

**THE TYPE LOCALITY OF *EOPERIPATUS SUMATRANUS*
(SEDGWICK, 1888), WITH BIOGRAPHICAL NOTES ON ITS
COLLECTOR W.J.E. HEKMEIJER***

by

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Lande, Virginia M. van der & L.B. Holthuis: The type locality of *Eoperipatus sumatranus* (Sedgwick, 1888), with biographical notes on its collector W.J.E. Hekmeijer.

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Acquisition records of the type material and biographical data of its collector make it likely that the type locality of *Eoperipatus sumatranus* (Sedgwick) is Mt. Arjuno, E. Java, and not E. Sumatra. Biographical data for W.J.E. Hekmeijer and some of his closest relatives are given.

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I. INTRODUCTION

In 1886 Horst (1886: 37-41, pl. 2 figs. 1-5) described and figured an Onychophoran, which he referred to as a "species of the interesting genus *Peripatus*"; notwithstanding his account of the species, Horst did not provide it with a specific name. It was Sedgwick (1888: 485) who first gave the species the specific name *Peripatus sumatranus*; at present the species is called *Eoperipatus sumatranus* (Sedgwick, 1888).

Horst stated in his account of the species that the single specimen was "found by my colleague Mr. Ritsema [= C. Ritsema Czn, curator of Entomology of the Rijksmuseum van Natuurlijke Historie] in a bottle with Insects from East-Sumatra, presented to our Museum by Mr. W.E.J. Hekmeijer".

During a study of Onychophora the first author became interested in obtaining more information about the type locality of *Eoperipatus sumatranus* and to that end wrote to the Rijksmuseum van Natuurlijke Historie. This started the second author on a search for more data about the collector W.J.E. Hekmeijer and the origin of his material. So many interesting facts came to light during this search, among the most important of which is that the type locality of *Eoperipatus sumatranus* is most probably not East Sumatra, but more likely Mount Arjuno, East Java, that it seemed useful to publish these data as a separate note. This note now forms the third number in the series "Biografische Notities betreffende verzamelaars voor het Rijksmuseum van Natuurlijke Historie te Leiden"; no. 1 (on H.S. Pel) and no. 2 (on W.C. van Heurn) were published as Zoologische Bijdragen no. 10 (1968) and no. 16 (1973), respectively.

II. BIOGRAPHICAL NOTES ON W.J.E. HEKMEIJER

Willem Jacob Eduard Hekmeijer was born 18 March 1835 in Woensel, now part of the town of Eindhoven, The Netherlands. Horst (1886) was mistaken when he cited the initials as W.E.J.; it should also be remarked that Hekmeijer's last name is sometimes misspelled "Heckmeyer" or "Hekmeyer".

He was the second son of Willem Jacob Eduard Hekmeijer (born Utrecht, 14 September 1805, died Utrecht, 22 June 1882) and Odilia Christina Tresya (sometimes spelled Fresya, Theresia, or cited as Cornelia) Hoogbruin (sometimes written Hoogbruyn) (born Delft, 15 September 1811, died Utrecht, 13 March 1880). The father was a veterinary surgeon ("paarden-dokter") first in Loenen (prov. Utrecht) and, according to his marriage cer-

tificate of 27 April 1831, drafted into the Netherlands army in connection with the war of secession with Belgium (1830-1839). As military veterinary surgeon he was stationed in various towns in the province of Noord-Brabant (Best, 1831; Rijen, 1833; Woensel, 1835). After leaving Noord-Brabant the Hekmeijer family first went to Utrecht, and in March 1840 they settled in Wijk bij Duurstede, a small town south-east of Utrecht, where the father was registered as druggist. The Hekmeijers lived here until 2 September 1853, when they definitely settled in Utrecht. In the town records of Utrecht the father is mentioned as "rijks-veearts" (= government veterinary surgeon) and "keurmeester" (= food inspector). The Hekmeijer family had seven sons: Franciscus (born 19 October 1831 in Best), Willem Jacob Eduard (born 18 March 1835 in Woensel), Frederik August (born 1 May 1840 in Utrecht), Alexander (born 5 June 1842 in Wijk bij Duurstede), George (born 26 December 1847 in Wijk bij Duurstede, died there 20 September 1850), Lucas Everard (born 10 September 1850 in Wijk bij Duurstede), and Henri François David (born 13 June 1854 in Utrecht); and four daughters: Johanna Hendrica (born 4 April 1833 in Rijen), Anna Christina Cornelia (born 14 May 1837 in Breukelen, prov. Utrecht), Odilia (born 15 December 1843 in Wijk bij Duurstede), and Susanna Eleonora (born 9 November 1845 in Wijk bij Duurstede).

Willem Jacob Eduard Jr., like his brothers Franciscus and Lucas Everard, was trained in pharmacy. On 17 July 1858 he was appointed "apotheker 3^e klasse" (= dispenser third class) with the Army Medical Service in the East Indies. According to the Utrecht town archives he spent (before 1869) some time in London. This must have been before 1858 as on 18 October 1858 he left the Netherlands for the East Indies, leaving from the naval base at Nieuwediep on board the "Thompoa". On 13 March 1859 he arrived in Batavia (= present day Jakarta), and on 19 May of the same year he was assigned to the Groot Militair Hospitaal in Soerabaja (= present day Surabaya), East Java. On 23 October 1862 he was promoted to "apotheker 2^e klasse" and on 21 September 1866 to "apotheker 1^e klasse". Throughout this period he was stationed at Surabaya. On 7 March 1871 Hekmeijer returned to the Netherlands on sick leave.

During this first stay in the East Indies, on 25 November 1867, W.J.E. Hekmeijer married Jeanne Marie Coets van Baggen (born Maastricht, the Netherlands, 11 April 1843) in Batavia, but we could find no indication that any children were born.

The Hekmeijers stayed in Europe until the end of 1872, when they left for a second stay in the East Indies, arriving with the "Holland" in Batavia on 3 January 1873. Upon his return Hekmeijer evidently took up his old post,

as the records of January 1874 mention that he is stationed in Surabaya. On 19 March 1875 he was transferred to Atchin, N. Sumatra, evidently in connection with the Atchin troubles (1873-1904); he returned to Surabaya on 15 January 1876. On 25 January 1878 he was promoted to "1e apotheker 2e klasse" with the rank of Major. Soon after, on 2 February, he was transferred to Weltevreden, Batavia, West Java, to become administrator of the "Magazijn van 's Rijks geneesmiddelen" (= National depot of medical supplies). He obtained the rank of "1e apotheker 1e klasse" on 9 April 1880 and 10 days later was appointed "1e laborant" of the chemical laboratory at Weltevreden. On 2 February 1885, at his own request, he was honourably discharged and granted an annual pension of f 3,500. —. His military rank at that time was "Overste" (= Lieutenant-Colonel).

During his stay in the East Indies Hekmeijer received (on 29 January 1874) the insignia for prolonged service as officer in the Indies; in 1876 he was awarded the badge of honour for important military exploits in the Atchin war.

Upon their return to the Netherlands the Hekmeijers settled in The Hague on 23 December 1885, moved to Haarlem on 30 October 1886, and finally left the Netherlands on 1 November 1891 for Switzerland. Here they spent the rest of their life in Vennes, municipality of Lausanne, in the house "Riant Pré". W.J.E. Hekmeijer died on 29 July 1893; his wife continued to live in Vennes until her death on 8 July 1915.

Zoological collecting. — During both stays (1859-1871 and 1873-1885) in the East Indies W.J.E. Hekmeijer collected for the Leiden Museum. His collecting activities were possibly inspired by an official appeal from the director of the Rijksmuseum van Natuurlijke Historie through the Head of the Military Medical Services in the Netherlands East Indies, which was addressed to the medical officers and dispensers in the East Indian army requesting their help in obtaining zoological specimens for the Leiden Museum. This appeal was first sent out in 1847 and repeated in a circular of 22 January 1857. Hekmeijer evidently made extensive collections and when he went back to the Netherlands in 1871, he offered them for sale to the Leiden Museum which paid him f 250. —. The accession catalogue of the Entomology Department of the Museum listed for 7 August 1872 (see fig. 1): "Van den Heer Hekmeijer te Utrecht 24 doozen met Javaansche Insecten uit alle orden. In koop. "(= From Mr. Hekmeijer in Utrecht 24 boxes with Javanese Insects of all orders. Purchased). In the Hekmeijer correspondence file of the archives of the Museum there is a list of these boxes, which actually totalled 28. This collection of metal, wooden and cardboard containers apparently mostly comprised dry Coleoptera and Lepidoptera (both Macro- and Micro-) but also included

1 July	Vanden Heer & van Bommelen 30 Insecten van Port Darwin, Nord Australië. In koop.
10 "	van D ^r C. Felder te Meenen 260 Hemiptera Orthoptera en Hymenoptera van de Himalaya, Mexico, Guatemala en Cuba. In ruil.
"	Vanden Heer & Medembach de Rooij te Amst ^{er} ham 100 Ind. Hemiptera. In ruil.
7 Augustus	Vanden Heer Hekmeijer te Utrecht 24 doozen met Javaansche Insecten met alle orden. In koop.
13 "	van den Heer van Medembach de Rooij te Amst ^{er} ham, 37 O. I. Lepidoptera, meest van Java. In ruil.
24 "	Van den Heer Hellebrand uit Java, 150 Insecten van verschillende Orden.
14 September	Van den Heer J. van Schapman 29 Hectopneusten. In ruil.
19 "	Van denzelfde 32 Tenthrediniden In ruil.
29 "	van D ^r C. de Garen, te Batavia 120 Coleoptera, 30 Orthoptera, 50 Hemiptera 40 Hymenoptera en 6 Diptera. Geëchtst.
1 October	Van den Heer Hekmeijer een stopflesch met Insecten op spiritus van Oostelijk Java In koop.
10 "	van D ^r C. Felder te Meenen 141 meest zeer zame Javaansche Coleoptera In ruil.
4 Nov ^{br}	Vanden Heer & Medembach de Rooij te Amst ^{er} ham, een 60 sal Indische Hemiptera In ruil.

Fig. 1. Page from accession register of the Insect Division of the Rijksmuseum van Natuurlijke Historie for July to November 1872, listing Hekmeijer's collections acquired on 7 August and 1 October.

Diptera, Orthoptera and "various". In the list a very brief account of the contents of each container is given as well as the estimated price (e.g., an oval tin box with Macrolepidoptera, *f* 2. –; a wooden box with Lepidoptera in paper envelopes, *f* 3. –; a green tin box with Coleoptera (2 *Paussus*), *f* 20. –; etc.). On the same page the accession catalogue lists for 1 October 1872: "Van den Heer Hekmeijer een stopflesch met Insecten op spiritus van Oostelijk Java. In koop" (= From Mr. Hekmeijer a stoppered bottle with insects in spirit from eastern Java. Purchased).

During his second stay in the East Indies Hekmeijer again assembled an important collection. The published annual report of the Museum for 1 September 1891 to 1 September 1892 (Jentink, 1892: 10) mentioned for September 1891: "Van den Heer W.J.E. Hekmeyer, Officier van Gezondheid te 's Gravenhage: 2 Spitsmuizen, eenige Slangen en vele Insecten op spiritus, door hem verzameld in de Preanger, Java, Noord-Celebes, Sangi, Ternate, Molukken en Nieuw-Guinea" (= From Mr. W.J.E. Hekmeijer, medical officer in the Hague [should be Haarlem]: 2 shrews, some snakes and many insects in spirit, collected by him in the Preanger Regentschappen (a region occupying the larger part of the southern half of West Java), Java, North Celebes, the Sangi Islands (N. of Celebes), Ternate (Moluccas), Moluccas and New Guinea). As there are no indications that Hekmeijer visited any islands other than Java and N. Sumatra, it is unlikely that the statement that the material was collected by him is entirely correct; he probably obtained the material from Celebes, the Moluccas and New Guinea via other collectors.

The Hekmeijer file in the archives of the Leiden Museum contains very little information. Apart from the list of the 1872 dry collection mentioned above, there is a letter from the director of the Museum (H. Schlegel) to Hekmeijer, dated 29 July 1872, offering him *f* 250. – for the collection. Secondly there is Hekmeijer's answer (dated Geertruidenberg, 2 August 1872) accepting the offer. Finally there is a letter by Hekmeijer (dated Utrecht, 18 October 1872) probably sent to the Curator of Insects of the Museum (S.C. Snellen van Vollenhoven) or his assistant (C. Ritsema, who was to succeed Snellen van Vollenhoven in 1873). In this letter Hekmeijer expresses thanks for information received and promises to continue collecting when back in the Indies. He specially mentions the Homopteran *Fulgora*, which he had so far not encountered but for which he promises to be on the look-out; he expects to depart for the Indies quite soon. There is no correspondence about the 1891 collection; presumably Hekmeijer took this to the Museum in person.

Although Hekmeijer collected insects very intensively (and almost exclusively), he was evidently not a true entomologist as there are no signs that he studied his own collections. The fact that his last collection was not handed

over to the Museum upon his arrival in the Netherlands in 1885 but was kept until 1891, when he left for Switzerland, may indicate that he once intended to study the material himself.

As far as we can find, W.J.E. Hekmeijer Jr. did not publish in the field of entomology, although it is interesting that his father did. In 1857 a "Handboek voor de bijenteelt" (= Manual for Bee-Culture) was published, of which a second edition was issued in 1866 (Zwolle, Erven J.J. Tijl, xx + 172 pp). The author is cited as W.J.E. Hekmeijer. That this is the father is explained by a remark in the second (1866) edition which states that the author is "veearts der eerste klasse en eerste keurmeester van vleesch te Utrecht" (= veterinarian surgeon first class and chief inspector of meat in Utrecht). Hekmeijer Sr. also published "De Hollandsche veearts, of de kunst om de ziekten van paarden, enz., te kennen en te genezen" (= The Dutch Veterinary Surgeon, or the art to recognize and to cure the diseases of horses, etc.) (Tiel, 1858).

The family relationships of the Hekmeijers are often difficult to unravel, not only because, as in the present case, father and son have the same initials, but also because brothers often followed similar professions. W.J.E. Hekmeijer Sr. is usually described as a veterinary surgeon (e.g., in his marriage certificate, in the birth certificate of his second son, in the town records of Utrecht 1853-1882), although the town records of Wijk bij Duurstede (1840-1853) listed him as pharmacist or druggist. At that time it was probably possible to be both. His half-brother (thus an uncle of our W.J.E. Hekmeijer Jr.) Franciscus Cornelis Hekmeijer (born Utrecht, 9 September 1809, died Utrecht, 15 February 1886) achieved a certain fame as author and teacher of veterinary science. Both W.J.E. Sr. and F.C. Hekmeijer served with the army as veterinary surgeons during the 1830-1839 Belgian rebellion.

At least three of the sons of W.J.E. Hekmeijer Sr. became pharmacists. The career of the second son, W.J.E. Hekmeijer Jr. has been described above. Of his older brother, Franciscus, we know from the Wijk bij Duurstede municipal register that he was 'apothecars leerling' (= apprentice pharmacist), when the family lived in that town around 1850. He left for the East Indies on 26 April 1855, and in 1865 he worked in the Groot Militair Hospitaal in Surabaya, evidently at the same time that his younger brother was there. However, one year later, in 1866, he gave his address as Batavia. He became a member of the Koninklijke Natuurkundige Vereeniging in Nederlandsch Indië (= Royal Natural History Society in the Netherlands Indies). F. Hekmeijer was elected member of the Society in 1865 and again in 1874; membership was probably interrupted by a European furlough. He was still a member in 1878, but had left the Society in 1880. He published several

papers on the chemistry of poison used in poison arrows in the journal of the Society, *Natuurkundig Tijdschrift voor Nederlandsch Indië* (F. Hekmeijer, 1865: 333-341; 1866a, b: 260-263).

The second youngest of the seven Hekmeijer brothers, Lucas Everard was also a pharmacist. On 1 September 1868 he entered the training course of the Pharmaceutical Service for the East Indies, becoming "apotheker 3e klasse" with the Medical Service of the East Indian Army on 12 July 1872. On 4 March 1873 he embarked on the ship "Prins van Oranje" at the naval base of Nieuwediep, and arrived in Batavia on 18 April 1873. He was stationed first at the Groot Militair Hospitaal in Weltevreden near Batavia, moved to Padang, West Sumatra on 17 November 1873, then to Semarang on the north coast of Central Java on 1 March 1875, back to Weltevreden on 22 May 1876, and finally returned to Padang on 6 September 1876. He was promoted to "Apotheker 2e klasse" on 1 October 1876. On 8 June 1880 he left the Indies on sick leave, and was retired 1 July 1883 with an annual pension of f 750. – He married Theresia Elise Königs (born Antwerp, Belgium, 15 July 1850, died Voorburg, 23 March 1922); we can find no indication that any children were born. Returning from the Indies, the L.E. Hekmeijers first lived in Amsterdam; on 10 October 1883 they settled in The Hague, which they left on 20 April 1885 for Voorburg (very close to The Hague) where, in 1883, they had bought the large estate "Heeswijk" on which they spent the rest of their lives. L.E. Hekmeijer died in Voorburg on 8 October 1903, and was cremated in Berlin, Germany, as at that time cremation was not permitted in the Netherlands. He seems to have been the first Dutch subject to be cremated; his ashes were placed in a mausoleum on his estate.

Although the Rijksmuseum van Natuurlijke Historie, so far as can be ascertained, received no material from L.E. Hekmeijer, he had some ties with the Museum. After his appointment as "Apotheker 3e klasse" of the East Indian army and before he was actually sent out to the Indies, L.E. Hekmeijer worked in the Museum for 3 months (1 September-1 December 1872) in order "zich bekend te maken met de dieren en mineralen tot Oost Indië in betrekking staande" (= to become acquainted with the animals and minerals of the East Indies). These "courses" formed part of the efforts of the Director of the Museum to interest the medical and pharmaceutical personnel of the army and navy in the East Indies in making collections for the Museum. There are no indications that L.E. Hekmeijer lived up to these expectations, unless his collections were incorporated into the ones donated to the Museum in 1891 by his older brother. Of two of the other brothers Hekmeijer (Frederik August and Alexander) and two of the sisters (Johanna Hendrica and Anna Christina) it is known that they spent some time in the East Indies; but there are no in-

dications that they made any zoological collections either.

Results of W.J.E. Hekmeijer's collecting activities. — Specimens collected by Hekmeijer formed the basis for several publications, and a fairly extensive number became type specimens of new species. In perusing the first 20 volumes of "Notes from the Leyden Museum" (1879-1899), we came across descriptions of 20 new species of Coleoptera, 4 of Diptera, and 2 of Lepidoptera which were based on material collected by Hekmeijer, while several known species collected by him were also mentioned. Hekmeijer material is also described in other periodicals; e.g., P.C.T. Snellen (1878: 130) gives a description of the Tineid species *Fumea pronubella* collected by Hekmeijer at Mt. Arjuno, E. Java. F.J.M. Heylaerts (1880: xxix) made that species the type of a new genus *Heckmeyeria*. The only other taxon that we know of which has been named in honour of Hekmeijer is *Onthophagus hekmeyeri* Snellen van Vollenhoven, a manuscript name, published by J.W. van Lansberge (1883: 41) in the synonymy of *Onthophagus victor* Sharp (Coleoptera). Other specific names dedicated to Hekmeijer may exist and would be revealed by a careful search of entomological literature. The above, however, suffices to show the importance of Hekmeijer's contributions to zoology and in particular to entomology.

III. THE TYPE LOCALITY OF *EOPERIPATUS SUMATRANUS* (SEDGWICK, 1888) WITH OBSERVATIONS ON THE DISTRIBUTION OF THE GENUS *EOPERIPATUS*

One of W.J.E. Hekmeijer's most important non-entomological discoveries was the first record of an onychophoran in the Netherlands East Indies. It was moreover the first in a large area comprising the entire region known to zoogeographers as "Oriental", together with the adjacent part of the Australian region which includes New Guinea and New Britain. Until that specimen was found, Onychophora were not known outside Australia and New Zealand, if other localities in America and Africa are disregarded. Sedgwick (1888) was one of several workers who had misgivings about Horst's record. He wrote (p. 485): "the evidence that the specimen was actually found in Sumatra is not . . . conclusive . . . The name of the finder is not given, and there is no evidence to show how the specimen got into the bottle . . . suspend our judgement as to the authenticity of the locality . . .". From the following account of various types of evidence now available, it seems that the most probable site of collection of this unique specimen, a male, was in fact East Java, not Sumatra.

The Sumatran locality was generally accepted once *Peripatus* had been found by R. Evans in Malaya (Poulton, 1899: 591). Leloup (1931: 13) subsequently added Java to the list of localities which at that stage included Sumatra, but he gave no evidence to justify Java's inclusion. The only subsequent addition has been Borneo, where male and female animals were collected from two sites in Sarawak in 1923 (Mjöberg, 1923: 28). Others have been found from time to time (fig. 2), but only in Malaya and Sarawak. The majority of reports are for single specimens. Because of Hekmeijer's specimen, Sumatra is at present, however, always included on distribution maps and locality lists. Although Hekmeijer did not leave Holland for Switzerland until 1891 and was alive until 1893, apparently he was never asked to describe any of the circumstances associated with the finding of the specimen, as twenty-five years later, Horst (1911: 153) simply re-affirmed the original locality: "East coast of Sumatra". The discrepancy between his account and Museum records have remained unnoticed until now.

The hypothesis that, through a slip of the pen, "Sumatra" was substituted for "Java" may be supported by several arguments. In addition to the mistakes in transcribing Hekmeijer's name already mentioned, there are at least three other deficiencies in Horst's account, which was not, moreover, written in his native language. He states that the specimen was a gift, whereas the accession register shows that all the Hekmeijer material was purchased. Also, important observations on the jaws and reproductive system, including the sex of the animal (male), were omitted. On re-examining the specimen, Evans (1901: 485) expanded the original description and pointed out that the common opening of the male accessory glands had been mislabelled "anus" in Horst's figure (plate 2 fig. 4). His own specimens included males which had many similarities with the Leiden specimen; he therefore created the genus *Eoperipatus* for the two species he had found in Malaya in 1899 and *Peripatus sumatranus* Sedgwick, which he re-named *Eoperipatus sumatranus* (Sedgwick) (cf. Evans, 1901: 473). Horst's unique specimen is now in the hands of Dr. H. Ruhberg of Hamburg University and will be dealt with in the second, still unpublished, part (dealing with the Peripatidae) of her Monograph on the Onychophora, of which the first part (on the Peripatopsidae) at present is in the press.

Although we now know that Onychophora are more widespread in the Oriental region, even if Leloup's unsubstantiated record is excluded, none have been found in Java or Sumatra in the last 113 years. At first sight this is puzzling; the Netherlands East Indies, especially Java, have been for years the focus of important scientific work. There have been numerous expeditions, including many from Europe, as well as sustained work by resident

scientists. The world-renowned Botanical Gardens at Bogor were well-established by the time Hekmeijer arrived, and, for example, the important biological investigations following the 1883 Krakatoa eruption were started soon after Hekmeijer's period of service. Java was relatively settled in comparison with Sumatra and had a large population with many expatriates: thus there were at the end of 1893 48,649 Europeans, of whom 6,403 resided in Surabaya (Van der Lith, Spaan & Fokkens, 1896: 513, entry "Europeanen"). Communications were good; this was the period when the railways were being constructed¹ and travel was assisted by the extensive system of roads, many of which had paved surfaces. Alfred Russell Wallace (1869, 1: 148-189 (chapter 7)) visited East Java for 15 weeks in 1861 and was impressed by the fast, horse-drawn carriages and posting-houses at six-mile intervals for changing the horses. By 1891 the main areas of rain-forest had been mapped (Küchler, 1968: 174). However, Onychophora apparently have never been found again despite impressive scientific activity by later field workers including the experienced *Peripatus*-collector Willem Cornelis van Heurn, who spent six years in Surabaya (1933-1939) and worked in several parts of East Java (Holthuis & Husson, 1973: 35-37). But it should be noted that the main emphasis of biological work in the area was botanical.

Only two out of the three Hekmeijer collections had reached the museum by the time Horst published his account, and this states that the specimen originated from Sumatra. But at that time the first two collections comprised only the 28 boxes with dry insects (7th August, 1872) and the stoppered bottle with spirit material (1st October, 1872). The insects in the 28 boxes are described as "Javanese" and the spirit material was even more precisely identified as having come from East Java. It seems very likely that the "bottle with Insects from East-Sumatra" of Horst's account is the same as the "stoppered bottle with Insects from East Java" listed for 1st October, 1872 (see fig. 1 for ledger entries). There is no indication that any Hekmeijer material of Sumatran origin had reached the Museum before 1886 and the few specimens from Sumatra which Hekmeijer provided were part of the last (1891) collection.

The mistake was probably made while the paper was being prepared in Holland. A locally-based government official of Hekmeijer's calibre would not confuse the two names or use incorrect terminology. In this context it is perhaps conceivable that one place-name has been substituted for another, a

¹ The sections Surabaya-Pasaruhan opened 16th May, 1878; Surabaya-Mojokerto on 16th August, 1880; Malang-Bangil on 20th July, 1879.

mistake which is still made in conversation by some who are unfamiliar with the area.

It should be remarked that in Hekmeijer's time the term East-Java was frequently used, even though this name did not become that of an official administrative entity until after 1925. The almost perfectly straight East-West position of Java made the term quite logical. There is no equivalent for Sumatra: the administrative area shown on contemporary maps is "Sumatra's East Coast" and no part of this island is named "East"; indeed the word is inappropriate if used in a descriptive sense (fig. 2), and the present ad-

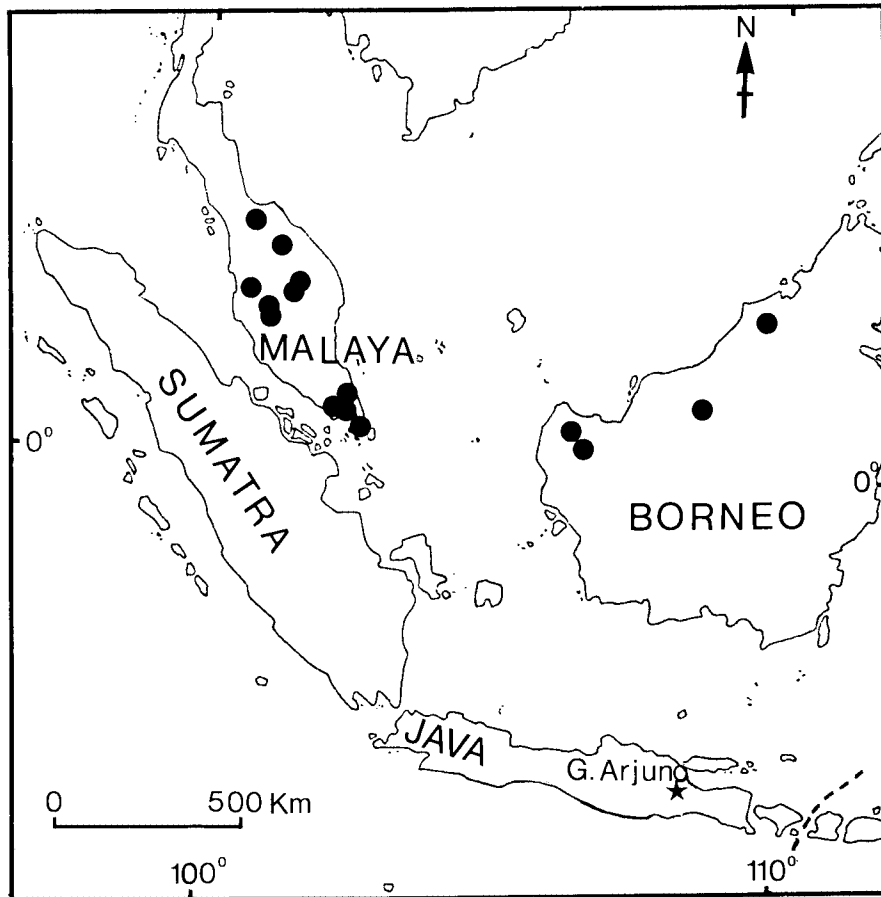


Fig. 2. Map showing the known distribution of *Eoperipatus* Evans, 1901. Filled circles, data from V.M. van der Lande, C.W.L. Mercer, P. Murphy, Zoological Reference Collection of National University of Singapore, Mjöberg (1923), Dover (1927), and Hendrickson (1957). Asterisk, probable type locality of *Eoperipatus sumatranus* (Sedgwick, 1888). Dashed line, Wallace's Line.

ministrative division of the island is in three provinces (North, Central, and South Sumatra).

A Javanese origin for the specimen of *Eoperipatus* in Leiden is given additional support by the publications concerned with material from the first and second Hekmeijer collections. The papers dealing with Hekmeijer's material published in the "Notes from the Leyden Museum" for 1879-1888 are concerned with specimens received by the Museum in 1872. They mention a total of 24 species of insect which had been provided by Hekmeijer: 14 of these apparently came from Mt. Ardjoeno (= Mt. or Gunung Arjuno) in East Java. For seven of the 24 the locality is given as "Ardjoeno", but the same group of mountains is undoubtedly meant as some later issues of the "Notes" (vols. 14, 15 and 18) name Mt. Ardjoeno as the locality for the Hekmeijer material. For the remaining three Java is given as the locality. The consistent indication of Mt. Ardjoeno for the pre-1872 material, except for the *Peripatus* specimen, is strong evidence that Horst's locality of East Sumatra is a mistake for East Java. The first non-Javanese locality for Hekmeijer specimens is mentioned much later in "Notes" vol. 18 (1896) when Coleoptera (*Eucyrtus*) from North Celebes, which formed part of the third Hekmeijer collection, are discussed.

It can be suggested that there is a reasonable possibility that the type locality for *Peripatus sumatranus* is Mt. Arjuno in East Java. However (see Wallace, 1869), this name is sometimes used for the whole complex of mountains of which Mt. Arjuno itself is only one of several, albeit the highest (3339 metres). Figure 3 shows the position of Mt. Arjuno and the routes by which it can be reached. It is the mountain which is closest to Surabaya, lying only 60 kms to the south, and would have been accessible without much difficulty to a determined collector, as the extent of the Hekmeijer collections prove. Hekmeijer would have had ample opportunity to explore and collect, and could have approached it from the southeast, or indirectly, using Wallace's route to Wonosalam from the northwest.

A case might be made to support a hypothesis that the specimen originated not from Java or Sumatra but from Malaya or Borneo. Evans decided that there were sufficient differences between the Malayan specimens to justify the creation of two species, namely *Eoperipatus horsti* and *E. weldoni*². As mentioned earlier, he also decided that the Leiden specimen belonged in the same genus; it thus became *Eoperipatus sumatranus*. However, it transpired at a later date that the differences forming the basis for distinguishing the various species were not consistent, since problems of identification were encountered

² Evans (1901) distinguished a third species, *E. butleri*, but Bouvier (1905) did not accept its validity, including it with *E. weldoni*.

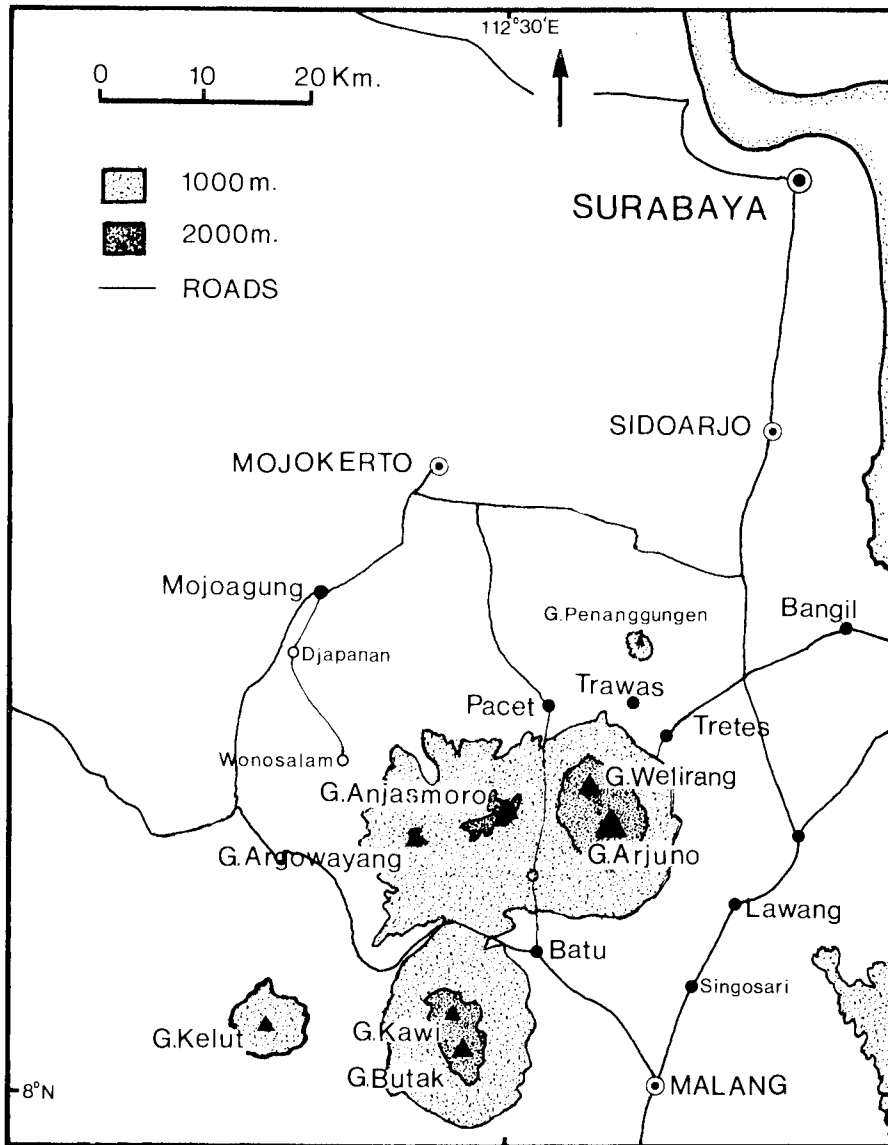


Fig. 3. Map of the area south of Surabaya, E. Java, showing communications in the vicinity of Mt. Arjuno.



Fig. 4. Recent Landsat imagery of Mt. Arjuno, E. Java (1:500,000). Madura Island is in the top right corner: due W. of it, on the mainland, can be seen the extensive fishponds. Surabaya lies outside the area of the photograph. The rivers are distinctive reference points: R. Porong extends across the centre of the picture. There are some clouds which cast deep shadows, particularly dense near the summits of the mountains in the South. Altitudinal changes in vegetation, corresponding approximately to the 1000 m and 2000 m contours, are clearly seen. Due N. is at the top of the picture which corresponds roughly with the area shown in fig. 3. Picture taken at 10 October 1973, altitude 915 km.

when more specimens were found in Sarawak and Malaya (Gravier & Fage, 1926: 293; Smedley, 1932: 34). Those collected up to the present time are therefore considered by some to belong to varieties of the species *E. sumatranus* (see Tweedie & Harrison, 1954: 202; Hendrickson, 1957: 33). To establish this synonymy would require additional Javan (or Sumatran) specimens of both sexes. If true, it would imply that the Leiden specimen may have originated from any one of the countries in which *Eoperipatus* occurs (fig. 2). However, this possibility can be discounted, as all the Hekmeijer material appears to have been collected in the Netherlands East Indies, i.e., from countries under Dutch control, although collectors other than W.J.E. Hekmeijer were probably involved as later on the material in the third collection came from farther afield.

Rare animals in inaccessible parts of the world provide uncertain records from which to construct distribution maps. Such maps will tend to reflect the efforts of collectors rather than the actual distribution of the animals. Also, the finding of Onychophora on only three out of the forty-four investigations and explorations, the majority of which included biologists, which are listed for Dutch Central New Guinea between 1909 and 1942 (Le Roux, 1948: 1) shows that these relatively unfamiliar and inconspicuous invertebrates are often overlooked, even by competent collectors. This must happen frequently: Clark (1915: 2) mentions another unique record consisting of tantalising findings in the east of the Oriental region: . . . "unidentified species (of Onychophora) . . . which were not preserved, have been met with in the Philippines . . .". Also Willey (1898: 2) noted that *Peripatus* may seem to be absent from a habitat which is very near and apparently identical to one which has yielded many specimens. Other collectors make similar remarks about the problem of finding these animals in the field which one of the authors can confirm from personal experience.

Wallace (1869: 148-189) collected for a month in East Java between July 18th and October 31st, 1861. His visit coincided with Hekmeijer's first tour of duty. He describes travelling to Djapannan via Mojokerto and Mojoagung through "magnificent forest" to reach his main collecting area at Wonosalam, at 500 m. This lies on the N.W. of the mountain complex (fig. 3), strictly speaking in the foothills of Mt. Anjasmoro; he writes about the area as 'the lower slopes of the Arjuna mountain, where I was informed I should find forest and plenty of game'. Unfortunately his visit was in the dry season so his searchings were unproductive and his descriptions are therefore brief. But he found at least one potential *Peripatus* habitat. The famous botanical traveller, Franz Wilhelm Junghuhn (1854, 3: 1143-1168) who reached the mountain on horseback via Lawang and Singosari, makes it clear from

his detailed botanical description that habitats appropriate for Onychophora also occurred on the S.E. side of the mountains. It should be noted, however, that suitable habitats (see Wells, Pyle & Collins, 1983: 515) are abundant in Sumatra's vast tracts of rain and moss forest (25% of the total surface: see the vegetation maps by Whitmore (1984: 461)) most of which occur in the western range of mountains, and it would not be surprising if Onychophora were eventually discovered there. The proximity of Sumatra to Malaya (fig. 2), with which it was connected until comparatively recently, is important. But as Wallace noted, there are significant differences between the faunas of Sumatra and Java, in that Java's, though overall poorer in numbers of animal species, has a higher proportion of endemics, so it is conceivable that Onychophora occur on one island and not the other (see discussions in, for example, Whitmore, 1981).

Part of G. Arjuno above 900 m is now designated the Gunung Arjuno-Lalijiwo Reserve (4,960 ha.). The lower slopes of the mountains, including the sites where Wallace collected have, for several centuries but particularly latterly, suffered greatly from tree-felling, the encroachment of paddy fields arising from the population increase, and, at higher altitudes, the influence of fire on the vegetation: in 1984 only some 11% of the surface of Java still retained primary rainforest. This compares with more than 13% in 1931 (1938: Atlas van Tropisch Nederland). It seems, nevertheless, that there are still remnants of the original rainforest in pockets in protected or inaccessible areas (J. Dransfield: pers. comm.). On these mountains, much of the moss forest seen by Junghuhn in 1844 can still be found (fig. 4). It is mostly on the south-facing slopes commencing at about 2,200 m, although volcanic activity prevents it from reaching the summits. It is worth noting that Onychophora are not necessarily restricted to habitats such as forests which overall have a constant and high humidity: an Australian species, for instance, occurs in some abundance in a reserve which has an annual dry period of several months duration and is subject to periodic fires (Van der Lande, 1978: 29). Onychophora are surprisingly tolerant and breeding colonies can survive for many years in comparatively small "islands" of original habitat which are able to satisfy the animals' physical and biological requirements, provided the community is a viable size. Many such "islands" probably exist in East Java wherever there are crevices and rockfalls, or perhaps ancient ruined buildings like those in a small rainforest at G. Penanggungen about 40 km south of Surabaya.

There is now, therefore, a convincing case that Mt. Arjuno, East Java, is the locality of the type specimen of *Eoperipatus sumatranus* discovered by C. Ritsema in the collections of the Leiden Museum. Since previous attempts to verify the record have probably been concentrated on Sumatra, it would be

worth carrying out a thorough investigation of the vicinity of Mt. Arjuno as there appear to be several areas which have the potential for harbouring Onychophora. Moreover, additional specimens would be invaluable for studies into the status of the different varieties (or species) comprising the genus *Eoperipatus*.

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