

The development of the geological map of Jamaica in the Nineteenth Century

SIMON F. MITCHELL

Department of Geography and Geology, The University of the West Indies, Mona, Kingston 7, Jamaica.
Email1: simon.mitchell@uwimona.edu.jm. Email2: barrettia2000@yahoo.co.uk OrcID: 0000-0002-7069-0188

ABSTRACT. Geological maps have been produced for Jamaica for more than 180 years, but have changed significantly as ideas about geology have changed. This paper reviews and provides a detailed history of the development of Geological Maps of Jamaica that were published between 1827 and 1958. The first map produced by Sir Henry De la Beche (published in 1827) attempted to relate the geology of Jamaica to that of Europe, something that he himself subsequently said was not possible. The first Government geological survey of the island resulted in two maps, a largely unpublished version in 1863 and a map showing the whole island dated 1865. Yet, due to the early termination of the survey in Jamaica, neither provided a complete understanding of the geology. Subsequently Hill in 1899 revised these maps, correcting some errors, while introducing others. It was only during the mid- to late-20th century that new, complete geological maps of Jamaica were published.

Keywords: Jamaica, Geological maps, historical geology, nineteenth century geology.

1. INTRODUCTION

The geological map of Jamaica has changed considerably since the first produced map, for which the field investigations were undertaken between December 1823 and December 1824 by De la Beche (**De la Beche, 1827**), and subsequent maps produced in the 19th and 20th centuries. The development of mapping campaigns coincided with different phases of geological exploration in Jamaica (**Figure 1**). Jamaica consists of three counties which are divided into parishes. The division into parishes has changed over time, and some of the parishes that existed before 1865 (during the time of the earliest surveys) were amalgamated to form the parishes that exist today (**Figure 2**). This paper explores the development of the geological map during the nineteenth century, and herein the **1863** map of **Sawkins and Wall** is published for the first time.

2. THE SIR HENRY THOMAS DE LA BECHE (1823) MAP

Rocks and minerals collected in Jamaica had found their way to Great Britain in the early part of the Nineteenth Century (**De la Beche, 1927**), but no work on trying to understand the geology of the island had been undertaken. This changed with the arrival of (Sir) Henry Thomas De la Beche in the island in 1823. De la Beche was born in London, England, on the 10th February, 1796 (**Chubb, 1958**). His family owned Halse Hall Estate in Jamaica and the young Thomas visited Jamaica at

the age of 5 in 1800-1801, during which time his father died. The young boy returned to England and grew up with his mother, first in Devon, and later in Charmouth and Lyme Regis, Dorset, where he developed a love for geology from his fascination with the wonderful Liassic fossils that were found along the Jurassic Coast. At the age of 21, he was elected as a fellow of the Geological Society (London), and two years later, he was admitted as a Fellow of the Royal Society. Subsequently he travelled around Switzerland and France and developed an understanding of European geology. De la Beche visited his ancestral home in Jamaica in 1823, having landed at Kingston on Sunday the 21st of December, 1823. He spent just over a year in Jamaica, where he undertook extensive transects across the eastern half of the island to investigate the geology. De la Beche left Jamaica for England on the 28th of December 1824.

De la Beche (1827) attempted to interpret the geology of Jamaica (**Figure 3**) in terms of the divisions he knew from Europe (France and Switzerland) and England. He therefore used terms 'borrowed' from the geology of England and Europe to describe the geology of Jamaica, attributing some units to the Submedial or Transition Rocks (rocks lying below the Medial or Carboniferous rocks) and associated Trap Rocks (extrusive dark-coloured lavas), the Coal Measures (Medial or Carboniferous rocks), and Diluvium (deposits of the 'Great Flood' from the Bible). He also named the 'White Limestone Formation' (**De la Beche, 1825, 1827**) and equated it with the Calcaire grossier of France and the London Clay of England

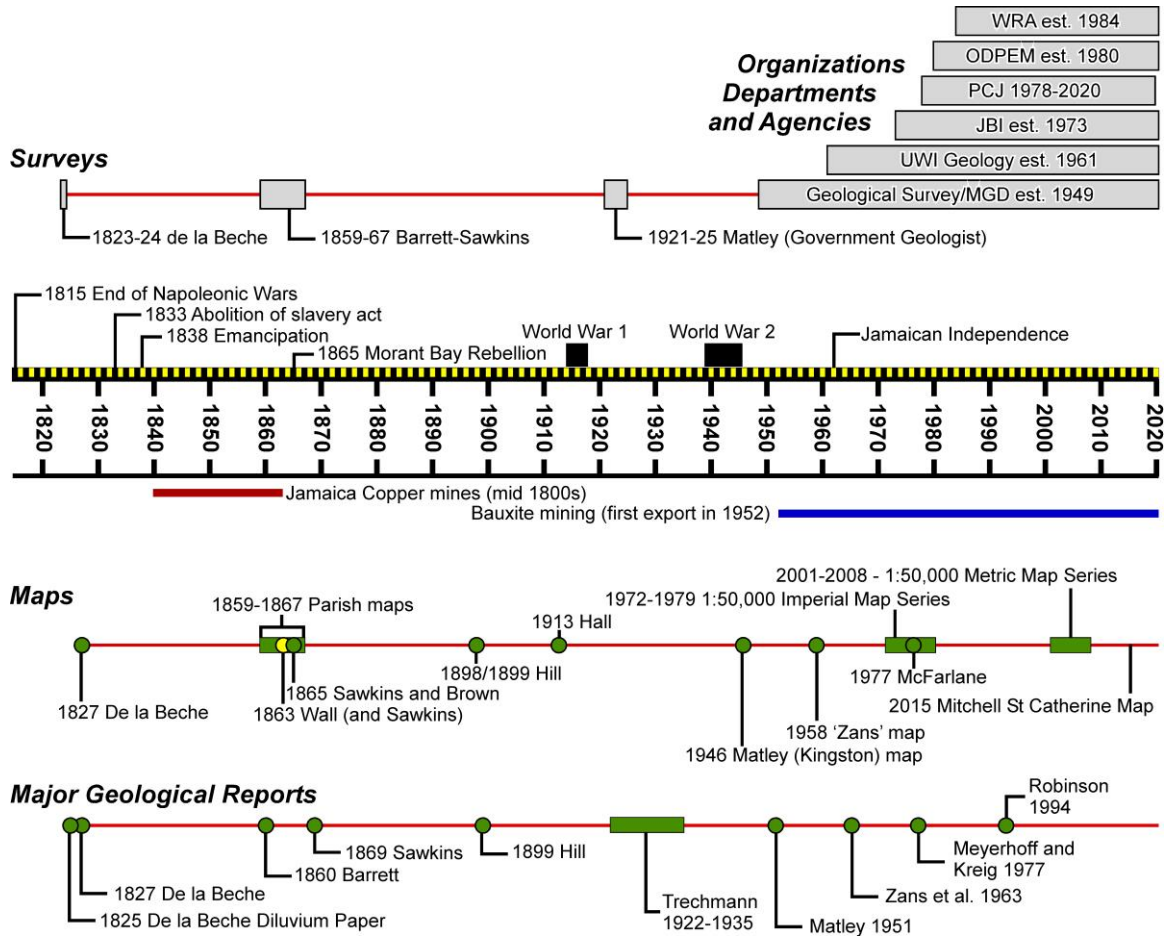


Figure 1. Timeline of geological surveys, geological entities, selected mineral exploration episodes, the publication of geological maps, and the major publications on the geology of Jamaica. Based on numerous sources.

based on the presence of a ‘gigantic cerithium’ that he illustrated on his plate XXI. This fossil is now attributed to the genus *Campanile*, which is still living in Australia (Darragh, 2001). Later, however, he realised that his attribution of rocks in Jamaica to European ‘units’ was erroneous, and in the explanation of his plate 37, De la Beche (1830) stated “I would by no means attribute much importance to the fossils [as] our present knowledge of the distribution of organic remains is too limited” and “the mineralogical character of rocks is of so little importance that, of itself, it would be valueless, even in determining a series of rocks in Britain and Italy.” Thus he, himself rejected his early comparisons of the rocks of Jamaica with Europe and England and stated that “I am more anxious to leave the question of the equivalents of the Jamaica rocks entirely open.”

His map, however, does provide the first breakdown of the strata in Jamaica into geological

units. Although the names have mostly long been abandoned, the different divisions can still be related to the rocks mapped in Jamaica at the moment. The clear and obvious scholarly interest was the establishment of the White Limestone Formation; a name, which, with modifications, is still in use today (e.g., Mitchell, 2004, 2013).

3. THE SAWKINS AND WALL (C. 1863) AND SAWKINS AND BROWN (1865) MAPS

The Abolition of Slavery Act was passed in 1833, and the former enslaved served apprenticeships from 1834-1838 with Emancipation (full freedom) of the former enslaved granted in 1838. The former enslaved no longer wanted to work on the plantations and coupled with a change in the preferential treatment of sugar imports from the West Indies into Great Britain, this led to the sugar industry going into a major decline and land owners

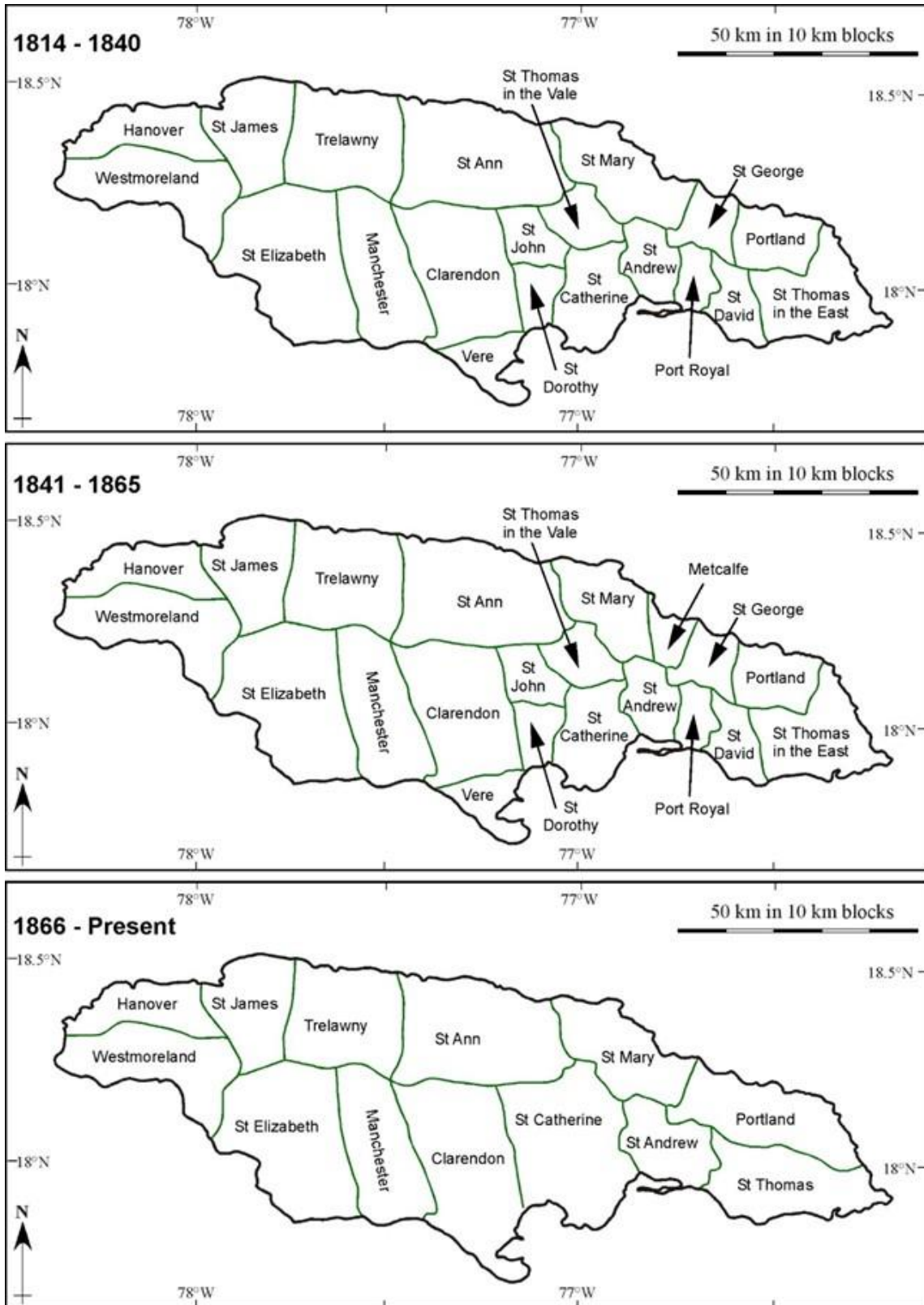


Figure 2. Changes in the parishes of Jamaica from 1814 to present (parish of Kingston omitted for simplicity).



Figure 3. Geology map of part of Jamaica, De la Beche 1823-1824, published in De la Beche, 1827. Out of copyright. Reproduced from original in author's collection with permission from the Geological Society of London. [A larger version of this map can be downloaded from the CJES website.]

looked for other ways to make money from their land (Mintz, 1959). In 1840, a box of minerals from Mount Vernon in the parish of St Thomas-in-the-East (current parish of St. Thomas) was sent to the Geological Survey in Great Britain. These were passed onto Sir Henry Thomas de la Beche who was asked to look at them and they were identified as minerals containing copper (Murchison Papers, 1841). Subsequently various copper mining companies were established in Jamaica: The Jamaica Copper Mining Company, with mines at Mount Vernon and Bloxburgh; The Liguanea and General Mining Company, with mines at River Head and Abbey Green; The Port Royal Company, with a mine at Silver Hill; The Metcalfe Mining Company, with mines at Job's Hill and Pembroke; and The Sue River Company, with mines at Sue River (MJRCG, 1852a, 1852b, 1852c, 1853a, 1853b, 1853c, 1853d; Figure 4).

The directors of the mining companies promised great wealth, but the mining captains brought in from the Cornish mines in England to examine the mines did not share this enthusiasm. Many of the investors felt that the mining captains from Cornwall could not be trusted and the Jamaican mines were in actuality prosperous and something needed to be done. The Mayor of Kingston, Philip Lawrence Esq, presided over a

meeting at the Kingston Courthouse on the 9th of September 1853 to establish the Jamaica Mining Association (MJRCG, 1853e). The association would protect the interests of mining in Jamaica against the jealousy of English Capitalists, and establish a "council of miners," for the mutual aid of all. "The association would also urge the Imperial Government, or the Local Legislature, to secure a complete geological survey, and provide the service of an eminent practical mineralogist, or mining engineer, to aid in securing faithful reports for publication on the progress and prospects of the various mines." In response to the lobbying of the new Jamaican Mining Association, the Governor of Jamaica, Sir Henry Barkly, sent a Despatch, dated the 22nd of December, 1853, to the Colonial Office in London requesting a "complete and systematic mineralogical survey of Jamaica" (Wall and Sawkins, 1860, p. 208). However, the Colonial Office, stating that such a survey should be the responsibility of the investors in the mines and not Her Majesty's Government, denied the request.

Similar searches for mineral resources were also going on in Trinidad and Herbert G. Bowen asked the Governor of the island, Sir Charles Elliot, that he be allowed to undertake a mineral survey of Trinidad. The Governor sent a Despatch to the Colonial Office in London, dated the 24th of May,

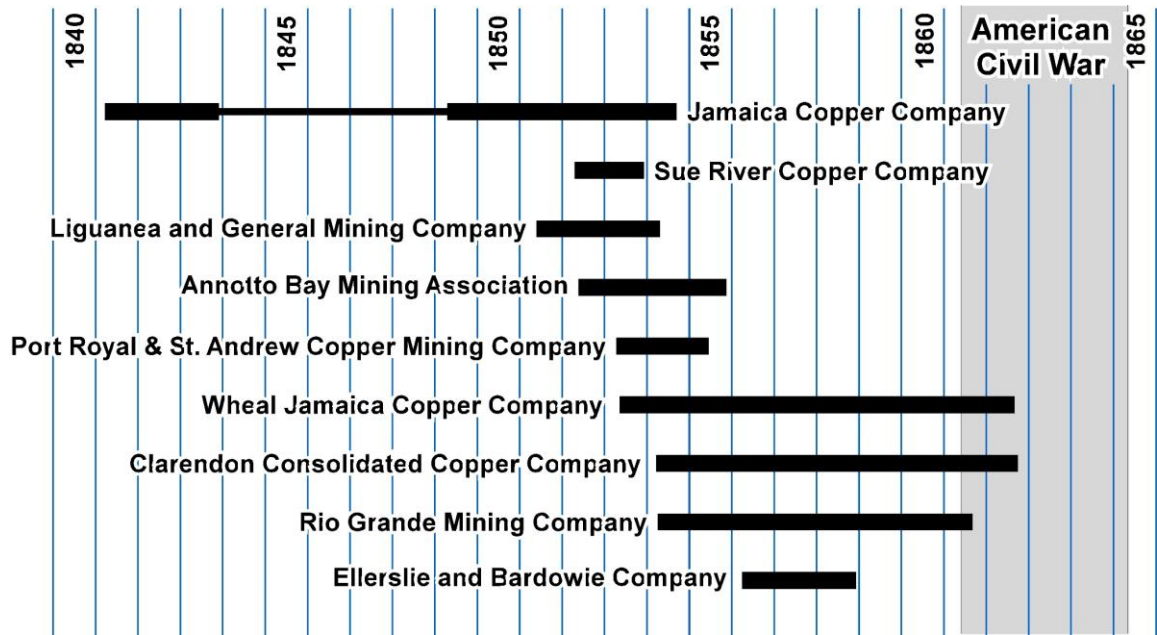


Figure 4. Selected copper mining companies and their time of operation in the mid nineteenth century in Jamaica.

1855, requesting that Mr Bowen should be asked to undertake a mineralogical survey of Trinidad (Murchison Letters, 1865). This marked the start of the geological survey of the West Indies with Trinidad to be surveyed first. Sir Roderick Murchison was now asked to suggest a geologist to undertake the survey of Trinidad (Murchison Letters, 1865). He selected George Parkes Wall for the position of Geologist and recommended he should have an assistant, for whom he nominated James Gay Sawkins. George Parkes Wall, born in Newcastle-on-Tyne in 1832, had been one of the first students to study at the Royal School of Mines in London, obtaining ‘the Associateship of the College in Mining’ in 1855; he had also spent one year at the mines in Freiberg, Germany, gaining practical experience (Watts, 1912). James Gay Sawkins was born in Southampton in 1806, and migrated to the United States at the age of 14, where he took up portrait painting and the teaching of art (Sorby, 1879). He developed a passion for mineralogy, and had worked in copper and gold mines in Mexico, Cuba, Peru, Australia and Jamaica. Wall and Sawkins spent the next two years surveying Trinidad.

Following the completion of the geological survey of Trinidad, the surveyors were to move to Jamaica. However, Wall resigned from the survey due to personal reasons (Colonial Archives, 1863), and a new head geologist was required. John Phillips was asked to suggest a replacement, and he suggested Lucas Barrett (Woodward, 1863). Lucas Barrett, born in London in 1837, was schooled at

Royston in Cambridge, and subsequently at University College School in London. He now took up duties in Jamaica with Sawkins in 1859.

The survey began on the eastern side of Jamaica, with field assessments being undertaken at the parish level; with the survey moving progressively from east to the west. However, the survey of Jamaica would be a longer prospect than that of Trinidad due to the islands greater size, in addition to being beset with problems. Together, the two geologists estimated that the survey would take 6 years to complete (Sawkins, 1869). They started by surveying St Thomas-in-the-East, but all was not well and evidence suggests that the two geologists did not get along with one another (Chubb, 1964). In 1862 a Great Exhibition was to be held in London, and Lucas Barrett was selected by the Colony to present the details of the geology and minerals of Jamaica (Simmonds, 1862). Having returned to London, Barrett was reluctant to return to Jamaica following the exhibition, but eventually left England in October 1862 (Barrett, 1862). Upon arriving in Jamaica, Barrett resumed his duties, but died in a diving accident on the 19th December 1862 offshore of Port Royal (Eyre, 1862).

Following the death of Lucas Barrett, James Sawkins assumed the leadership of the Geological Survey of the West Indies (Sawkins, 1869). Since George Parkes Wall was at the time in the island, he became assistant geologist under Sawkins (1869). James Sawkins was asked by the Governor to estimate the length of time for completion of the geological survey of the Colony. So in February,

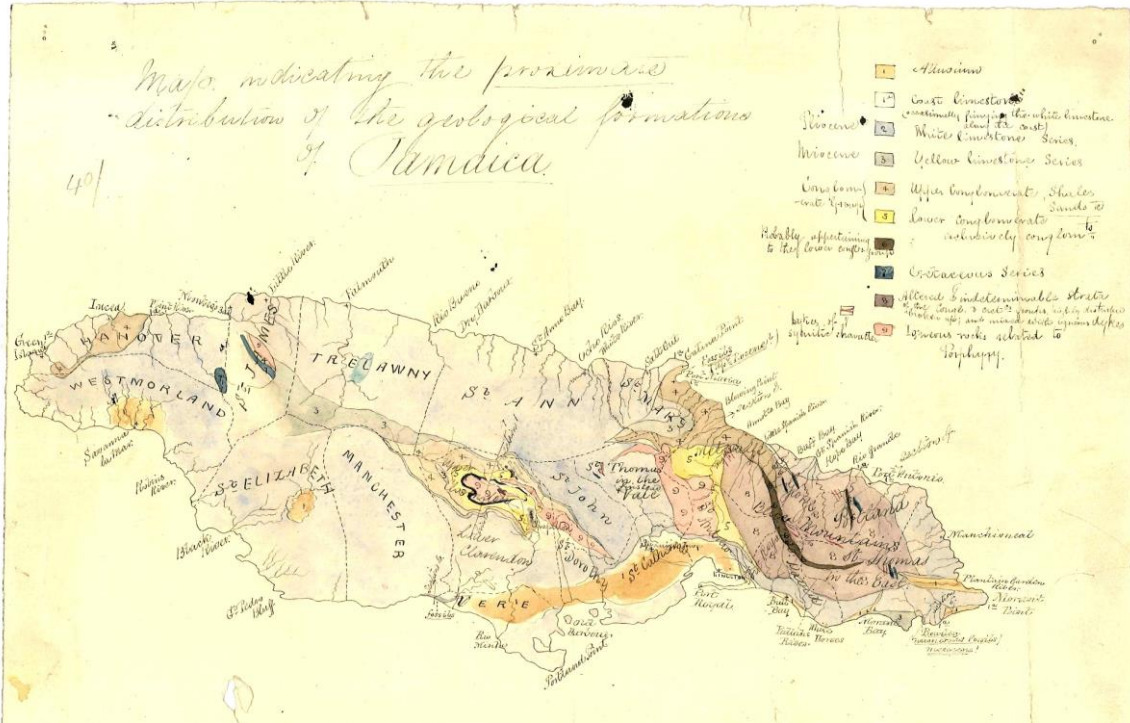


Figure 5. The Sawkins and Wall 1863 Map. Unpublished, other than for the area of the Central Inlier which was published in Duncan and Wall, 1863. Original in the archives of the Geological Society of London. [A larger version of this map can be downloaded from the CJES website.]

Table 1. Key to Sawkins and Wall 1863 map.

Unit	Notes
1. Alluvium	
2. Coast Limestone	
3. White Limestone Series	Assigned to the Pliocene
4. Yellow Limestone Series	Assigned to the Miocene and considered to lie below the White Limestone Series.
5. Upper Conglomerate	Shales and sands above (= 5. Upper Conglomerates) passing into exclusively conglomerates (= 6. Lower Conglomerate) below.
6. Lower Conglomerate	
7. Probably pertaining to the Lower Conglomerate.	
8. Cretaceous Series	
9. Altered and indeterminate strata of the Congl. & Cretaceous groups.	
10. Igneous rocks related to Porphyry	

1863 (Rogers, 1865), James Sawkins and George Wall undertook “a tour through the western portions of the island ... with the view of performing a preliminary inspection of the counties of Middlesex and Cornwall as well as of approximately determining the duration of the survey.” They agreed that “to complete a fair examination of the Geology of Jamaica a period of four years must be allotted to field labour, whilst the preparation of the final maps, drawings and reports will require an additional year.” During their tour, the geologists produced a provisional map (Figure 5). A copy of this map was taken

England with Wall when he left Jamaica and parts of it were subsequently published (Duncan and Wall, 1865).

This map (Figure 5) is the first map of Jamaica that shows the geology across the entire island. The manuscript copy is preserved in the archives of the Geological Society (London) and is published in full for the first time here. The key is reproduced in Table 1.

This map shows the draft distribution of many lithologies across the island, albeit in rather low resolution with smaller areas of Cretaceous rocks missing. However, it confused the impure

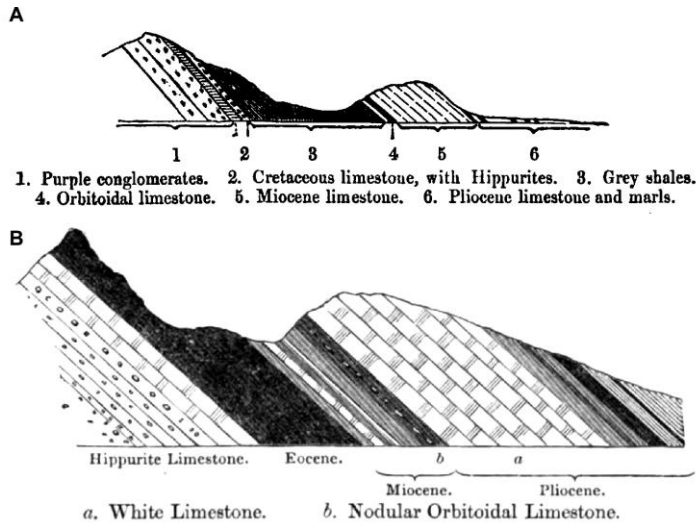


Figure 6. Comparison of the sections provided by Lucas Barrett and published by: (A) Woodward (1862), and (B) Jones (1863). The White Limestone (5 in A and a in B) is attributed to the Miocene and Pliocene, respectively, whereas the overlying Pteropod Marl (not named) is placed in the Pliocene. The Orbitoidal Limestone is placed between the Eocene (Carbonaceous or black shales) and Miocene (White Limestone) in A, and in the Miocene in B.

limestones, sands and shales lying below the White Limestone Series with those lying above. Both these sets of rocks were attributed to the Yellow Limestone Series and shown as underlying the White Limestone Series.

The ages of the various deposits in Jamaica were still poorly understood at this time. Hill (1856) had discussed the age of De la Beche's (1827) 'Coal Measures' in consultation with C. B. Adams (a geologist who had visited Jamaica, understood the geology of the United States, and had worked extensively on the land snails of the island) and attributed the shales in the Moore Town valley to the Eocene. Lucas Barrett submitted a report in 1861 on the copper veins of Portland to the Governor of Jamaica and attributed ages to some of the geological units. The rocks below the Carbonaceous Shale (De la Beche's, 1827, 'Coal Measures') were attributed to the Cretaceous, the Carbonaceous Shale to the Eocene (presumably following Hill, 1856), the White Limestone to the Miocene, and the Pteropod Marl (exposed at Bowden in St. Thomas-in-the East, near Manchioneal in east Portland, and on the north coast of Portland) to the Pliocene. On his trip to England for the Great Exhibition in 1862, Lucas Barrett carried a series of fossil from eastern Jamaica to be examined by various specialists. Samuel Woodward and J. Carrick Moore would look at the molluscs, Martin Duncan, the corals and T. Rupert Jones, the foraminifera.

Following Lucas Barrett's death, two of his generalized cross-sections of the rocks in eastern Jamaica were published, but with different ages attributed to different strata (Figure 6). Whether these ages were those suggested by Lucas Barrett, or whether they were adjusted by those who published them is unclear. Clearly, the section

published by Woodward (Figure 6A) agrees with Barrett's (1861) ages reported in his work on the mineral veins in Portland. These are different in the section published by Jones (1863), with his accompanying remarks stating that this was his interpretation of what Mr Barrett had told him.

The 1863 Sawkins and Wall map of Jamaica showed both the Orbitoidal Limestone and the Pteropod Marl as lying below the White Limestone, with the former two units attributed to the Miocene and the latter to the Pliocene. This was probably based on the interpretation of the structure of the Central Inlier of Jamaica, which is shown as an anticline in a cross section in Duncan and Wall (1865, reproduced as Figure 7A here). Duncan and Wall (1865) also illustrated two further cross-sections (Figure 7B-C) and in these the Pteropod Marl was confused with the Yellow Limestone. One showed a transect across St Thomas-in-the-East, with the White Limestone at the core of a syncline, underlain to the north by Yellow Limestone (now the Eocene Font Hill Formation) and to the south erroneously by supposed 'Yellow Limestone' (the Pteropod Marl of Barrett, 1860, or Pliocene Layton Formation (Bowden Member) Formation of the Coastal Group in current nomenclature; James-Williamson and Mitchell, 2012) that should have been above the White Limestone. The other section showed Round Hill in Clarendon with the supposed 'Yellow Limestone' (now the late Miocene to Pliocene August Town Formation) overlain, apparently unconformably, by the White Limestone.

The Jamaican geologists now went about their business of mapping the geology across Jamaica. Wall, however, left the island and was replaced first by Arthur Lennox for the period December 1863 to February 1864 and subsequently by Charles Barrington Brown (Lennox, 1867; Brown, 1917).

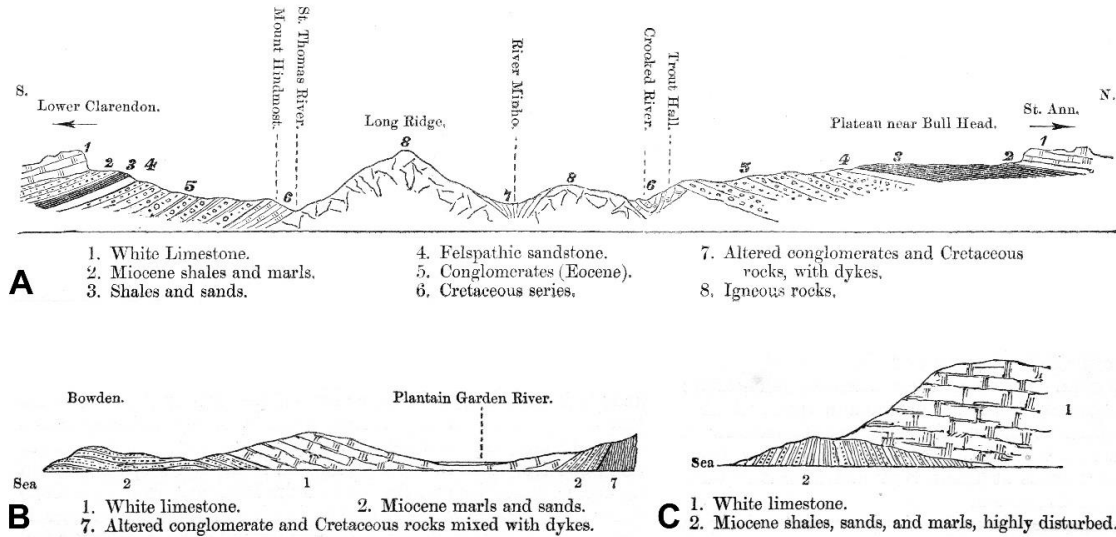


Figure 7. Cross sections from **Duncan and Wall (1863)** showing relationships between the ‘Yellow Limestone’ and White Limestone. **A** (their fig. 2), S-N section across the Central Inlier showing the relationship between the Yellow Limestone (as now accepted) and the White Limestone. **B** (their fig. 5), S-N section showing relationships between the rocks in a transect across St. Thomas-in-the-East: showing the ‘correct’ position of the Yellow Limestone below the White Limestone to the north (right), but the supposed ‘Yellow Limestone’ (Pteropod Marl, now Bowden Member of the Layton Formation, Coastal Group) lying incorrectly below the White Limestone to the south. **C** (their fig. 4), S-N section through Round Hill (southern Clarendon) showing White Limestone apparently overlying unconformably the ‘Yellow Limestone’ (actually the August Town Formation of the Coastal Group).

Table 2. Parishes for which geological mapping had been completed and was in progress as of 25th July 1865: source **Sawkins (1865)**.

Completed
1 st St Thomas in the East by Barrett and Sawkins
2 nd Portland by Barrett and Sawkins
3 rd St George by Barrett
4 th St David by Sawkins
5 th Port Royal by Sawkins
6 th St Andrew by Sawkins
7 th Metcalf by Barrett completed by Wall
8 th St Mary by Wall and Sawkins
9 th St Thomas in the Vale by Wall and Sawkins
10 th St John by Sawkins
11 th St Dorothy by Sawkins
12 th St Catherine by Lennox
13 th Vere by Sawkins
14 th Clarendon by Sawkins
15 th Manchester by Brown
In progress
16 th St Ann by Sawkins
17 th St Elizabeth by Brown

From the start of this time to late July 1865 the following was the state of the mapping (**Table 2**).

By mid-1865, financial conditions in Jamaica had deteriorated, and the Legislature decided to discontinue the Geological Survey (**Murchison, 1865**). Using the information available, the two geologists now prepared a ‘final’ geological map of

Jamaica (**Figure 8, Table 3**). This map included the areas that had been mapped in the east and central parts of the island as well as an update on the exploratory work done in the western part of the island by **Sawkins and Wall** in 1863. The map retained the same errors related to the Yellow Limestones as included on the 1863 map, but also had other notable errors and omissions.

In many areas Cretaceous rocks were omitted. Notable omissions include: the Cretaceous rocks in St. Ann’s Great River in St Ann; the Lazaretto Inlier in the Port Henderson Hills in St Catherine, and the Cretaceous rudist limestones at Haughton Hall, near Green Island in Hanover.

At the south-western extremity of the Brazillitto Hills, in Hayes Savannah (as well as elsewhere, e.g., at Treasure Beach and Alligator Pond, St Elizabeth), an area coloured as Trappean Series (but referred to as Savannah in the Vere parish report) is bounded by the Yellow Limestone. The term Savannah here being used for ‘cemented’ conglomerates containing pebbles of ‘agates, jasper, chalcedony, quartz, porphyry and syenite’ – these are probably errors that crept in during the production of the published map, and not of the geologists.

In some areas, Paleocene to Early Eocene limestones were mapped as Cretaceous limestones: such as, limestones at Chepstow in St George (now Portland), and limestones in and around Clydesdale

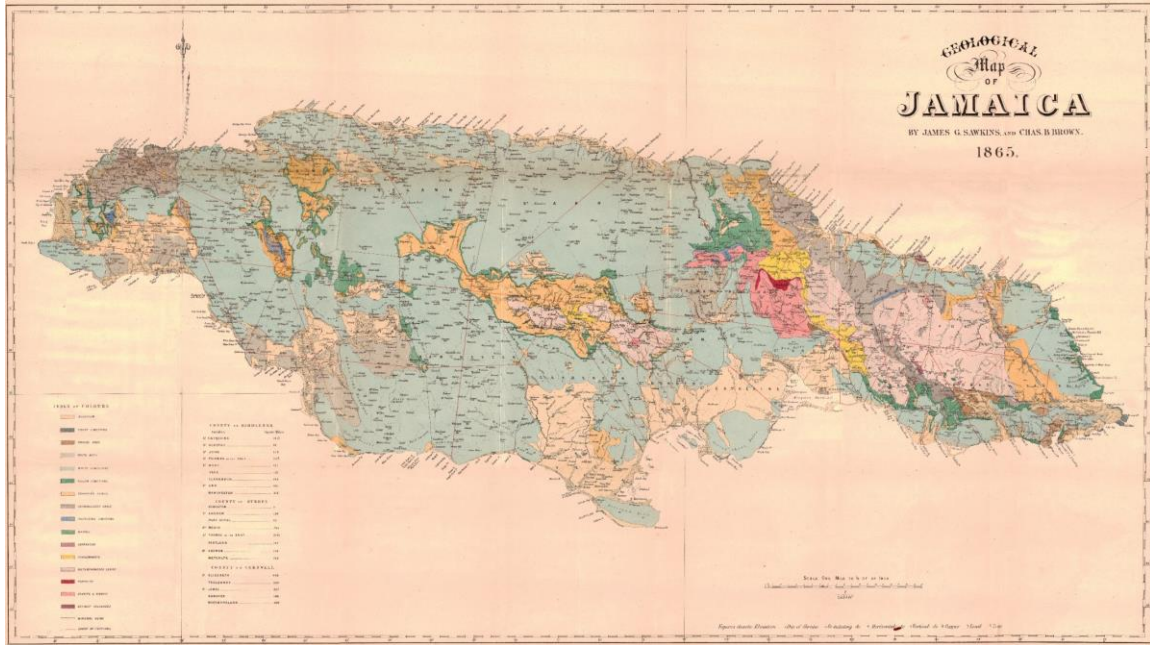


Figure 8. The Brown and Sawkins 1865 Map. Produced when the survey was told it must end before completing the geology of the whole island. Details were based on parishes mapped up until 1865, but unmapped parishes were taken from the Sawkins and Wall 1863 map. [A larger version of this map can be downloaded from the CJES website.]

Table 3. Geological units (selected) on the 1865 Sawkins and Brown Map (reproduced from key and information in Sawkins, 1865) with comments.

Unit	Notes
Alluvium	Includes fan deposits, such as the Liguanea fan, etc.
Coast Limestone	Including the Falmouth Fm., but possibly some other parts of the Coastal Group.
Gravel Beds	
White Marl	
White Limestone	Largely rocks of the White Limestone Group, including both shallow-water and deep-water facies; together with parts of the lower Coastal Group (e.g., Manchioneal Fm in St Mary and Hopegate Fm. in Trelawny, etc.).
Yellow Limestone	Includes rocks belonging to the Yellow Limestone Group as well as lower parts of the Coastal Group (August Town, Layton and Manchioneal fms.). Most of the Coastal Group along the eastern coast of the parishes of St Thomas and Portland, as well as south of Round Hill in the parish of Vere, is shown as 'Yellow Limestone' on the map.
Trappean Series	Includes: Cretaceous rocks (Bellevue Fm.) and Paleogene rocks (upper Moore Town Fm.) in the Rio Grande Valley;
Carbonaceous Shale	Includes rocks around the periphery of the Blue Mountains (the Richmond Fm and small parts of the Moore Town Fm. of current usage) together with Cretaceous shales in western Jamaica (the Marchmont, Grange and Lucea inliers).
Cretaceous Limestone	Includes Cretaceous limestones along with grey-coloured Paleocene and early Eocene limestones (Clydesdale and Chepstow limestones) in eastern Jamaica.
Conglomerate	Includes the Slippery Rock Formation in the eastern Central Inlier,
Metamorphic Series	Includes large areas of the Blue Mountains as well as the older rocks in the central and eastern parts of the Central Inlier.
Porphyry	
Granite & Syenite	

in the parish of Port Royal (now St Andrew). In fact, all the dark grey limestones (including the Benbow Limestone in St Mary) were included amongst the Cretaceous Series. In contrast, in many of the 'Cretaceous inliers' of central and western

Jamaica, Cretaceous shales and conglomerates were shown as Carbonaceous Shale and Trap Rocks.

The year 1865 would also see the Morant Bay Rebellion where Paul Bogle's supporters rose up complaining about conditions for the formerly

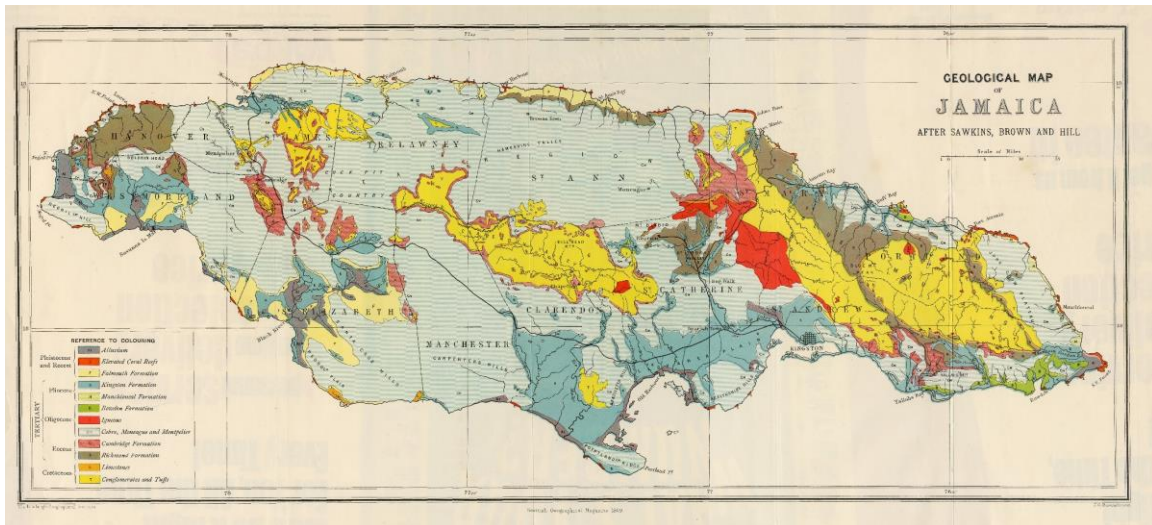


Figure 9. The Hill 1899 Map. This map updates the **Brown and Sawkins 1865** map with the details mapped from the additional parishes and also revises the rocks of the Bowden and Manchioneal formations in eastern Jamaica. The map was included in **Hill's 1899a** memoir, reproduced in the *Scottish Geographical Magazine* (Hill, 1899b) and available as a separate map from the Edinburgh Geographical Institute. Reproduced from an original copy in the *Scottish Geographical Magazine*, vol. 15, no. 12, pp. 628-639, A sketch of the geology of Jamaica after R. T. Hill (reprinted by permission of Informa UK Limited, trading as Taylor & Francis Group, www.tandfonline.com). [A larger version of this map can be downloaded from the CJES website.]

enslaved Africans and people of colour, they were ruthlessly put down by the Government's forces (*The Colonial Standard*, 1865; Heuman, 1994; Wilmot, 2010). Subsequently, the Geological Survey was reinstated by the Governor, and although the remaining parishes were mapped, no revisions to the **1865 Sawkins and Brown** map were made. **Sawkins (1870)** received proof copies of the *Geology of Jamaica* volume (**Sawkins, 1869**) and stated "I am much displeased and disgusted at the manner in which my report on the island of Jamaica has been sent out by the Lord Com[missioner]s – they have rendered the text of the least value by omitting the sections and diagrams referred to. This was done to economise I suppose. I could not superintend its publication and be here [in British Guiana] on duty at the same time. Consequently [I] do not hold myself responsible for the various errors I notice in it." It would have been interesting to see how Sawkins would have modified the different reports if he had been allowed time to work on the final version of the published memoir.

4. THE HILL (1899) MAP

In the 1890s, a renewed interest in the geology of Jamaica was born and it was promoted by *The Daily Gleaner* (24th November 1893). As a result the new Curator of the Institute of Jamaica, James Duerden, was someone with geological experience

(*The Daily Gleaner*, 14th December, 1894). At this time, Professor Robert T. Hill of the United States Geological Survey started visiting Jamaica (**Mitchell and James-Williamson, 2015**). Hill had been studying the geology of Mexico, Cuba, Central America and the Isthmus of Panama in collaboration with Professor Alexander Agassiz, the Director of the Museum of Comparative Zoology at Harvard (**Goodale, 1912**), and now sought to expand his surveys to Jamaica. His map of the geology (**Figure 9**), which was an update of that of **Sawkins and Brown (1865)** was dated 1899 and included in his memoir which was published in 1899 (**Hill, 1899a**) and reproduced in the *Scottish Geographical Magazine* for 1899.

Hill (1899a) was the first to start using formational names based on geographical locations, and introduced many geological formations with geographical names for units across Jamaica. Hill's map is effectively a reproduction of the **1865 Sawkins and Brown** map with corrections and geographical names for most units. Thus, all the grey limestones are attributed to the Cretaceous, and Cretaceous limestones are shown at Treasure Beach and Alligator Pond (St Elizabeth) and Cretaceous conglomerates at the southern end of the Braziletto Hills (St. Catherine). Hill, however, does include the Cretaceous Limestones at Haughton Hall (Hanover). Hill's main modification relates to the Yellow Limestone and White Limestone of the **Sawkins and Brown Map**. The Yellow Limestone

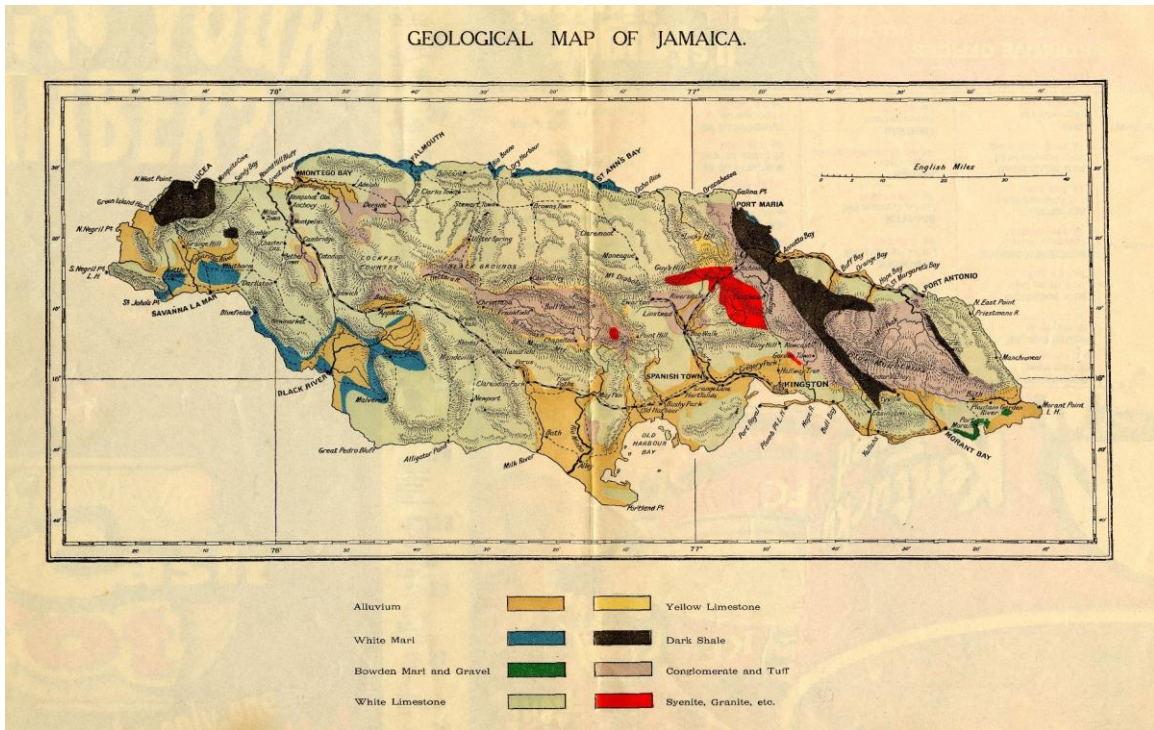


Figure 10. Geological map of Hall (1913) based on that of Sawkins and Brown (1865). Reproduced from original owned by author (not in copyright). [A larger version of this map can be downloaded from the CJES website.]

was restricted to beds below the White Limestone, and mapped as the Cambridge Formation that was divided into the Catadupa beds (with a mixed Cretaceous-Eocene fauna) below and the Chapelton beds (with an Eocene fauna) above. He separated the White Limestone into his Cobre, Moneague and Montpelier series; and in the eastern part of the island, mapped rocks above the White Limestone as Manchioneal Formation (north of the Plantain Garden River) and Bowden Formation (south of the Plantain Garden River).

5. EPILOGUE

It was left to subsequent authors to revise the units and geological maps of Jamaica. Hall (1913) reproduced a simplified version of the 1865 Sawkins and Brown map (Figure 10), without significant changes by way of comments or drafting (although the Bowden Marl and conglomerates are distinguished in St Thomas). In contrast, the errors with the palaeontological problems with earlier surveys were worked out by Trechmann who spent many years in the island in the earlier part of the twentieth century (Donovan, 2003). Trechmann specifically worked out: (1) that Hill (1899a) had mixed up Cretaceous rocks and Eocene Yellow Limestone in his Catadupa beds (Trechmann, 1922, 1923); (2) correctly reinterpreted some of the ‘Eocene shales’ as

Cretaceous rocks, such as, the Providence Shales of Portland (Trechmann, 1927), and the succession seen below the Yellow Limestone in St Ann’s Great River (Matley, 1924; Trechmann, 1927); but (3) fervently believed that the shales in several inliers (e.g., Lucea and Sunderland inliers) erroneously belonged to the Eocene (Trechmann, 1924). Only subsequent palaeontological studies (too numerous to mention) have corrected the many errors with the ages of the different rock units in Jamaica. Yet the geological map of Sawkins and Brown (1865) continued in use until a revised map was produced by the Geological Survey in 1958 (the Zans 1958 map), and even then, parts of the Blue Mountains were reproduced from the Sawkins and Brown map (Zans et al., 1963). It was only with the appearance of the Geological Survey’s 1977 McFarlane map that a completely revised 20th century map showing the geology of Jamaica was produced. So for one hundred and twelve years the 1865 Sawkins and Brown map served as the benchmark for geological mapping in Jamaica.

Acknowledgements. I thank Wendy Cawthorne for facilitating my visit to the Geological Society of London at Burlington House and for assisting me with locating data on James Sawkins and the geology of Jamaica. I thank Caroline Lam for scanning the copy of the map (Figure 5) at the Geological Society (London) and Michael McKimm and the Geological Society of London for providing permission to publish the maps shown in

Figures 3 and 5 (the latter, not in copyright). I thank the British Geological Survey for providing permission to publish a copy of the map shown in Figure 8 (not in copyright). I thank Informa UK Limited, trading as

Taylor & Francis Group, www.tandfonline.com for allowing permission to reproduce Figure 9 (not in copyright). I thank the reviewers and editor for their comments which helped improve the original draft.

GEOLOGICAL MAPS

(in date order)

DE LA BECHE MAP 1827. Published in **De la Beche, H. T. 1827.** Remarks on the geology of Jamaica. *Transactions of the Geological Society, London* (series 2), **2**, 143-194.

SAWKINS AND WALL MAP C. 1963. Unpublished. Archive Copy in the Library of the Geological Society of London.

SAKWINS AND BROWN MAP 1865. Published in **Sawkins, J. G. 1869.** *Reports on the geology of Jamaica or, part II of the West Indian survey. Memoirs of the Geological Survey*, Longmans, Green and Co., London.

HILL MAP 1899b. Published in **Hill, R. T. (after) 189a9.** A Sketch of the geology of Jamaica. *Scottish Geographical Magazine*, **15**, 628-639, and **Hill, R. T. 1899b.** The geology and physical geography of Jamaica: study of a type of Antillean development based on surveys made for Alexander Agassiz with an appendix on some Cretaceous and Eocene corals from Jamaica by T. Wayland Vaughan. *Bulletin of the*

Museum of Comparative Zoology at Harvard College, **34**, 1-256, Cambridge, Mass.

HALL MAP 1913. Published in **Hall, M. 1913.** *Notes on the geology of Jamaica, with a small geological map. To accompany "The rainfall of Jamaica from about 1870 to end of 1909, with maps."* Kingston, Jamaica, Government Printing Office, 1913, No. 420, 3 pp.

MATLEY, C. A. 1946. *Outline of the geology of the Kingston district of Jamaica*, Institute of Jamaica, 4 pp (un-numbered) and map.

ZANS MAP 1958. **Zans, V. A. 1958.** *1,250,000 Jamaica Geology*. Jamaica.

McFARLANE MAP 1977. **McFarlane, N. (Compiler). 1977.** *1:250,000 Jamaica*. Geology. Mines and Geology Division, Ministry of Mining and Natural Resources, Jamaica.

MITCHELL, S. F. 2015. *Geology of the parish of St Catherine (1:50,000 scale). Geological Map*. Kingston, Jamaica.

REFERENCES

Note: microfilms of the nineteenth-century *Colonial Office Dispatches CO 137* series are held in the West Indies Collection of the Main Library at the University of the West Indies, Mona, Kingston, Jamaica.

Barrett, L. 1860. On some Cretaceous rocks in the south-eastern portion of Jamaica. *Proceedings of the Geological Society*, **1860**, 324-326.

Barrett, L. 1861. *Report on the copper veins of Portland, Jamaica*, 22 pp., 2 pls., Taylor and Francis, London. [Text, but not figures, reproduced in **Sawkins, 1869**, pp. 74-84, see below.]

Barrett, L. 1862. Letter from Barrett to H. C. Norris Esq, received 13 October 1862, **CO 137/369**, folio 423, *Colonial Office Dispatches*. The National Archives (London).

De la Beche, H. T. 1825. Notice on the diluvium of Jamaica. *Annals of Philosophy*, new series no. **10**, 54-58.

De la Beche, H. T. 1827. Remarks on the geology of Jamaica. *Transactions of the Geological Society, London* (series 2), **2**, 143-194.

De la Beche, H. T. 1830. *Sections and views illustrative of geological phaenomena*, i-viii, 1-71, 40 pls., London.

Brown, C. B. Jr. 1917. Obituary. Charles Barrington Brown, Assoc. R.S.M., F.G.S. *Geological Magazine*, **4**, 235-237.

Chubb, L. J. 1958. Sir Henry Thomas de la Beche. *Geonotes*, **I**, no. 4, 3-26 (separately numbered).

Chubb, L. J. 1964. Lucas Barrett a biography. *Geonotes*, **6**, 3-45.

Colonial Archives, 1863. Letter to Newcastle from Murchison, dated 23 January 1863, received 27 January 1863, **CO 137/377**, folio 139, *Colonial Office Dispatches*. National Archives (London).

Darragh, T. A. 2001. *Campanile* (Mollusca: Gastropoda): A new record from the early Miocene of Victoria, Australia. *Alcheringa an Australasian Journal of Palaeontology*, **26**(3), 501-506.

Donovan, S. K. 2003. Charles Taylor Trechmann and the development of Caribbean geology between the wars. *Proceedings of the Geologists' Association*, **114**, 345-354.

Duncan, P. M. and Wall, G. P. 1865. A notice of the geology of Jamaica, especially with reference to the district of Clarendon; with descriptions of the Cretaceous, Eocene and Miocene corals of the island. *Quarterly Journal of the Geological Society, London*, **21**, 1-15.

Eyre, 1862. Letter from Governor Eyre to Duke of Newcastle dated 24th December 1862, received 15 January 1863, **CO 137/368/48**, folio 591-594, *Colonial Office Dispatches*. The National Archives (London).

Goodale, G. L. 1912. Biographical memoir of Alexander Agassiz 1835-1910. *National Academy of Sciences, Biographical Memoirs*, **7**, 291-305.

Hall, M. 1913. *Notes on the geology of Jamaica, with a small geological map. To accompany "The rainfall of Jamaica from about 1870 to end of 1909, with maps."*

- Kingston, Jamaica, Government Printing Office, 1913, No. 420, 3 pp.
- Heuman, G. J. 1994.** *The Killing Time: The Morant Bay Rebellion in Jamaica*, University of Tennessee Press, 199 pp.
- Hill, R. 1856.** On the beds of lignite coal in the Moore-Town Mountains, Portland. *Transactions of the Royal Society of Arts of Jamaica*, **ii**, 22-26.
- Hill, R. T. 1899a.** The geology and physical geography of Jamaica: study of a type of Antillean development based on surveys made for Alexander Agassiz with an appendix on some Cretaceous and Eocene corals from Jamaica by T. Wayland Vaughan. *Bulletin of the Museum of Comparative Zoology at Harvard College*, **34**, 1–256, Cambridge, Mass.
- Hill, R. T. (after), 1899b.** A Sketch of the geology of Jamaica. *Scottish Geographical Magazine*, **15**, 628-639.
- James-Williamson, S. A. and Mitchell, S. F. 2012.** Revised lithostratigraphy of the Coastal Group of south-eastern St. Thomas, Jamaica. *Caribbean Journal of Earth Science*, **44**, 9-17.
- Jones, T. R. 1863.** Notes on some Nummulinae and Orbitoides from Jamaica. *Quarterly Journal of the Geological Society, London*, **xvi**, 514-515.
- Lennox, A. 1867.** *Rapport sur la Géologie d'une partie de la Roumélie inspectée par ordre du Gouvernement Impérial Ottoman en 1866*, 46 pp., W. Clowes et Fils, London.
- Matley, C. A. 1924.** Further report on the possibility of the occurrence of petroleum deposits in the valley of St. Ann's Great River. Supplement to the *Jamaica Gazette*, September 25, 1924, 398.
- Matley, C. A. 1951.** *Geology and physiography of the Kingston district, Jamaica*. Crown Agents of the Colonies, London, 139 pp.
- Meyerhoff, A. A. and Krieg, E. A. 1977.** *Petroleum potential of Jamaica*, 1-131, Ministry of Mining and Natural Resources, Kingston, Jamaica.
- Mintz, S. 1959.** Labor and Sugar in Puerto Rico and in Jamaica, 1800-1850. *Comparative Studies in Society and History*, **1**, No. 3 (Mar., 1959), pp. 273-281, Cambridge University Press.
<https://www.jstor.org/stable/177876>
- Mitchell, S. F. 2004.** Lithostratigraphy and palaeogeography of the White Limestone Group. *Cainozoic Research*, **3**, 5-29.
- Mitchell, S. F. 2013.** Stratigraphy of the White Limestone of Jamaica. *Bulletin de la Société Géologique de France*, **184**, 111-118.
- Mitchell, S. F. and James-Williamson, S. A. 2015.** An Enormous Fossil Shell – the inspiration that led to the description of Jamaica's fossil rudist bivalves. *Jamaica Journal*, **35** (No. 3), 62-64.
- MJRCG, 1852a.** Liguanea and General Mining Company of Jamaica. *The Mining Journal, Railway and Commercial Gazette*, 3rd April 1852, p. 158.
- MJRCG, 1852b.** Annotto Bay Mining Company. *The Mining Journal, Railway and Commercial Gazette*, 2nd October 1852, p. 475.
- MJRCG, 1852c.** Jamaica Copper Mining Company. *The Mining Journal, Railway and Commercial Gazette*, 25th December 1852, p. 617.
- MJRCG, 1853a.** Port Royal and St. Andrew's Copper Mining Company. *The Mining Journal, Railway and Commercial Gazette*, 19th February 1853, p. 103.
- MJRCG, 1853b.** The Jamaica Copper Mining Company. *The Mining Journal, Railway and Commercial Gazette*, 5th March 1853, p. 135.
- MJRCG, 1853c.** Metcalfe and General Mining Company of Jamaica. *The Mining Journal, Railway and Commercial Gazette*, 26th March 1853, p. 177.
- MJRCG, 1853d.** Sue River Company. *The Mining Journal, Railway and Commercial Gazette*, 13th August 1853, p. 499.
- MJRCG, 1853e.** Jamaica Mining Association. *The Mining Journal, Railway and Commercial Gazette*, 8th October 1853, p. 634-635.
- Murchison Letters, 1865.** BGS, #39: Roger (Downing Street) to Murchison, 27th September 1865. Enclosed: Abstracted history of the Geological Survey of the West Indies. *Murchison Letters, 1865-1867*, British Geological Survey Archives, Keyworth, Nottingham, UK.
- Murchison Papers, 1841.** Letter from Roderick Impey Murchison to H. T. De la Beche, No. 1016, 20 March 1841. British Geological Survey Archives, Keyworth, Nottingham, UK.
- Robinson, E. 1994.** Jamaica. In **S. K. Donovan and T. A. Jackson (Eds.)**, *Caribbean geology an introduction*, 111-127, University of the West Indies Publisher's Association, Kingston, Jamaica.
- Roger, 1865.** Details from: Letter from Roger (Downing Street) to Murchison, 27th September 1865, *Murchison Letters, 1865-1867*, #39, BGS, Keyworth, Nottinghamshire, England.
- Sawkins, J. G. 1865.** Letter from Mr Sawkins to Mr Hall, Director of West Indian Survey, dated Kingston 25th July 1865, **CO 137/393/7**, folio 124-129, Colonial Office Dispatches. The National Archives (London).
- Sawkins, J. G. 1870.** Letter from J. G. Sawkins to Prof. J. Henry, 5th Jan 1870. *Office of the Secretary, Incoming Correspondence, 1863-1879*, Smithsonian Institute Archives, Records Unit 26, (Microfilm Reel 41), Smithsonian Institute, Washington D.C.
- Sawkins, J. G. 1869.** *Reports on the geology of Jamaica or, part II of the West Indian survey. Memoirs of the Geological Survey*, Longmans, Green and Co., London.
- Simmonds, P.L. 1862.** The British Colonies and the International Exhibition of 1862. *Journal of the Society of Arts*, **10**, 109-111 (Issue of Friday, January 10, 1862).
- Sorby, H. C. 1879.** James Gay Sawkins (Obituary). President's Anniversary Address. *Quarterly Journal of the Geological Society of London*, **35**, p. 54.
- The Colonial Standard**, 24th October 1865, 4 pp.
- The Daily Gleaner**, 24th November 1893.
- The Daily Gleaner**, 14th December, 1894.
- Trechmann, C. T. 1922.** The Cretaceous and Tertiary question in Jamaica. *Geological Magazine*, **59**, 422-431.
- Trechmann, C. T. 1923.** The Yellow Limestone of Jamaica and its Mollusca. *Geological Magazine*, **40**,

- 337-367.
- Trechmann, C. T. 1924.** The Carbonaceous Shale or Richmond Formation of Jamaica. *Geological Magazine*, **61**, 2-19.
- Trechmann, C. T. 1927.** The Cretaceous shales of Jamaica. *Geological Magazine*, **64**, 27-42.
- Wall, G. P. and Sawkins, J. G. 1860.** Despatch from Governor Henry Barkly, Governor of Jamaica to Sir George Grey, 26th November 1855. Appendix O in: *Report on the geology of Trinidad; or, Part I. of the West Indian survey*; xi + 211 pp., Longman, Green, Longman and Roberts, London.
- Watts, W. W. 1912.** George Parkes Wall (Obituary), in President's Anniversary Address. *Quarterly Journal of the Geological Society*, **68**, lxiii-lxiv.
- Wilmot, S. R. 2010.** The Jamaican Morant Bay Rebellion, 1865. In **J. M. Jemott, A. Josephs and K. E. A. Monteith (Eds.)**, *The Caribbean, the Atlantic World and Global Transformation* (Kingston: Social History Project), 96-109.
- Woodward, S. P. 1862.** Some account of *Barrettia*, a new and remarkable fossil shell from the hippurite limestone of Jamaica. *The Geologist: a Popular Illustrated Monthly Magazine of Geology*, **V** (October 1862), 372-377, pl. XX-XXI, London.
- Woodward, S. P. 1863.** *The Geologist*, **6**, 60-62.
- Zans, V. A., Chubb, L. J., Versey, H. R., Williams, J. B., Robinson, E. and Cooke, D. L. 1963.** *Synopsis of the geology of Jamaica an explanation of the 1958 provisional geological map of Jamaica*. Bulletin No. **4**, Geological Survey Department, Jamaica, 1-72, Government Printer, Duke Street, Kingston. [Dated on front cover and title page 1962, Printers imprint at bottom of front page is 1963.]
-

Editorial Responsibility: Dr S. James-Williamson. Type setting: Prof. S. F. Mitchell

Accepted 10th June 2023