

Compilation and suggestions for a standardized nomenclature for eastern Jamaica

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Abstract — The correlation difficulties during the compilation of notes to accompany 1:50,000 scale geological maps of eastern Jamaica identified a need for clarification and standardization of nomenclature. Previous research described lithostratigraphic units from limited areas only, without any attempt at regional correlation. The present study involved evaluation of lithostratigraphic nomenclature and descriptions produced by earlier authors. After meetings with the geologic community, the following nomenclature was agreed upon and should be adopted as standard for eastern Jamaica. From oldest to youngest:

Corn Husk Group: Back Rio Grande and Catalina Formations

Alligator Church Group: Guava River, Bellevue, Ginger House, Bath/Dunrobin, St Helen's Gap, and Rio Grande Formations

Plantain Garden Group: Cross Pass, Providence Shales, Bowden Pen, and Spanish River Formations

Wagwater Group: Clydesdale, Chepstow and Newcastle Volcanic Formations

Yellow Limestone Group: Font Hill Formation

White Limestone Group: Bonny Gate Formation and Montpelier Formation, Sign and Spring Garden Members.

INTRODUCTION

DURING the compilation of the 1:50,000 scale geologic maps nos. 26-30, for eastern Jamaica, it became evident that confusion exists between rock unit names of the different geologic sheets. The various authors call similar lithologic units different names in their separate areas of study. In addition, many of the existing names do not follow the international conventions of stratigraphic nomenclature. Scientists using the data agreed that it was necessary to compile the pre-Oligocene nomenclature for the eastern end of the island, examine lithological descriptions and time-stratigraphic data, and try to solve problems and questions associated with each geologic unit. In 1987, during the Chubb Symposium, Ray Wright and Locksley Allen (Petroleum Corporation of Jamaica), Grenville Draper and Edward Robinson (Florida International University), Winfried Schmidt and the author (Geological Survey Department) met to review the

nomenclature for eastern Jamaica. The nomenclature suggested in this paper was agreed upon at that meeting.

This study looks at the area east of the Wagwater Belt and includes the Blue Mountain Block. The Cretaceous Blue Mountain and Sunning Hill Inliers are located in this region, as is the ophiolitic Wild Cane Complex. Five geologic sheets, from the Swift River Sheet in the north

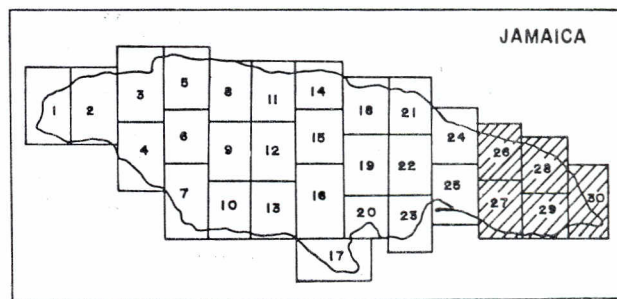


Figure 1. Index map showing all geological sheets on the eastern end of Jamaica (in hatchures).

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and Yallahs Sheet in the south eastward to Holland Bay, describe the region. Figure 1 is an index map showing all sheets on the eastern end of Jamaica.

The earliest work on eastern Jamaica was conducted by De la Beche (1827). Later contributions were made by Sawkins (1869), Hill (1899), Stockley (1925), Matley (1929), Trechmann (1936), Chubb (1962), and Green and Holliday (1970). The most recent contributions are in the

publications and theses by Kemp (1971), Green (1974, 1977), Draper (1979, 1986), Jackson (1985), Robinson (1969, 1985), and Wadge and Eva (1978). Table 1 shows a summary of the nomenclature of previous authors. The current suggested name for each formation is listed on the left-hand side of the table, while previous equivalent names and authors are listed on the right-hand side.

Table 1. Summary of nomenclature of previous authors.

CORN HUSK GROUP

Bon Hill Formation (Wadge and Eva, 1978)

Blue Mountain Group (Draper, 1979)

Back Rio Grande Formation (Krijnen and Lee Chin, 1977)

Blue Mountain Volcanic Group (Green, 1974 and 1977)

Blue Mountain Volcanic Group (Kemp, 1971)

Back Rio Grande Formation

Bon Hill Formation (Wadge and Eva, 1978)

Back Rio Grande Formation (Draper, 1979)

Back Rio Grande Formation (Krijnen and Lee Chin, 1977)

Epping Farm Formation (Kemp, 1971)

Fork Limestone (Draper, 1979)

Back Rio Grande Limestone Member (Krijnen and Lee Chin, 1977)

Catalina Formation

Catalina Member (Draper, 1979)

Unnamed Conglomerate (Krijnen and Lee Chin, 1977)

ALLIGATOR CHURCH GROUP

Main Ridge Group (Kemp, 1971)

Bellevue Formation (Krijnen and Lee Chin, 1977)

Bellevue Group (Draper, 1979)

Guava River Formation

Peak Formation (Kemp, 1971)

Guava River Formation (Draper, 1979)

Guava River Member (Krijnen and Lee Chin, 1977)

Bellevue Formation

Thornton Formation (Wadge and Eva, 1978)

Bellevue Porphyry Member (Krijnen and Lee Chin, 1977)

Brownsfield Formation (Draper, 1979)

Cornerpost Member (Kemp, 1971)

Garbrand Hall Volcanics (Draper, 1979)

Ginger House Formation

Ginger House Formation (Draper, 1979)

Ginger House Conglomerate Member (Krijnen and Lee Chin, 1977)

Provenfield Formation (Kemp, 1971)

Bath/Dunrobin Formation (Wadge and Eva, 1978)

Bath/Dunrobin Formation

Bath/Dunrobin Volcanic Formation (Draper, 1979)

Bath/Dunrobin Volcanic Formation (Wadge and Eva, 1978)

Suggested standardized nomenclature for eastern Jamaica

St Helen's Formation	Green Volcanic (Green, 1974 and 1977)
Rio Grande Formation	Bath Limestone (Wadge and Eva, 1978) Rio Grande Formation (Draper, 1979) Rio Grande Limestone Member (Krijnen and Lee Chin, 1977) <i>Barrettia</i> Limestone (Chubb, 1962)

PLANTAIN GARDEN GROUP

Main Ridge Group (Kemp, 1971)	
Blue Mountain Shale (Green, 1974 and 1977)	
Blue Mountain Formation (Krijnen and Lee Chin, 1977)	
Plantain Garden Group (Draper, 1979)	
Clarkes River Formation (Wadge and Eva, 1978)	
Cross Pass Formation	Jacobs Ladder Formation (Kemp, 1971) Blue Mountain Shale (Green, 1974 and 1977) Cross Pass Formation (Draper, 1979) Lower Clarkes River Limestone (Green, 1974 and 1977)
Spanish River Formation	Purple Volcanics (Green, 1974 and 1977)
Bowden Pen Formation	Main Ridge Group, Provenfield Formation (Kemp, 1971) Bowden Pen Conglomerate Member (Krijnen and Lee Chin, 1977) Bowden Pen Formation (Draper, 1979) Upper Clarkes River Formation (Wadge and Eva, 1978)

WAGWATER BELT GROUP

Richmond Group (Kemp, 1971)	
Wagwater Group (Green, 1974 and 1977)	
Wagwater Formation (Krijnen and Lee Chin, 1977)	
Wagwater Belt Group (Draper, 1979)	
Richmond Formation	Chepstow Limestone (Krijnen and Lee Chin, 1977) Chepstow Formation (Draper, 1979) Part of Richmond Group (Kemp, 1971) upper subgroup Richmond Facies (Green, 1974 and 1977) Richmond Formation (Draper, 1979)
Wagwater Formation	Part of Richmond Group (Kemp, 1971) lower subgroup Wagwater Facies (Green, 1974 and 1977) Wagwater Formation (Draper, 1979)
Halberstadt Formation	Part of Richmond Group (Kemp, 1971) middle subgroup, Newcastle Volcanic (Green, 1974) Halberstadt Volcanic Group (Matley, 1951)
Newcastle Formation	Wilmington Formation (Wadge and Eva, 1978) middle subgroup (Newcastle Volcanics) (Green, 1974) Newcastle Volcanics (Draper, 1979)

NOMENCLATURE

THE NOMENCLATURE for eastern Jamaica is described below in the conventional order of oldest to youngest. The approach taken here follows Draper (1979): it attempts to put the various formations into stratigraphic groups.

Corn Husk Group (Campanian)

The Corn Husk Group is named after the Corn Husk River and includes the Back Rio Grande and Catalina Formations. The oldest rocks exposed in the Blue Mountain Inlier are dated to be of Campanian age based on the presence of *Pseudorbitoides trechmanni* in the Back Rio Grande Formation. The Back Rio Grande Formation is overlain by the lowermost unit of this group, the Catalina Formation (Draper, 1979).

The Corn Husk Group occurs throughout eastern Jamaica and has been given several names. The Eppings Farm Formation of Kemp's (1971) Blue Mountain Volcanic Group may be the same as the Corn Husk Group (Draper, 1979), as it consists of a conglomerate overlain by a limestone which Kemp considers to be equivalent to the *Barrettia* Limestone Beds (Chubb, 1962) of the Back Rio Grande River. Krijnen and Lee Chin (1977) considered the Corn Husk Group to consist of the Back Rio Grande Formation and included the Back Rio Grande Limestone Member and the Unnamed Conglomerate Member. Draper (1979) called the Back Rio Grande Formation the Fork Limestone Member. He also gave a name to the Unnamed Conglomerate: the Catalina Member.

Wadge and Eva (1978) described the stratigraphic section in the Sunning Hill Inlier area. At the base of the section is the Bon Hill Formation. This unit is also conglomeratic, but it has clasts of a different lithology. The Catalina is composed of volcanic clasts, while the Bon Hill is carbonate rich (Draper, 1979). The Bon Hill includes the *Inoceramus* Shales and the Bon Hill Limestone of Bailey (1963) and Chubb (1971). This limestone contains clasts of *Barrettia monilifera* and *Distefanella sp.* Kauffman (1966) has dated the Bon Hill Formation as late Santonian-Campanian from *Inoceramus (Actinocera-mus)*. Wadge and Eva (1978) suggest a correlation based on the occurrence of *Barrettia monilifera* in both limestones.

Alligator Church Group (Campanian-Maastrichtian)

This group is named after the place where the Port Antonio-Ginger House road crosses the Rio Grande. The Campanian-early Tertiary rocks of eastern Jamaica have been divided into the Alligator Church and Plantain Garden Groups. The older Alligator Church Group consists

of the Guava River, Bellevue, Ginger House, Bath/Dunrobin, St Helen's Gap, and Rio Grande Formations. The Plantain Garden Group consists of the Cross Pass, Bonny View Andesite, Spanish Rivër, and Bowden Pen-Formations.

Because many of its formations are laterally discontinuous, the Alligator Church Group is the most complex of all the Cretaceous groups of eastern Jamaica. According to Krijnen and Lee Chin (1977), the northern portion of the Blue Mountain Inlier contains the most complete succession of the Alligator Church Group and consists of the Guava River, Bellevue, Ginger House Rio, and Grande Formations. Kemp (1971) described the southwestern portion of the Blue Mountain Inlier as consisting of the Peak and Provenfield Formations. Finally, Wadge and Eva (1978) described the southeastern portion of the inlier as consisting of the Thornton, Garbrand Hall, Bath/Dunrobin, and Rio Grande Formations. Only the Rio Grande Formation is consistent across the entire inlier.

The Guava River Formation (Draper, 1979) may be the lateral equivalent of the Peak Formation (Kemp, 1971), based on Kemp's reports of the presence of rare radiolaria (Draper, 1979). The Peak Formation of Kemp (1971) consisted of two members, the older Cornerpost Member and the younger Queensbury Ridge Member. Krijnen and Lee Chin (1977) observed that the Queensbury Ridge Member is in fault contact with the underlying Cornerpost Member and overlying Provenfield Formation, and its position in the sequence is mistaken. Also, they note limestone clasts and conglomerates similar to those within the Bowden Pen Formation. No faunal work on the limestone clasts has been conducted to date. Until this is done, Krijnen and Lee Chin's hypothesis cannot be fully supported.

Draper (1979) describes the Thornton Formation as lithologically similar to the Garbrand Hall Formation, and much of his Blue Mountain Volcanic Group is part of the Alligator Church Group (personal communication of J. Krijnen to G. Draper). There is confusion as to the lithological similarities and age relationships of the Thornton Formation. In places it interdigitates with the Back Rio Grande Formation, and in other areas it overlies the Bon Hill Formation. Draper (1979) suggests the name Brownsfield Formation for the Bellevue Porphyry Formation of Krijnen and Lee Chin (1977). Krijnen and Lee Chin (1977) correlate the Bellevue Porphyry to Kemp's (1971) Cornerpost Member of the Peak Formation.

In summary, the Bellevue Formation is locally interbedded with the Ginger House Formation in the north-central portion of the Blue Mountain Inlier (Draper, 1979). The Ginger House Formation is equivalent to the Bath/Dunrobin and Provenfield Formations.

St Helen's Gap Formation

Green (1974, 1977) called the grey-green basaltic lavas found in the Blue Mountain and 'St Peter's' Inliers the Green Volcanics. He suggested a Campanian age for these rocks, since the overlying limestone has been dated as Maastrichtian (Krijnen and Lee Chin, 1977; Draper, 1979). Also, Jackson (1985) suggested that the outcrop of 'Green Volcanics' in the St Peter's area was much younger (Eocene) than the Green Volcanics of the Blue Mountains and renamed them the St Peter Volcanics. It is suggested that the Green Volcanics of Maastrichtian age should be called the St Helen's Gap Formation after their occurrence in St Helen's Gap (St Andrew).

The Rio Grande Formation, the uppermost unit of the Alligator Church Group, is a shallow-water limestone characterized by the presence of *Orbitoides sp.*, *Pseudo-orbitoides sp.* and *Vaughanina sp.* (Krijnen and Lee Chin, 1977). *Titanosarcotites sp.*, *Plagiopychus sp.*, radiolitic fragments, and gastropods are also present (Draper, 1979).

Plantain Garden Group (Maastrichtian–Paleocene?)

This group is more laterally continuous than the Alligator Church Group across the eastern end of the island, making it much easier to correlate. It consists of the Cross Pass, Bonny View, Spanish River, and Bowden Pen Formations. The name of the group is derived from its widespread occurrence in the catchment basin of the lower Plantain Garden River. The name was originally used by Draper (1979), who considered the older name, Blue Mountain Shale, very easily confused with the Blue Mountain Group.

Formations of this group have been identified throughout the Blue Mountain Inlier by Kemp, Krijnen and Lee Chin and Draper. In the Sunning Hill area, Wadge and Eva call rocks of similar composition the Clarkes River Formation. The lowermost unit of the Plantain Garden Group is the Cross Pass Formation, the upper part of which may include the Providence Shales of Chubb (1962) and may be equivalent to Kemp's (1971) Jacob's Ladder Formation. Lithologically, the Cross Path Formation is similar to the Lower Member of the Clarkes River Formation, and seems to be the same age. Interdigitating with and overlying the Cross Pass Formation is the Bowden Pen Formation. Krijnen and Lee Chin (1977) and Draper (1979) consider the Bowden Pen Formation to be equivalent to Kemp's (1971) Queensbury Ridge Member, as conglomerates of the Queensbury Ridge Formation are of the same lithology as the lower portion of the Bowden Pen Formation. The Bowden Pen Formation is also equivalent to the upper part of the Clarkes River Formation (Krijnen and Lee Chin, 1977) and the Purple Volcanics of Green (1974 and 1977). Draper, Robinson and Krijnen

(personal communication) suggest renaming the Purple Volcanics to the Spanish River Formation because, though the unit is time-equivalent to the Bowden Pen Formation, it is of different lithology. The stratigraphic position of the Bonny View Andesite (Bonny View Porphyry), a member of the Plantain Garden Group, is not well understood. It appears to overlie the Cross Pass Formation in the Port Antonio area. The Bonny View Formation is interpreted as an intrusive sill, but it may also have an extrusive origin (Krijnen and Lee Chin, 1977).

Wagwater Belt Group (Paleocene?–lower Eocene)

The Wagwater Belt Group includes the Clydesdale, Chepstow, Wagwater, Richmond, St Peter's, Halberstadt Volcanic, and Newcastle Volcanic Formations. The rocks of this stratigraphic unit are Paleocene? to lower Eocene in age (Green, 1974 and 1977; Krijnen and Lee Chin, 1977; Draper, 1979). The Wagwater Belt Group, although quite thick, is relatively local in its distribution, not extending further east than the Sunning Hill Inlier (Wadge and Eva, 1977) nor further west than the Wagwater Fault (Chubb, 1959; Sohl, 1967). The most complete sequence of this group is concentrated in the Wagwater Basin. Because of its local nature, Green (1977) divides the Wagwater Belt Group only into subgroups, not wishing to formalize formation and member names. He describes upper, middle and lower subgroups, placing the Wagwater facies into the lower subgroup and the Richmond facies into the upper subgroup. Draper (1979) is more formal and breaks the units down into formations. The oldest rocks in this group are the purple sandstones and conglomerates of the Wagwater Formation. After an initial phase of Wagwater deposition, the Richmond Formation was deposited. The two formations interdigitate and were probably deposited contemporaneously. This graben fill sequence was interrupted in many areas at different times by flows of the Newcastle Volcanics and limestone deposition. Jackson and Smith (1979) describe the relationship between the Wagwater and Richmond as one of 'gradation by alternation'. Within the Wagwater Belt Group there are two distinctive types of volcanism. The first type is represented by the Halberstadt Volcanic Formation (tholeiitic, plateau, intra-plate-type basalts) associated with an intra-plate extensional regime. The second, the Newcastle Volcanic Formation (dacitic), is related to a convergent plate margin (Jackson and Smith, 1979). The flows of both units interfinger in the middle section of the Wagwater Group.

Jackson (1985) identified the St Peter's Volcanics (previously 'Green Volcanics') as tholeiitic basalts associated with intra-plate tectonics and suggested that they formed in a similar volcanic setting as the Halberstadt and Low Layton Volcanics. The Nutfield and Annotto Bay

Volcanics are also correlated to the Halberstadt Volcanics (Jackson and Smith, 1979).

The age of the Newcastle Volcanic Formation has not yet been established. Robinson *et al.* (1970) describe the Newcastle as the 'topographically highest unit forming a cap over less resistant Richmond and Wagwater Formations'. The Newcastle Volcanic Formation is intercalated with the Wagwater Formation, occurring as reworked rubble beds and as volcanoclastic turbidite sequences of the Richmond Formation and Chepstow Limestone. Fritted contacts exist where lava flows are in contact with sediments. This indicates an earlier age than the Richmond Formation (Robinson *et al.*, 1970), at least for part of the Newcastle Formation.

The Richmond Formation is the same age as the Providence Shale (Chubb, 1962) and is possibly its equivalent. Portions of the Wilmington Formation of the Sunning Hill Inlier are probably equivalent to the Richmond Formation (Wadge and Eva, 1978).

The Chepstow Limestone is equivalent to the Halberstadt (Zans *et al.*, 1962) and Woodford Limestones (Draper, 1979). Green (1974), on the Kingston Sheet no. 25, scale 1:50,000, grouped a number of limestones together. These include the Clydesdale, Woodford, Middleton Mountain, Halberstadt, and Chepstow Limestones. It is not known whether the Middleton Mountain Limestone correlates to the Chepstow. Draper (1979) considers that the Clydesdale Limestone is older than the Chepstow Limestone, based on fossils identified by Robinson, and could be Paleocene in age.

Yellow Limestone Group

In eastern Jamaica this group is represented by the Font Hill Formation and has been clearly and consistently identified by all workers.

White Limestone Group

Earlier discussions of stratigraphy and nomenclature of the White Limestone Group are contained in Hill (1899), Hose and Versey (1956), Zans *et al.* (1962), Robinson (1967, 1969 and 1985), Wright (1971 and 1974), and Steineck (1974 and 1981).

The limestones of eastern Jamaica were studied in detail by Robinson (1969) in his dissertation. Eastern Jamaica contains only two units of the White Limestone, the upper Montpelier and lower Montpelier Formations of Hill (1899), also called the Montpelier Formation and

Bonny Gate Formation by Robinson (1967, 1969 and 1985) and Wright (1971 and 1974). These units are separated by an unconformity. Robinson (1985) proposes that the White Limestone in the eastern portion of the island can be divided into smaller units, which represent two broad depositional environments. Along the north coast and over much of the area flanking the Blue Mountains, the White Limestone occurs as a series of evenly bedded chalks or micrites, characteristically containing nodular or platy layers of chert. Fossil assemblages are dominated by planktonic foraminifera and calcareous nannofossils and represent deposition in the open ocean at bathyal to abyssal depths (Spring Garden Member, *Geological Survey Department Annual Report, 1959*, p. 4). The second broad depositional environment includes limestones belonging to a shallow, open shelf environment. These rocks are characterized by more or less pure carbonates, massive to thick bedded, sometimes thinly bedded without chert, but occasionally dolomitized (Sign Member).

SUMMARY

TABLE 2 summarizes the suggested succession for eastern Jamaica. Ages, lithologies, type sections, fauna, and contacts for the various units are included.

For Campanian rocks, the name Corn Husk Group replaces Blue Mountain Group and consists of the Back Rio Grande Formation, which is equivalent to the Eppings Farm Formation, and the Catalina Formation, which is equivalent to the Unnamed Conglomerate.

The name Alligator Church Group replaces Bellevue Group. Its constituents are the Rio Grande, St Helen's Gap (equivalent to, respectively, the Bath Limestone and the Green Volcanics), Bath/Dunrobin, Ginger House, Bellevue (equivalent to the Brownsfield, portions of the Thornton and Cornerpost), and Guava River Formations.

For Maastrichtian to Tertiary rocks, the name Plantain Garden Group replaces earlier Blue Mountain Formation. The Plantain Garden Group consists of the Bowden Pen Formation, which is equivalent to the Upper Clarke River Formation, and the Cross Pass Formation, which is equivalent to the Lower Clarke's River Member and the Jacob's Ladder Member. The Spanish River Formation is the lateral equivalent to the Bowden Pen Formation and replaces the Purple Volcanics.

Table 2. Suggested nomenclature for the eastern end of Jamaica.

UNIT	LITHOLOGY	TYPE SECTION	FAUNA/CONTACTS
<u>CORN HUSK GROUP</u>			
Catalina Formation (Campanian)	Polymict agglomeratic conglomerate of lava clasts in a sandy matrix	Confluences of the Catalina/Back Rio Grande and Stony/Back Rio Grande Rivers, Portland	Base not seen
Back Rio Grande Formation (Campanian) – Krijnen and Lee Chin, 1977	Lower portion moderately to thickly bedded, rubbly limestone, upper portion more conglomeratic, with lava clasts grading into layers of tuffaceous material	Downstream of confluence of Catalina and Back Rio Grande Rivers, Portland	Fault contact with underlying Catalina. Fauna include <i>Pseudorbitoides trechmanni</i> , <i>Barrettia monilifera</i> , Radiolitiid frameworks
<u>ALLIGATOR CHURCH GROUP</u>			
Guava River Formation (Maastrichtian)	Well-bedded grey calcareous mudstones and siltstones	Along banks of Guava River W of Bellevue, Portland	Overlies Back Rio Grande Formation conformably. In fault contact overlying Bellevue Porphyry Member? (Krijnen and Lee Chin, 1977)
Ginger House Formation	Tuffaceous conglomerates with pebble-size clasts of andesitic porphyry and chloritized rock	Northeast of Ginger House, Portland	Upper boundary is transition from volcanoclastics without limestone clasts to volcanoclastics with limestone
Bath/Dunrobin Formation (Maastrichtian)	Basaltic (spillitic) lavas and pyroclastics with fossiliferous limestones	Bath Volcanics from Roaring River eastwards. Dunrobin Volcanics between East Arm of Morant and Roaring Rivers	Overlain by or interbedded with poorly fossiliferous micritic limestones of the Rio Grande Limestone Formation
St Helen's Gap Formation	Grey-green lavas sometimes porphyritic	St Helen's Gap area, St Andrew	Interbedded with or possibly overlying thin recrystallized limestones (identified by Draper and Krijnen to correlate with the Rio Grande Limestone). Fauna include <i>Plagioptychus</i> sp. fragments
Rio Grande Formation (Maastrichtian)	Grey and rubbly limestone	Banks of Rio Grande River between Ginger House and Alligator Church, Portland	Fauna include <i>Titanosarcolites</i> sp., <i>Plagioptychus</i> sp., <i>Pseudorbitoides</i> sp., <i>Orbitoides</i> sp., and gastropod fragments

UNIT	LITHOLOGY	TYPE SECTION	FAUNA/CONTACTS
PLANTAIN GARDEN GROUP			
Cross Pass Formation (Maastrichtian: Wadge and Eva) (Maastrichtian–Paleocene: Draper, 1979)	Well-bedded brown weathering shales, siltstones and sandstones, occasionally gritty to conglomeratic, with limestone and radiolarian chert fragments in a fine-grained matrix	NNW of Bath in Cross Pass area	Lower boundary conformable on Rio Grande Limestone Members, upper fault contact with Bowden Pen and fault contact with Bonny View Formation. Fauna includes <i>Pseudorbitoides</i> sp., <i>Globotruncana</i> sp.
Bonny View Formation (late Maastrichtian–early Tertiary)	Massive fairly homogenous porphyry with plagioclase phenocrysts, slightly altered to chloritic material, clinopyroxene and olivine altered to serpentine and iron oxides	S of Port Antonio, within its city limits, along road to Bonny View Hotel, Portland	Lower and upper boundaries in fault contact with Cross Pass Formation
Spanish River Formation	Reddish volcanoclastics and andesitic lavas which are chloritized, epidotized, replaced by calcite	Spanish River drainage	
Bowden Pen Formation			
Lower Member (Maastrichtian)	Purply polymict conglomerates with rounded to subrounded pebbles, cobbles and boulders of porphyritic material, metasediments, limestones, and granodiorite. Occasionally, quartz and agate pebbles occur	Area of Bowden Pen, extending to Cuna Pass, St Thomas	Lower and upper boundaries are faulted contacts. Fauna include <i>Pseudorbitoides trechmani</i> , <i>Orbitoides</i> , <i>Plagioptychus</i> sp.
Upper Member (Maastrichtian)	Shale		
WAGWATER BELT GROUP			
Chepstow Formation (Paleocene–very early Eocene)	Thin-bedded impure limestones interbedded with shaly layers; grades upward into thickly bedded limestone	In Chepstow area, Portland, S of Hope Bay, along Spanish River. Most complete section: on Mt Herman–Shirley Castle road	Comformably overlies the Bowden Pen Formation. Very fossiliferous. Fauna includes foraminifera, algae, echinoderms, colonial corals, bivalves, and gastropods

UNIT	LITHOLOGY	TYPE SECTION	FAUNA/CONTACTS
Richmond Formation (lower Eocene)	Well-bedded alternating sandstone, siltstone and mudstone	N of Blue Mountain Ridge, along Rio Grande valley from Friendship to Mooretown, along Mabess River, and S by Bybrook	Lower boundary unconformable with Chepstow Formation in northwest part of Blue Mountain Inlier. Upper boundary conformable with Yellow Limestone. Fossils scarce, but gastropods, burrow markings, plant remains, colonial corals, and coal seams occasionally seen
Wagwater Formation (lower Eocene)	Red and purple conglomerates, sandstones and marls. Grains derived from andesitic-dacitic volcanic terrane and a secondary contribution from subadjacent or co-genetic granite intrusions	Jacks Hill-Gordon Town area, St Andrew	Interbeds with Richmond Formation and is unconformable with Kintyre Porphyry
Halberstadt Volcanic Formation	Basalts and spillites	Bito-Good Hope area, St Andrew	Richmond Formation passes alternately into Halberstadt Formation (Green, 1974)
Newcastle Volcanic Formation	Dacites and quartz keratophyres, porphyritic plagioclase-hornblende andesite. Some varieties not porphyritic	Content Gap and Barbeque areas, St Andrew; Mocho, near Llandewey, St Thomas	Grades into Wagwater and Richmond sediments, interbeds with Richmond and Wagwater sediments as 5 distinct flows; as cap on less resistant Richmond and Wagwater Formations; these sediments are baked where they are in contact with the Newcastle

YELLOW LIMESTONE GROUP

(middle Eocene)	Thinly to moderately well-bedded micritic limestones with very thin partings between beds	Font Hill, St Thomas	Gradational contact with Richmond Formation. Unconformable contact with overlying White Limestone Group. Fauna includes predominantly planktonic foraminifera, although reworked benthonic fauna can be found
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UNIT	LITHOLOGY	TYPE SECTION	FAUNA/CONTACTS
WHITE LIMESTONE GROUP			
Bonny Gate Formation (middle Eocene and Oligocene)	Evenly bedded white micrites, typically chalky and porous. Chalky layers separated by layers of dark brown, platy chert	Near Dressikie, St Mary, near Bonny Gate	Comformably overlies Yellow Limestone. Fauna includes globigerinacean and radiolarian tests
Montpelier Formation			
Sign Member (uppermost Oligocene-lower Miocene)	Soft, evenly bedded radiolarian- and planktonic foraminifera-rich chalks. Chert present	Low bluffs along road and shoulders in vicinity of Sign Cross roads, along Montego Bay-Adelphi road (NW Jamaica), near Falmouth, E of Buff Bay Village and S of Discovery Bay, and in Yallahs, Eccles-down Districts	Gradational contact with overlying Spring Garden. Fauna include radiolaria, planktonic foraminifera
Spring Garden Formation (middle Miocene)	Soft, evenly bedded chert-free chalks	Cliffs along coast road E of Buff Bay Village	Gradational contact with underlying Sign and overlying Buff Bay Formations. Fauna include planktonic foraminifera

In rocks of the lower Eocene, the name Wagwater Belt Group replaces Wagwater Group and Richmond Group. The Richmond Formation is equivalent to portions of the Wilmington Formation and the Providence Shales. The Eocene St Peter's Volcanics, introduced by Jackson (1985), replaces the Green Volcanics in the 'St Peter's Inlier' (Yallahs Horst). Beyond this the authors are consistent with their nomenclature.

Also consistent is the Yellow Limestone Group. The authors agree on their descriptions and names. The Montpelier and Bonny Gate Formations are the only units of the White Limestone Group which are exposed on the eastern end of the island. The Montpelier Formation consists of the Sign and Spring Garden Members.

CONCLUSION

FROM THE preceding discussion, it is apparent that many of the geologic rock units are lithologically similar — so much so that they may be mistaken for one another in the field. It may have been easier in the past simply to rename the rocks rather than try to classify them. This paper tries to remedy this by developing a geologically consistent nomenclature that enhances rather than hinder

researchers' ability to understand the stratigraphy of the rocks of eastern Jamaica. Hopefully, researchers can now spend more time on field research rather than untangling nomenclature.

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