Contents

Zlatozar Boev
A specimen of little bush moa *Anomalopteryx didiformis* (Owen, 1844), Emeidae Bonaparte, 1854 from the National Museum of Natural History, Sofia ............................................................... 3

Petar Beron
Stoitse Andreev (1937–2018) – In memoriam .......................................................... 6
A specimen of little bush moa *Anomalopteryx didiformis* (Owen, 1844), Emeidae Bonaparte, 1854 from the National Museum of Natural History, Sofia

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**Abstract:** A complete right tarsometatarsus from an unknown site of New Zealand was identified as little bush moa (*Anomalopteryx didiformis* (Owen, 1844)), possibly an adult male individual.

**Keywords:** Dinornithiformes, moa, *Anomalopteryx didiformis*, extinct birds, New Zealand

**Introduction**

The specimen, described here, is the only representative of the order Dinornithiformes Bonaparte, 1852 in the collections of the National Museum of Natural History in Sofia (NMNHS). In a previous paper (Boev, 2005), it was reported as “Dinornithidae gen. indet.” of “(Holocene) from an unknown locality in New Zealand”. The specimen is a complete right tarsometatarsus (tmt) of very good preservation. The whole bone was burnt, an indication the species had been used as prey of local people. It was given as a gift by Dr Cyril Alexander Walker (1939–2009) from the Natural History Museum, London during the author’s short visit in May 1986.

**Material and methods**

Material: tarsometatarsus dex. ad. The date, collector’s name and the site are unknown.

For the species identification of this subfossil find, we used the special key for identification of the long bones of moas (Worthy, 1988). The measurements of this specimen are given in Table 1.

**Results and discussion**

According Worthy (1988), if the ratio TL : WD is less than 2.5, the tmt belongs to a species of Anomalopterygidae. If this ratio is 2.1–2.5, the key leads

| Measurement                              | Abbreviation | Value (mm) |
|------------------------------------------|--------------|------------|
| Maximum total length                     | TL           | 185.00     |
| Width of proximal epiphysis              | WP           | 65.93      |
| Width of distal epiphysis                | WD           | 85.15      |
| Minimal width of diaphysis               | MW           | 35.89      |
| Diameter of condyles medialis of trochlea metatarsi tertii | DM | 36.69 |
| Diameter of condyles lateralis of trochlea metatarsi tertii | DL | 37.00 |
| Length of cotyla medialis                | LC           | 39.64      |

Table 1. Measurement of tarsometatarsus dex. ad. NMNHS 3852 of *Anomalopteryx didiformis*. 

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to *Eneus crassus* (Owen, 1846) or *Anomalopteryx didiformis* (Owen, 1844). The ratio TL : WD of the specimen NMNHS 3852 was 2.17 and fell within the range.

Other features that helped to identify the species as *Anomalopteryx didiformis* (Worthy, 1988): lateral hypotarsal ridge longer than medial (Plate 1 – b); medial nutrition foramen not in distinct hollow, bounded proximally by a ridge (Plate 1 – b); length typically 2.2 times distal width (in the specimen NMNHS 3852 it is 2.17, i.e. approx. 2.2).

Measurements (Cracraft, 1976): TL – 179.02 (n = 43); WP – 59.15 (n = 41); WD – 77.43 (n = 42). The values of all these measurements for the specimen NMNHS 3852 were very close to them (Table 1). As they exceeded slightly the mean values of Cracraft (1976), I supposed the examined specimen belonged to an adult male individual.

At present, the little bush moa *Anomalopteryx didiformis* belongs to the family of the emeid moas Emeidae Bonaparte, 1854 (Worthy & Scofield, 2012). The species used to be “the more common and occurred on both the North and South islands (Cracraft, 1976). According Day (1981), *A. didiformis* belongs to the group of the so-called “Pygmy Moas”, which used to be between 90 cm and 120 cm in height.”. The same is stated by Cracraft (1980). The last moas survived until 600 to 800 B.P., although “a small species of *Anomalopteryx*… may have survived in the remote wilderness of the Southern Alps until the eighteenth or nineteenth centuries.” (Cracraft, 1980). The little bush moa used to be abundant at “slightly lower altitudes” (Worthy & Scofield, 2012).

*Anomalopteryx didiformis* is known from the Fern Flat, Marton, near the Waimutu Stream, the Kaimatira Pumice Sand (dated 700 000 to 800 000 years ago), Scinde Island, Hawke’s Bay, Near Napier, Hawke’s Bay, Gleniti Valley, Timaru, Cook Strait (New Zealand). The finds of “Timaru Basalt, would be about 2.5 m. y. old and would, therefore, be the oldest known fossil record of moa.” (Worthy et al., 1991). Another locality where it has been recorded is the Takaka Fos-
A specimen of little bush moa *Anomalopteryx didiformis* (Owen, 1844)…

sil Cave on the Takaka Hill, South Island (Worthy & Roscoe, 2003).

Worthy (1997) summarises that (1) *A. didiformis* preferred unmodified habitats, (2) it disappeared in the prehistoric time and (3) it is known from a total of 22 sites (9 on the Northern Island and 13 on the South Island).

Thus, the little bush moa is the moa species of both the oldest and the latest fossil/subfossil record of all nine species of Dinornithiformes.

**Conclusions**

Although relatively numerous at the paleontological and archaeological sites in the New Zealand, the little bush moa is a rarity among the avian museum collections. The examined tarsometatarsus NMNHS 3852 is one of the most valued specimens in the avian collection of fossil and subfossil birds of the NMNHS.

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Stoitse Andreev (1937–2018) – In memoriam

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Dr Stoitse Andreev is a prominent Bulgarian carcinologist and biospeleologist. Born on 8th July 1937 in Sofia, he graduated from the University of Sofia as a zoologist and hydrobiologist. For many years he has studied caves and cave animals in Bulgaria and other countries, also hyporheic fauna, mountain lakes and sea creatures. Stoitse Andreev became specialist on Isopoda and Amphipoda of the Balkan Peninsula, describing one new genus and many new species, mostly Isopoda Oniscidea (28 species from Bulgaria and Greece) and Anthuridea (two new species from Sarawak and Papua New Guinea), also three new taxa of Amphipoda. He published 75 scientific papers. Half of his papers deal with biochemistry of sea weeds and animals (sterols and other active substances in Porifera, Bryozoa, Coelenterata, Mollusca, Tunicata).

Stoitse Andreev retired in 2002, after many years of work in the National Museum of Natural History in Sofia. He was head of the Department of Non-insect Invertebrates (1993–2002) and scientific secretary (1994–1999) of the museum (Dr since 1988, associate professor since 1988). From 1971 to 1983, Dr Andreev was member of the Board of the Bulgarian Federation of Speleology. Having accumulated knowledge and experience in some of the leading museums in Europe and Cuba, Stoitse Andreev was very useful for consulting the projects for new expositions in the museums in Sofia and elsewhere. He was also consultant in many projects for protected territories. Stoitse Andreev has enjoyed the esteem and sympathy of his colleagues and is recognised by many foreign specialists.

In 2007 I published a biobibliography of Stoitse Andreev (Historia naturalis bulgarica 18). Here it is completed with the papers he published since this time.

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