

# Hal Dixon's millipedes (Late Pleistocene)

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**ABSTRACT.** Millipedes are rare fossils. In the Antilles they are only known from two sites, in the Miocene amber of the Dominican Republic and the Late Pleistocene Red Hills Road Cave (RHRC), parish of St Andrew, Jamaica. A 'lost' collection, picked from a bulk sample by the late Hal Dixon, recorded herein, contain all taxa previously recorded from the RHRC: *Rhinocricus* sp. or spp.; aff. *Chondrotropis* sp.; *Caraibodesmus verrucosus* (Pocock); and *Cyclodesmus* sp. cf. *C. porcellanus* Pocock. This is the only collection of fossil millipedes in the Geology Museum of the University of the West Indies and only the third accumulation of these arthropods recorded from the RHRC.

**Keywords:** caves, collections, taphonomy, biodiversity, Antilles, Konservat-Lagerstätten.

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## 1. INTRODUCTION

The Red Hills Road Cave or Fissure (RHRC) in the parish of St Andrew (for locality map, see Paul and Donovan, 2006, fig. 1) is the most important site for terrestrial fossils of Late Pleistocene age in Jamaica (Donovan et al., 2013). The fauna is large and diverse, including common land snails (Paul and Donovan, 2006) and tetrapods (McFarlane and Blake, 2005; Ouwendijk et al., 2014; Boot et al., 2015), and rarer arthropods (Baalbergen and Donovan, 2013). The latter group includes ostracods (so far undescribed), land crabs, rare insect growth phases, isopods and, most notable from the point of view of the present communication, millipedes.

The two most important contributions on the RHRC millipede fauna were the original discussion by Donovan and Veltkamp (1994) and the subsequent description of the entire macroarthropod diversity by Baalbergen and Donovan (2013); the latter was derived from a report of a project that formed part of Baalbergen's (2011) M.Sc. research. The latter was based on a wet sieved sub-sample taken from the sediment deposited in the UWIGM by Donovan (1997) in 2007 (Donovan, 2008), and picked by Baalbergen and others for fossil arthropods. On the day that Baalbergen handed me her thesis for grading, I was rummaging in a cabinet of specimens and I uncovered a forgotten collection of RHRC millipedes that I had in my care. From memory and the way that specimens were packed into tubes with tissue paper, I determined they had been picked by the late Hal Dixon, formerly my M.Phil. research student, and whose collecting methods I knew well. This collection is discussed below.

## 2. MATERIALS AND METHODS

All specimens discussed and illustrated herein are deposited in the Geology Museum, University of the West Indies, Mona (UWIGM). Photographs taken with a Canon G11 digital camera were manipulated in Photoshop.

## 3. HAROLD L. DIXON (1941-2005)

Harold ('Hal') Dixon was a technician in the Department of Geology (later Geography and Geology) at the University of the West Indies, Mona (UWI), between 1988 and 2001 (Donovan, 2007). He was hired by Trevor Jackson, Head of Department of Geology, mainly as a darkroom technician. But Hal also proved to be an enthusiastic field geologist (he was one of the first to graduate in geology from UWI in the mid-1960s) and was an energetic member of my 'field team' in the 1990s, driving the departmental vehicle, and throwing himself into any and all field campaigns. He also initiated his own research programme and wrote a monograph of the previously almost unknown echinoids of the Upper Oligocene of Jamaica for his M.Phil. dissertation (Dixon, 1995; Dixon and Donovan, 1998). An example of his devotion to uncovering minutiae in the island's rock record was his approach to collecting limestone scraped from his echinoids, which were then examined microscopically; this approach yielded the first ossicles of ophiuroids and a crinoid from the Jamaican Oligocene (Dixon et al., 1994).

In 1995, Hal was a key member of the team that collected a major bulk sample, about 500 kg, from the RHRC, deposited in the UWIGM (Donovan, 1997). When we ran out of collecting bags, it was

Hal who drove around the Red Hills area, inveigling owners of small shops to sell him their 'scandal' bags (= carrier bags)! Hal's collection of millipedes is presumed to have come mainly, probably entirely, from this sample. That the specimens include many that are larger than most of those picked from the same sample subsequently (Baalbergen and Donovan, 2013) at least suggests that this was the case.

### 3. THE COLLECTION

The millipede fauna of the RHRC is comprised of four species. Donovan and Veltkamp (1994) identified *Rhinocricus* sp. or spp., aff. *Chondrotropis* sp. and *Caraibodesmus verrucosus* (Pocock, 1894), to which Baalbergen and Donovan (2013) added *Cyclodesmus* sp. cf. *C. porcellanus* Pocock, 1894. All of these taxa are recognised in the present collection. Apart from the 13 figured specimens (Figure 1; UWIGM 2017-01-0001 to 0013), there are a further 54 unsorted millipedes (UWIGM 2017-01-0014). These comprise the second largest, recorded collection of millipedes from the RHRC (Table 1).

### 4. DISCUSSION

The significance of the RHRC arthropod faunas, most prominently the millipedes, is both local and regional. While it is not intended to regurgitate in detail what has been discussed elsewhere (e.g., Donovan and Veltkamp, 1994; Baalbergen and Donovan, 2013; Donovan, 2017), brief reiteration of the main points of importance may be of interest to the present audience; the RHRC has not been discussed in this journal for almost 30 years (Donovan and Gordon, 1989).

The RHRC is the most important site for Late Pleistocene terrestrial palaeontology in the fossil record of Jamaica, with a fauna unmatched for diversity. This biodiversity includes 62 species of land snails (Paul and Donovan, 2006), that is, more than known from any other Jamaican cave. It also has yielded the most varied association of terrestrial arthropods (Baalbergen and Donovan, 2013). The disarticulated vertebrates are only slowly revealing their secrets, but include, for example, the largest recorded variety of birds (mostly identified at the level of family) from any Pleistocene site on the island (Boot et al., 2015).

It may be idle speculation, but it is interesting to ask what the presence of four taxa of millipedes at the RHRC means for their coeval diversity in Jamaica? With a fauna of extant, endemic gastropods comprised of 505 species (Rosenberg

and Muratov, 2006), the land snails of the RHRC represent 12.3% of the living snails. If a similar ratio applies to the millipedes, this implies that the Late Pleistocene millipede fauna of Jamaica consisted of c. 33 species. This is probably an underestimate as there are 59 extant species (<http://insectoid.info/checklist/diplopoda/jamaica/>). However, 31 of these extant species are Rhinocricidae, that is, *Rhinocricus* spp. and related taxa. Assuming that *Rhinocricus* sp. or spp. from the RHRC (Donovan and Veltkamp, 1994) represents two or more species, as has been suspected for over 20 years in light of the very numerous specimens and the difficulties in refining the identification to nominal species (Table 1; Figure 1), then any estimate should be revised up and will more closely approach the modern millipede diversity.

Examining the fauna of the RHRC from the viewpoint of the Antillean region, it is only the second site to yield even a moderate diversity of fossil terrestrial arthropods after the Miocene amber deposits of the Dominican Republic (Iturralde-Vinent and MacPhee, 1996; Wu, 1996; Ross, 1998). The ancient terrestrial biota of the Antilles remains poorly known and its geographic distribution is patchily defined. A good illustration of this is that the only land snails older than Late Pleistocene from Jamaica are an allochthonous accumulation of limited diversity in the Late Pliocene Bowden shell beds, deposited in deep water (Goodfriend, 1993). The RHRC must be recognised as a palaeontological treasure and a true Konservat-Lagetstätten (Allison and Briggs, 1991; Martin, 1999) with respect to its arthropods.

### 5. CONCLUSIONS

Hal Dixon's collection of Late Pleistocene millipedes from the RHRC is important for several cogent reasons. Millipedes are rare fossils in the Antillean region and elsewhere, and, hitherto, there were only two published collections from Jamaica (all RHRC material), both in European museums (Table 1); the Dixon collection is the third such collection. Many of the specimens in the Dixon collection are particularly well preserved (Figure 1). This is the only collection of fossil millipedes in the UWIGM. And documenting this collection revives our appreciation of a notable Jamaican fossil collector.

One final point is relevant. I have written this as a deliberately 'hands off' account of Hal Dixon's millipedes with reason, recording the taxa, but not describing them in detail. Since the first examination of RHRC millipedes by scanning

Table 1. Composition of published millipede collections from the RHRC. Key: BMNH = the Natural History Museum, London (Donovan and Veltkamp, 1994); RGM = Naturalis Biodiversity Center, Leiden (Baalbergen and Donovan, 2013).

	<i>Rhinocricus</i>	<i>Chondrotropis</i>	<i>Caraibodesmus</i>	<i>Cyclodesmus</i>
BMNH	22 specimens			0
RGM	numerous	25	20	30

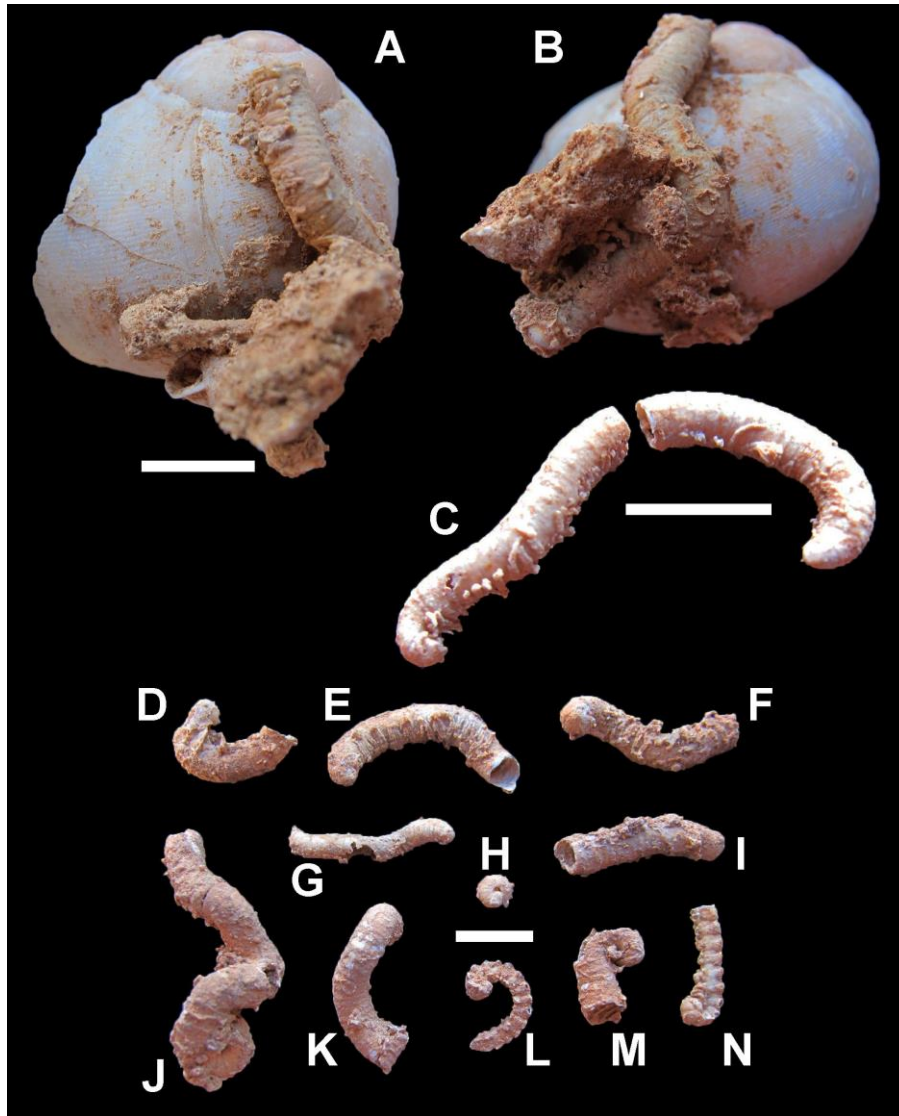


Figure 1. Some of the Hal Dixon collection of millipedes from the Late Pleistocene of the Red Hills Road Cave, parish of St Andrew, Jamaica. All specimens are *Rhinocricus* spp. unless stated otherwise. A, B, UWIGM 2017-01-0001, millipede cemented to the large land snail *Eurycratera jamaicensis* (Gmelin), a second smaller snail (free lip of aperture lower left of centre in (A)), bones and limestone. C, UWIGM 2017-01-0002, complete millipede broken in half. D-N, a pot pourri of eleven millipede fossils all printed at the same scale to enable relative sizes to be compared (UWIGM 2017-01-0003 to 0013, respectively). H is *Cyclodesmus* sp. cf. *C. porcellanus* Pocock (UWIGM 2017-01-0007); L, N are *Caraibodesmus verrucosus* (Pocock) (UWIGM 0011, 0013, respectively). Specimens uncoated. Scale bars represent 10 mm.

electron microscope (Donovan and Veltkamp, 1994), the methodologies of imaging have greatly improved and diversified. Hal Dixon’s 67 specimens cry out for examination using modern

three-dimensional imaging technology. This would be a fascinating subject for an energetic research student. I trust that a suitable candidate will not delay in grasping this opportunity with both hands.

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