documented here: 'hills down' by theodolite from a number of trig stations (like figure 5) and 'coast up' from a series of coastal points (like *figure 6*). *Figure 5* includes a description of Colby's first station on Balta Island. Although in 1817 Thomas was ordered to give priority to supporting the Ordnance, he managed to take observations from this station when Colby was engaged elsewhere. On the NLS website, many of his points are on Admiralty chart 116, Plan of Balta Sound, 1829.



Station on Balta Island. 1817.

This Station lies near the highest part of Balta Island in Latitude 60° 45' 3" North, and near the center of the Island, and is the first Station at which the large Circular Instrument employed in the Grand Trigonometrical Survey was fixed for the Survey of the Shetland Islands; it was through this point a Meridian was fixed by the Elongations of the North Pole Star, and the Latitude observed with the large Zenith Sector belonging to the Ordnance Department: a large flat Stone was let into the ground, and a hole about three Inches deep bored in the Stone, marks the center of the Station, and a pile of Stone, and Turf was erected on the spot.

170 - 27 - 15½	Yell Island ⊙	27 - 52 - 55	Eastmost Rock off Lambaness	145 - 3 - 42½	Lambaness ⊙
170 - 34 - 2½	1st Pile S. of D°	27 - 16 - 58¾	Rock like a House D°	140 - 16 - 35¾	Rock at the Neve
170 - 32 - 38½	Pile on Munes.	26 - 29 - 38½	Lambaness ⊙	135 - 13 - 53¾	Meridian Staff.
172 - 20 - 19¾	Pile on high Hill (Yell)	22 - 59 - 36½	Extreme Rocks off the Neve	124 - 32 - 48	West of Neaw pile.
173 - 17 - 49¾	D° on the same Hill	21 - 47 - 2½	Rock 7. at the Neve	115 - 10 - 35¼	Saxaverd Hill ⊙.
43 - 4 - 23¾	Vallafield Hill ⊙.	21 - 42 - 44½	Rock 8 D°	114 - 29 - 50¾	Sudersfield pile.
63 - 22 - 48	Vallafield N. pile.	166 - 33 - 10¾	N. White House, Haroldswick	106 - 3 - 12½	Housafield pile.
115 - 10 - 33½	Saxaverd Hill ⊙.	166 - 11 - 36¾	White House at D°	91 - 48 - 6	East Hyoag ⊙
134 - 24 - 40½	True Meridian	166 - 44 - 19¾	Extreme Rocks off Haydale.	89 - 28 - 28	Neem Hill pile
135 - 13 - 53¾	Meridian Staff.	1 - 7 - 52	½ tide Rock N. side Haroldswick	85 - 46 - 7½	West Hyoag ⊙.
145 - 3 - 42¾	Lamba Ness ⊙.	164 - 59 - 0	House with portico, at D°	70 - 53 - 1½	Nicaford Hill pile.
170 - 27 - 19	Yell ⊙.	147 - 11 - 58¼	West Hyoag ⊙.	68 - 17 - 27	Houlma Groena pile.
150 - 40 - 27½	Fetlar Island ⊙.	168 - 14 - 6¼	East Hyoag ⊙.	54 - 55 - 22¾	Vallafield North pile
129 - 15 - 25	Pile on Out Skerries	182 - 18 - 52½	Nicaford Hill pile	48 - 9 - 20½	1st pile N. of Vallafield ⊙.
	Grune ⊙	152 - 39 - 17½	House on Balta Island.	43 - 4 - 24½	Vallafield Hill ⊙.
120 - 8 - 16	Pile on Out Skerries	134 - 42 - 7½	Hammer House.	26 - 52 - 48	Vallafield S. pile.
121 - 3 - 14	D° D°	133 - 31 - 3¼	Rock off Sivence Ness.	22 - 13 - 49	Verdesfield ⊙
161 - 20 - 13	Yell Island ⊙.	132 - 48 - 50¾	Midgarth House.	14 - 32 - 45	Pile near Clugon ⊙
~~49 - 9 - 6¼~~	~~Mr Biots Observatory~~	129 - 43 - 14¾	Houlma Groena pile.	2 - 3 - 29½	Yord of Clugon ⊙.
106 - 3 - 26½	Saxaverd Hill ⊙	130 - 21 - 6¼	Hut on beach near Hammer.	160 - 39 - 51¼	NW. Tower of Munes Castle
126 - 6 - 45½	Meridian Staff.	128 - 48 - 36¾	Vallafield N. pile.	159 - 46 - 51¾	Rammagoe ⊙.
		124 - 1 - 47¼	½ tide Rock N. side Balta Harbour	150 - 40 - 25¼	Fetlar Island ⊙.
126 - 19 - 59½	Pile on Out Skerries	120 - 44 - 48¾	Buness Pier ⊙.		
166 - 36 - 61	Yell Island ⊙	120 - 31 - 17¾	Buness House.	71 - 21 - 32	Mr Biots Observatory
~~54 - 25 - 64~~	~~Mr Biots Observatory~~	120 - 0 - 6½	Baliasta Kirk Belfry.	128 - 13 - 23½	Saxaverd Hill ⊙.
111 - 20 - 20	Saxaverd Hill ⊙.	117 - 11 - 53½	Twing House.	148 - 16 - 37½	Meridian Staff
131 - 28 - 35½	Meridian Staff	118 - 36 - 50½	Outer Rock N. side D°		

Figure 5 : Observations tabulated by George Thomas at Ordnance station on Balta Island (truncated).

However most of the observations in Thomas's survey book were recorded after he returned to Shetland in 1825. For Balta Sound, as well as observations from Colby's station on Balta Island, these included numerous observations from stations around the Sound.

Figure 6 shows the 'coast up' approach on Muckle Roe, with compass bearings taken from Thomas's cairns and other coastal landmarks. These include some, but not many, observations of the secondary stations referred to above and other points that can be located on the NLS website on Thomas's Admiralty chart 1118 and, at a larger scale, 1122.

[19] G Thomas, *Triangulation Data Book No 87*, UKHO, SFD 9/55/1, 1828-34.

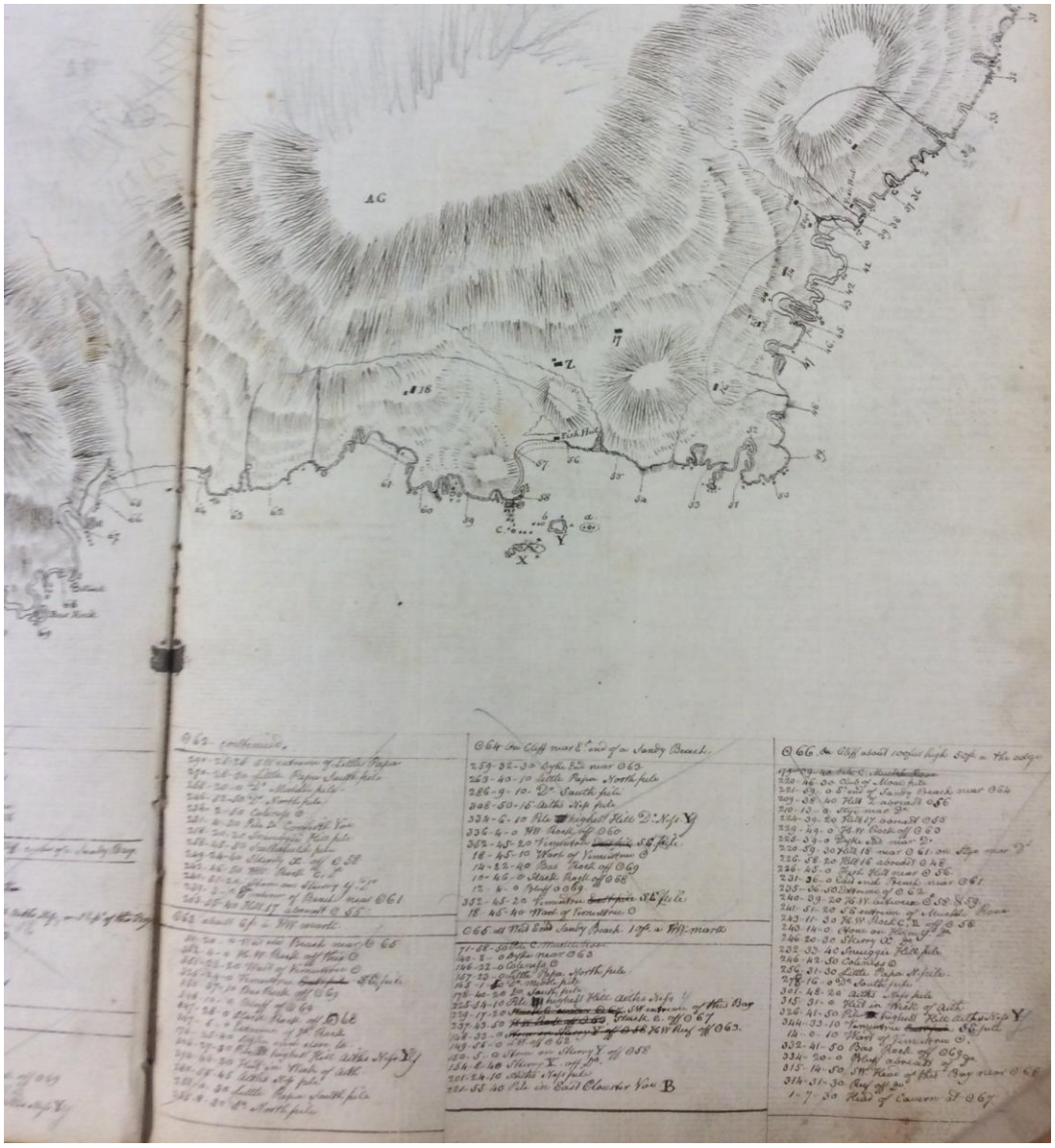


Figure 6 : Muckle Roe: coastal points located by compass bearings 'upwards'.

The representation of the trigonometrical surveys of Great Britain after 1840

As topographical survey necessarily lags behind trigonometrical survey, it may be difficult to draft an accurate coastline for trigonometrical diagrams. But this was little excuse for the completely inappropriate choice of Bowles's map of Scotland for the diagram prepared in 1834 in response to an Ordnance internal investigation into the progress of the survey.[20]

In 1840 Lt Col Colby, in response to Lt Col Fanshaw, did much better by adopting a Scottish coastline apparently taken from the 1807 map by Aaron Arrowsmith, whose superb documentation is in the Society archives.[21] But Arrowsmith's map was lacking the coastline of the Shetland Islands, and for this the Ordnance wisely used the chart by Mr George Thomas published in 1838, as demonstrated in *figures 7 to 9*.

[20] David L Walker, 'The Initial Triangulation of Scotland', *Sheetlines* 98, December 2013, 5-15.

[21] Aaron Arrowsmith, *Memoir relative to … the map of Scotland*, 1809, CCS/OS/379/7; David L Walker, 'An 1840 Diagram of the Secondary Triangulation of N. Scotland', *Sheetlines* 124, Aug 2022, 39.

At the Great Exhibition in 1851 a new trigonometrical diagram was exhibited[22] (and it irked the Scottish publisher AK Johnston that this was the only material shown by the Ordnance that included Scotland). Unless and until this missing Great Exhibition diagram is found anywhere else, the writer now concludes that it is matched by both of the diagrams in note 28, for which he, about 10 years ago, suggested a date of 'about 1852'.[23]

A revised date of 1851 for the diagrams in note 28 firmly attributes these to William Yolland and usefully marks the transition between Yolland and Alexander Ross Clarke.[24]

The same coastline of the Shetland Islands was used for two more diagrams, showing Clarke's updated but diminished triangulation, published for the Ordnance by the Royal Society in 1856 and to accompany the report on the Principal Triangulation in 1858.[25] Thus Thomas's greatest achievement endured after his death and continues to endure today.

Figures 7, 8, 9 : Comparisons of Thomas's coastline with Ordnance diagrams
7 : Shetland chart[26]; 8 : Shetland 1840[27]; 9 : Shetland Yolland 1851[28]

[22] Great Exhibition of 1851, Official descriptive and illustrated catalogue, Vol 1, page 342: Ordnance Survey Department [item] XIII – '*Diagram showing the principal triangulation of the United Kingdom of Great Britain and Ireland, of which an account is now being prepared for publication.*'

[23] David L Walker, 'The Initial Triangulation of Scotland', *Sheetlines* 98, Dec 2013, 6.

[24] Ditto, 'The Troubled Progress of the Scottish Triangulation', *Sheetlines* 104, Dec 2015, 14-17.

[25] *Account of the observations and calculations of the principal triangulation etc*, Captain Alexander Ross Clarke etc, London, 1858, British Library, Maps 207.b.5, vol 2, Plate XVIII.

[26] *The Shetland Isles*, surveyed by George Thomas, 1833, Admiralty chart 1118, NLS maps website.

[27] David L Walker, 'An 1840 diagram of the Secondary Triangulation of N. Scotland', *Sheetlines* 124, Aug 2022, 38.

[28] *Diagram shewing the Principal Triangulation for the Ordnance Survey of Great Britain and Northern Ireland* , Southampton, undated, British Library, Maps 1105(15); *[same title with image available],* National Library of Scotland, Ordnance Survey small scale maps of Great Britain, ca 1852?, Map.Area.C16(144)

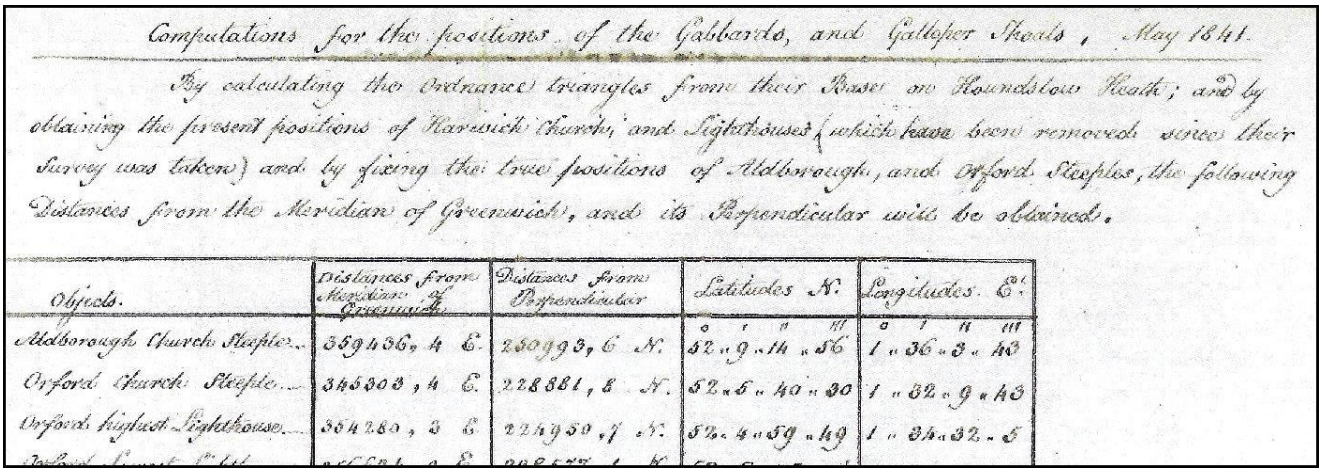
The Positions of the Gabbards and Galloper Shoals 1841

In a diversion from the Orkney Islands, Thomas was assigned back to the Thames Approaches when he was ordered

> as soon as HMS Mastiff under your command is in every respect ready for sea you will take the Woodlark and Violet Tenders and the Sinbad Lighter under your command and proceed to the Galloper Bank in order to determine the exact position of its extremities and of its Light Vessel, which you will effect by means of a series of triangles connecting them with proper objects on the Essex and Suffolk shores - You will also connect them with the Kentish Knock, the Long Sand Head, and Sunk Light – and if it should not be productive of disproportionate delay with the Inner Gabbard - and you will carefully note every change in position in those sands or of depth in the adjacent water since the last survey was made.[29]

Thomas tackled this by re-working the Ordnance triangles back to Danbury to check the Ordnance stations between Clacton and Orford, and by creating the offshore stations shown in figure 12. The opening and closing remarks from his beautiful calculations to establish position A, and so the Gabbards, are shown in *figures 10 and 11* respectively.[30]

But where was Captain Bullock, who is credited by Robinson with at least joint leadership of this survey?[31] On 26 May Beaufort wrote to commend Thomas's work and to instruct that 'if Bullock should appear in the offing, make a signal to him that fresh orders are going by this night's post for him to Harwich'. On the following day Bullock was provided (by the Orwell steamer) with charts of the East Anglian coast for his next task.[32]



Computations for the positions of the Gabbards, and Galloper Shoals, May 1841.

By calculating the Ordnance triangles from their Base on Roundstow Heath; and by obtaining the present positions of Harwich Church, and Lighthouses (which have been removed since their Survey was taken) and by fixing the true positions of Aldborough, and Orford Steeples, the following Distances from the Meridian of Greenwich, and its Perpendicular will be obtained.

Objects.	Distances from Meridian of Greenwich	Distances from Perpendicular	Latitudes N.	Longitudes E.
			° ′ ″ ‴	° ′ ″ ‴
Aldborough Church Steeple	359436, 4 E.	250993, 6 N.	52 . 9 . 14 . 56	1 . 36 . 3 . 40
Orford Church Steeple	345303, 4 E.	228881, 8 N.	52 . 5 . 40 . 30	1 . 32 . 9 . 43
Orford highest Lighthouse	354280, 3 E.	224950, 7 N.	52 . 4 . 59 . 49	1 . 34 . 32 . 5

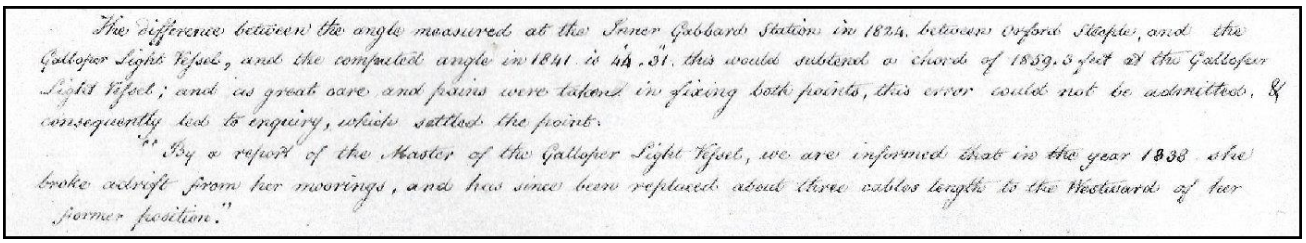
Figure 10 : Thomas's explanation of the basis for the triangulation of the Gabbard shoals in 1841

[29] UKHO, Minute Book 3, page 265, 12 April 1841.

[30] Thomas Geo, *Computations for the position of the Gabbard Shoals*, UKHO, SFD 9/55/2, ff 1&11. A friend has demonstrated that these words sound even better when declaimed aloud (perhaps in the style of Samuel Taylor Coleridge, taught at Christs Hospital 10 years before George Thomas by William Wales, Captain Cook's navigator: as considered in Clifford Jones, *The Sea and The Sky*, publ. privately in 2015, 190-192).

[31] Robinson, AHW, *Marine Hydrography in Britain*, Leicester UP, 1962, 138.

[32] UKHO, Letter Book 10, 48, 26 May 1841.



The difference between the angle measured at the Inner Gabbard Station in 1824, between Orford Steeple, and the Galloper Light Vessel, and the computed angle in 1841 is 44°.31', this would subtend a chord of 1859.3 feet at the Galloper Light Vessel; and as great care and pains were taken in fixing both points, this error could not be admitted, & consequently led to enquiry, which settled the point.

"By a report of the Master of the Galloper Light Vessel, we are informed that in the year 1838 she broke adrift from her moorings, and has since been replaced about three cables length to the Westward of her former position."

Figure 11 : Thomas's explanation of changed positions of Gabbard light vessel between 1824 and 1841

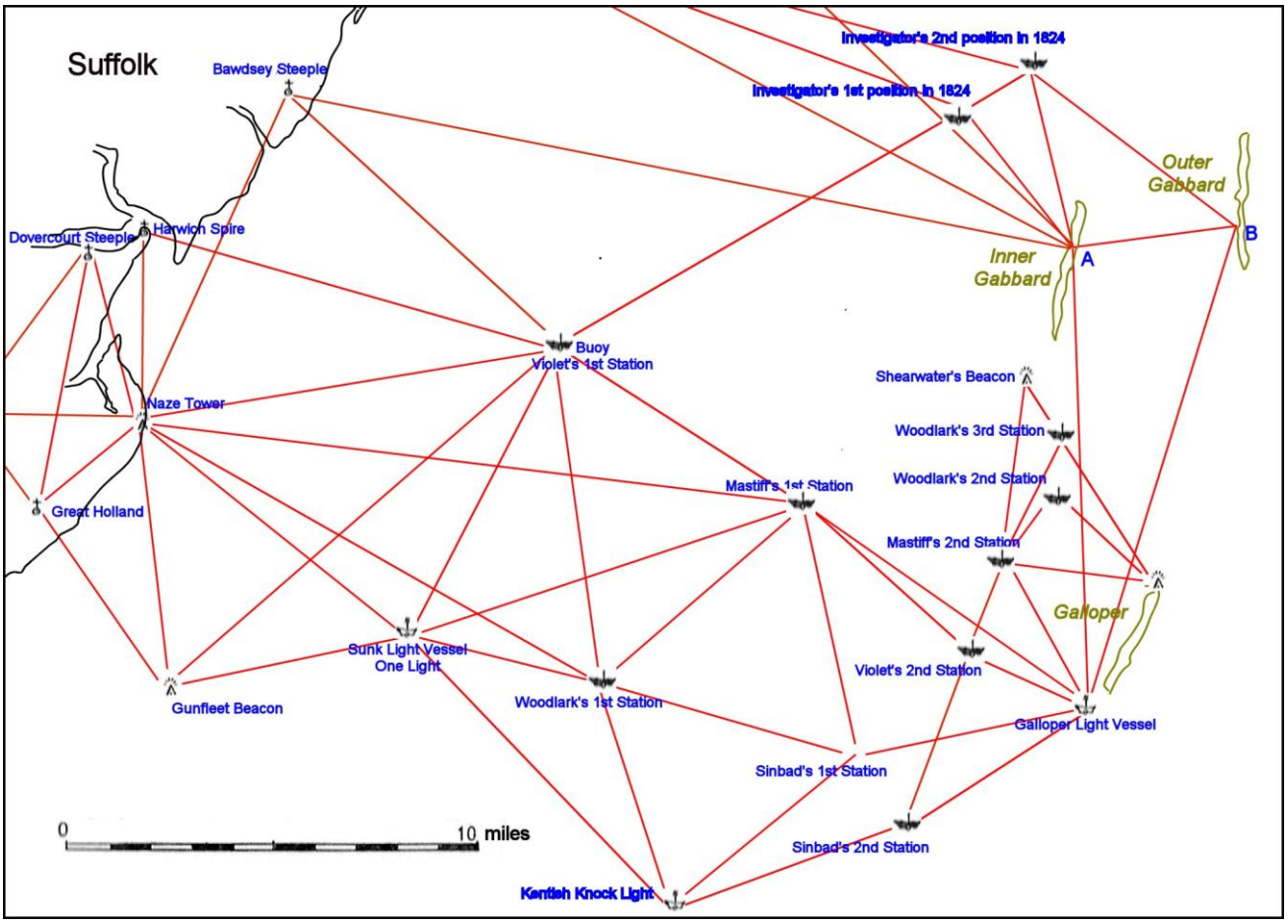


Figure 12 : George Thomas's triangulation of the Galloper and Gabbard shoals in 1841

FWL (Frederick) Thomas

After completing his survey of the Shetland Islands, George Thomas in 1835 was assigned to the Orkney Islands, with some interludes in the Firth of Forth to extend his previous work to the inner Firth. In 1837 he was given command of the brig *Mastiff* to replace *Investigator*, became addressed as Master and Commander, and was soon joined by his son Frederick, promoted to Lieutenant and ready to support his father's declining years.

When George Thomas retired at the end of 1846, Lt Becher, Baufort's chief assistant, took command of *Mastiff* in the Forth and the Orkney Islands for only one year, until succeeded by Lt Frederick in 1848. Although Beaufort had advised Thomas that his son's promotion had been advanced solely in tribute to him, Frederick Thomas's Remark Book illustrates his surveying ability as well as his variety of interests.[33]

[33] *Remark Book compiled by Capt FWL Thomas*, National Records of Scotland, GD 226/15/2, 1847-1863.

The wealth of precise information included in the Remark Book includes, for example, this record from the Firth of Forth in 1850 that:

> The triangulation was formed by taking the Ordnance distance from Grangemouth Station to Culross Church as a base and selecting the prominent points upon the north and south banks for computing stations … At each of these stations the angles were repeated six times upon different parts of the graduated circle of the theodolite.

However we can inagination his feelings about the Ordnance when

> The triangulation was made altogether independent of the Ordnance work as I was not aware of them having any stations in this district. In July however a pole was put up by them at 39 feet distance from my station at North Ferry which was ultimately the cause of much confusion and delay to me for on being further supplied with some objects in this locality I found that my distance from N Ferry Station to Dalmeny Station diferred more than forty feet from the Ordnance distance; I recomputed my triangles but could by no means distort them to such an error till at last I was informed that my station was the computed point when I discovered that my first computations had brought out the distance to within three feet of the Ordnance.

This setback did not delay his completion of one of the most impressive fair copies in the UKHO archive.[34] The writer recalls, when its 8 feet length was un-rolled, Ann-Marie proudly remarking that 'it has everything: colour, trigonometery, tidal records and pictures' (as exemplified by the following sailing directions in *figure 13*):

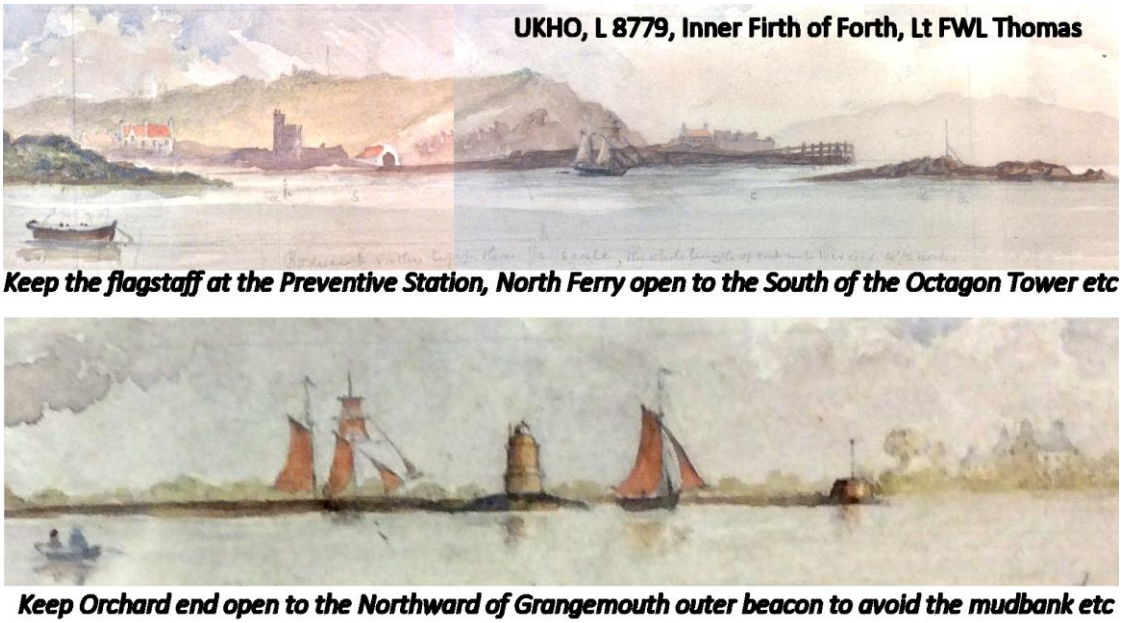


Figure 13 : Sailing directions from FWL Thomas's chart of inner Firth of Forth

His masterly fair copy was completed in 1850, the year of his father's death, and Frederick Thomas, as well as making post captain in the surveying service, went on to make his name as antiquarian, naturalist and photographer.

[34] The fair copy (the surveyor's draft) is at UKHO, L8779, *Inner Firth of Forth*, FWL Thomas, 1850.
The sailing directions are readily interpreted on Admiralty chart 114c on the NLS maps website.

George Thomas's Departure

It is worth recording that in 1844 Thomas, requesting an extra station pointer, offered 'should the mathematical Instrument maker want a model to make such an instrument, I can spare mine for one day; which has been employed since 1810 by me, and several years previous by Spence, and Mackenzie, and never been out of Order.' In 1845 he 'entertained myself by computing the angles taken by the Ordnance Department from Chiviot (sic) Hills, in Northumberland, to Ben Lomond beyond Stirling, from their own angles …'

Even in the year of his retirement, Thomas continued to put firm questions to the Ordnance (through the Admiralty Hydrographer). In January he sought 'lengths of degrees in feet on the Meridian, and its Perpendicular in the Latitudes 55º, 56º, and 57º' and 'should they have surveyed the shores of the River of Forth between Stirling Bridge and Grangemouth, a copy of which would greatly facilitate my operations in that neighbourhood.' In May, 'Ordnance surveyors observed on a hill called Durniat and erecting a beacon on the south shore opposite Kincardine – may I have a copy of their observations', and in June 'my work in that neighbourhood would be greatly facilitated if Colonel Colby would be pleased to cause me to be furnished with copies through the Hydrographical Office of the observations taken between Grangemouth and Stirling.'

When Thomas wanted angles as well as distances, Captain Beaufort felt obliged to write in person to Col Colby asking 'Would it be very troublesome if I were to beg of you to comply with his present request' (and this request was met within three days). [35]

According to Dawson's memoirs,[36] Mr George Thomas died in the autumn of 1846 and *Mastiff* was paid off at the end of that year. In fact, Thomas was able to write in his own hand to Beaufort on 2 December 1846 asking to remain in command of *Mastiff* until the end of that month, congratulating him on his promotion to Admiral, and wishing that Beaufort might 'live in peace and happiness for many years after your devoted and humble servant arrives at that harbour from which nobody returns.'

Three months later Thomas wrote to Captain Miles that 'my mind is much occupied in computing the heights of all the principal stations in the Orkney Isles that may assist Captn Becher in the work he will have to perform', and a month later that 'as I cannot keep from computing during the day consequently my nerves suffer very much & my mind so much affected that I cannot sleep at night'. In September, using an amanuensis, he thanked Beaufort for a kind present. The last letter, in January 1848, sought his advice on Frederick applying for the rank of Commander on taking command of *Mastiff*. [37]

Sadly, George Thomas's death certificate, dated 10 February 1850 in Fulham, attributes his death to 'softning of the brain'. In his lifetime this brain proved second to none in navigating, measuring and recording the hazards of the British coast.

Acknowledgement

Anne Taylor, at very short notice kindly provided vital information that the writer should have sought years ago.

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[35] UKHO, Surveyors' Letters, SL 12b, 17 Dec 1844, 1 Dec 1845, 19 Jan 1846, 16 May 1846, 25 June 1846 and UKHO, LB 14, 7 and 10 July 1846.

[36] Dawson, *Memoirs of Hydrography*, vol II, 50.

[37] UKHO, Surveyors' Letters, SL 12b, 2 Dec 1846, 23 Nov 1847 and 20 Jan 1848.